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Economic sciences

USING VR AND AR TECHNOLOGIES IN TOURISM AND HOSPITALITY

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Abstract

Virtual Reality (VR) and Augmented Reality (AR) are IT technologies widely used in various fields such as medicine, education, architecture, industry, tourism and others that enhance real-time interaction through selected formats. This paper discusses the use of augmented reality and VR technologies in the tourism sector. With each passing day, the interest and discussions related to the application of augmented reality and VR technologies in tourism are growing rapidly. This article explores the possibilities of using virtual (VR) and augmented reality (AR) technologies in the tourism and hospitality industry. In recent years, these technologies have significantly expanded the range of services offered, including virtual tours of attractions and hotels, as well as interactive guides and applications with AR elements. The article also identified the advantages of using VR/AR technologies in tourism. SWOT analysis of virtual and augmented reality in the tourism industry was carried out. On the basis of the analysis were identified weak and strong factors of development of these areas, as well as analysed the risks and opportunities. The integration of virtual and augmented reality (AR) technologies into the tourism industry offers many opportunities for both travellers and businesses. The key objectives are to (a) analyse consumer awareness of augmented reality and virtual reality in tourism, (b) assess the need for new technologies to improve domestic tourism experiences and (c) assess the overall demand for augmented reality and virtual reality in the tourism sector. The key objectives are to (a) SWOT analyse about augmented reality and virtual reality in tourism, (b) assess the need for new technologies to improve domestic tourism experiences and (c) statistically estimate the overall demand for augmented reality and virtual reality in the tourism sector. It also shows examples where these technologies have been or are being implemented. The paper emphasises the benefits of VR/AR to enhance customer experience, improve marketing approaches and increase operational efficiency of tourism and hospitality companies. Implementation challenges such as high costs and the need for staff training are also discussed. The article also provides examples of opportunities and suggestions for further implementation of these technologies in tourism industries. The essence of the study lies in its practical application to understand how companies can adapt and sustain their tourism operations. The research methodology is based on both primary and secondary sources.

Keywords: virtual reality, augmented reality, tourism, hospitality, customer experience, technology, innovation.

Introduction. *The tourism and hospitality industries have long been characterised by rapid growth and innovation. With the advancement of technology, these industries are undergoing significant*

changes in the way travellers interact with the world around them. Virtual reality and augmented reality are cutting-edge innovations that allow customers to experience destinations and facilities before they visit them in person. This improves decision-making processes and creates a more personalised and immersive experience. Virtual and augmented reality technologies allow travellers to experience attractions from the comfort of their own homes. Human interaction with the environment is through the organs of sight, touch, hearing, taste and smell. However, most modern add-ons focus primarily on visual and auditory experiences. Visual displays and spatial audio have been used to allow tourists to better immerse themselves in virtual journeys. Despite advances in vision and sound simulation, other senses such as touch, taste and smell have yet to be fully integrated into virtual and augmented reality technologies to provide a comprehensive sensory experience in tourism.

Today's consumers are increasingly looking for interactive and visually enriched solutions when planning their journeys. Virtual tours of hotels, museums and attractions allow them to browse these sites, assisting in both marketing and the booking process. Meanwhile, augmented reality enhances the on-site experience by providing easy access to information and interactive features via mobile devices. Virtual reality in tourism represents one of the most advanced and promising tools for showcasing tourist destinations, resorts and hotels in VR/AR. [1]

The purpose of this article is to study the current trends and opportunities for the application of virtual reality and augmented reality in the tourism and hospitality industry, describing the advantages they offer, as well as the challenges faced by businesses in implementing these technologies.

Literature review. In recent years, virtual (VR) and augmented reality (AR) have significantly changed approaches to creating customer experiences in industries such as tourism and hospitality. This literature review examines key research on the application of VR and AR in these fields, focusing on their impact on customer experience, marketing, operational efficiency, and current issues and challenges. [2]

According to Yung and Khoo-Lattimore (2019), VR and AR technologies are actively applied to improve customer experience. In particular, they allow tourists to take virtual tours of sites before visiting them, which according to Guttentag (2010) contributes to more informed travelling decisions. This is supported by research that shows that more than 70% of VR tour users plan to actually visit the sites they see (Yeo & Lim, 2019).[3].

The work of Tussyadiah and Wang (2020) emphasises that VR and AR have become important tools in tourism marketing strategies. Virtual tours and AR applications allow potential customers to experience offers in advance, which increases the likelihood of booking. For example, Han et al. (2019) describe a case study using VR to promote hotels that significantly increased booking rates. [5]

Kim and Hall's (2020) research also shows that AR technologies are actively used to create interactive marketing campaigns. AR-enabled apps provide information about attractions, helping tourists to better understand the cultural context of the places they are going to visit.

According to Jung and Dieck (2017), VR and AR significantly improve customer experience both before and during travelling. Using VR to anticipate experiences allows travellers to form more accurate expectations of the trip.

Despite the numerous benefits, the adoption of VR and AR faces a number of challenges. As Yung and Khoo-Lattimore (2019) point out, the high initial costs of equipment and content development can be a barrier for many companies, especially SMEs. Kim et al. (2019) also emphasise that employee training is required to use these technologies effectively, which requires additional resources. [3]

A study by Park et al. (2021) shows that limited access to modern devices among consumers also hinders the widespread adoption of VR and AR in developing countries, which affects the overall level of their use in tourism.

Research Methodology. To study the use of virtual and augmented reality in tourism, a statistical analysis from official websites of the tourism industry was conducted. The authors have also studied 3D tours of various tourist facilities and accommodations where users and potential consumers of services can use these technologies in planning their trips.

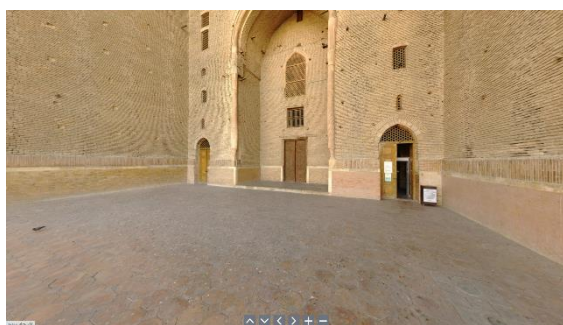
Main part. In recent years, virtual reality (VR) and augmented reality (AR) technologies have significantly changed various industries, especially tourism and hospitality. As these technologies continue to evolve and become more accessible, virtual reality and augmented reality tools are becoming important components of marketing, enhancing customer experience and optimising business operations. Statista shows that the adoption of these technologies can significantly improve business performance and customer satisfaction.

The Statista report states that the global virtual reality tourism market was valued at approximately \$2.6 billion in 2021 and is projected to grow to \$12.6 billion by 2027, at a compound

annual growth rate (CAGR) of over 30%. This growth is driven by the growing interest of consumers and businesses in innovative ways to utilise travel products.

In addition, data from Booking.com shows that 57% of travellers are willing to use virtual reality technology to improve their travel planning. Research shows that people who have participated in virtual tours are 25% more likely to book compared to those who do not use these technologies. These findings suggest that virtual and augmented reality are not only eye-catching, but also play a crucial role in purchasing decisions. If we consider the use of VR/AR in Kazakhstan, in recent years Kazakhstan has been actively introducing virtual reality (VR) and augmented reality (AR) technologies into its tourism sector, which significantly improves the quality of service and generates interest in the country as a tourist destination. With its rich cultural heritage, breathtaking natural landscapes and developing infrastructure, the introduction of these technologies opens up new opportunities for both locals and international tourists. [2]

The first is virtual tours and excursions. An outstanding application of virtual reality in tourism in Kazakhstan is the organization of virtual tours. This allows potential visitors to 'see' the sights of the country without leaving their own homes. Some well-known examples of VR/AR technologies use in Kazakhstan:



Picture 1-2. 3D tour of the Mausoleum of Khoja Ahmed Yasawi

Mausoleum of Khoja Ahmed Yasawi in Turkestan, which is recognised as a UNESCO World Heritage Site. In ZD-reality 'visitors' can familiarise themselves with a series of unique monuments of religious culture.



tour of

In the heart of the Eurasian continent, where the Altai and Sayan mountain ranges meet, lies the Altai Biosphere Reserve. Altai National Park, showcasing stunning landscapes including mountain rivers and unique flora and fauna.

The second is augmented reality in museums and cultural sites. Augmented reality is actively used in museums and cultural institutions to enhance the visitor experience:

- The Museum of the First President of the Republic of Kazakhstan in Astana uses augmented reality technologies to create interactive exhibits, allowing visitors to scan QR codes for additional information, including video and audio guides.

- The Dostyk Cultural Centre hosts interactive exhibitions that introduce Kazakh culture through augmented reality, highlighting historical events and cultural traditions.

Kazakhstan's tourism sector is increasingly integrating virtual and augmented reality into its marketing strategies. Virtual tours and 3D demonstrations of hotels, restaurants and attractions help to attract the attention of potential tourists. For example, travel agencies can create virtual reality videos

that showcase the natural beauty of places such as the Charyn Canyon or the Caspian Sea, creating vivid and memorable images to inspire travellers. Augmented reality technologies can be incorporated into mobile applications to provide real-time information on attractions, restaurants and cultural events. Hotels in Kazakhstan are also utilising these technologies. Rixos President Astana, Hilton Garden Inn Almaty, Novotel Almaty City Centre, Kimek Hotel (Ust-Kamenogorsk), The Ritz-Carlton Almaty are hotels in Kazakhstan that introduce and use VR/AR technologies.

Firstly, the use of virtual and augmented reality technologies significantly improves the quality of customer service. Guests can virtually inspect hotel rooms before booking, which helps to avoid unpleasant surprises and increases customer satisfaction. Tourists can use augmented reality to navigate cities, get information about nearby attractions and route recommendations, which makes their travelling experience more enjoyable.[3]

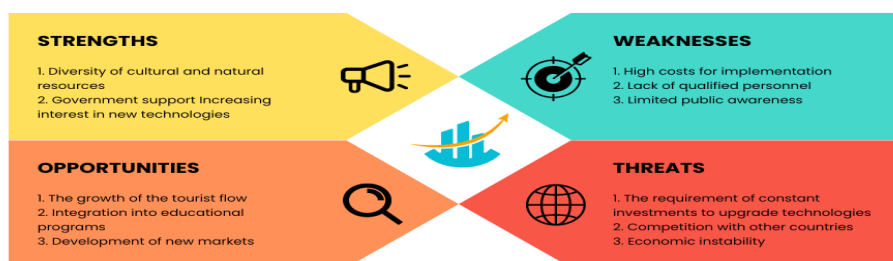
Secondly, Kazakhstan is endeavouring to develop its technology and infrastructure to support virtual and augmented reality in tourism. Government initiatives such as the Digital Kazakhstan programme are increasing investment in digitalisation, facilitating the adoption of new technologies in various sectors, including tourism. The government of Kazakhstan is actively promoting the development of the tourism industry, including the introduction of technologies that increase the inflow of tourists and improve the quality of service. [6]

The introduction of virtual and augmented reality technologies in the tourism sector of Kazakhstan opens new opportunities for development. Virtual and augmented reality technologies have significant potential to improve the quality of tourism services, increase interest in cultural and natural attractions and provide travellers with unique experiences. Given current trends and government initiatives, Kazakhstan has every chance to become a leader in the application of virtual and augmented reality in the tourism industry of Central Asia. However, despite the promising achievements, the integration of virtual and augmented reality into the tourism sector of Kazakhstan faces a number of challenges, which are reviewed and investigated through SWOT analysis.

The purpose of this SWOT analysis is to provide a comprehensive assessment of the current state of VR/AR technologies in Kazakhstan. (1 - table)

Table 1

SWOT ANALYSIS



* compiled by the authors

Table 1 presents the SWOT analysis of VR/AR technologies in Kazakhstan. Kazakhstan is rich in cultural heritage and ideal landscapes, which makes it favourable for these technologies. Also, at the moment, the 'Digital Kazakhstan' programme implemented by the state is developing, which also provides support for the introduction of VR/AR technologies. At the same time, weaknesses, high costs and lack of qualified personnel create problems for the development of technologies. However, there are still many opportunities for technology development, i.e., Kazakhstan can become a leader in the application of these technologies and be competitive among other countries. Threats may include economic instability and increased competition, as well as rapid technological development. Rapid changes in technology can make existing solutions obsolete, requiring continuous investment.

Conclusion. In conclusion, virtual reality (VR) and augmented reality (AR) technologies are transforming the tourism industry by introducing innovative ways of interacting with the world,

significantly improving traditional methods of planning and executing trips. These technologies allow travellers to 'visit' their desired destinations in advance, explore cultural and historical attractions from the comfort of their own homes, and access real-time information during their travels through augmented apps. This not only makes travelling more convenient and informative, but also enhances the overall traveller experience. Travel companies, hotels, museums and attractions are increasingly using virtual and augmented reality technologies to attract new customers by offering virtual tours that help potential visitors visualise their itineraries and available services. Using these tools allows travellers to make more informed decisions about their destinations and itineraries, while businesses can use them to improve their competitiveness in today's market. While recent developments have largely focused on visual and auditory perception, the potential of virtual and augmented reality extends far beyond these dimensions. These technologies can create multi-sensory experiences that include touch, taste and smell, further enhancing the immersion and realism of virtual journeys. Kazakhstan has also started to use these technologies in various spheres, including tourism. This increases the level of tourism development in the country and affects economic and other tourism indicators. Nevertheless, the industry faces a number of challenges, including accessibility issues, the need for technological improvements, and the urgent need to raise user awareness of the possibilities of virtual and augmented reality. Looking to the future, we can expect the continued development of these technologies, adapted to the diverse needs of a wide range of travellers, as well as their wider application in the tourism sector. Ultimately, virtual reality and augmented reality technologies have great potential to revolutionise traditional travel management methods, opening the way to new opportunities for both travellers and businesses in the tourism industry.

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ANALYZING AND MANAGING TEACHER AND STUDENT PERCEPTIONS IN ONLINE EDUCATION: A MATLAB-BASED STUDY

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Abstract

This study explores the perceptions of both teachers and students towards online education. Using MATLAB for data analysis, the experiences and preferences of educators and students across various fields and demographic factors were compared. Key statistical metrics such as Traces, Means, Norms, and meansII were used to quantify perceptions. These metrics provide insights into the effectiveness of online education and highlight differences in how various groups interact with online learning. The results form a basis for improving online educational practices to better serve both teachers and students, particularly in fields that face greater challenges in online adaptation.

Keywords: Online education, teacher perceptions, student perceptions, MATLAB analysis, Traces, Means, Norms.

Introduction

The perception of teachers and students towards online education has been a topic of increasing academic interest. (Chicherina et al., 2020) focused on classroom management in English as a Foreign Language classes in China and Russia, emphasizing the significance of understanding perceptions in language instruction. Similarly, (Kulal et al., 2020) investigated teacher and student attitudes towards online classes in specific Indian districts, underlining the influence of online courses on teaching efficiency. Amidst the global shift prompted by the COVID-19 pandemic, (Mohalik et al., 2020) assessed student teachers' e-readiness and perceptions of online learning, demonstrating how the crisis catalyzed the transition to digital platforms. (Makarova, 2021) contributed a comparative study of traditional and online learning, delving into student perspectives to weigh the benefits and limitations of digital education. This is aligned with (Haleman et al., 2021), who studied the acceptance of e-learning among ESL primary school students in Malaysia, focusing on the growing role of Information and Communication Technology (ICT) in education.

In addition, (Alawadhi et al., 2021) explored undergraduate perceptions of gamified learning through Kahoot! in EFL classrooms, demonstrating how digital tools influence engagement and learning in language settings. (Gupta, 2021) examined college students' preferences for online and offline platforms, stressing the need to accommodate both learning modes in a rapidly evolving digital environment. The shift to online teaching also brought attention to faculty perceptions, as analyzed by Ms. R. Nithya (2021), who reflected on the challenges and opportunities of transitioning to online teaching.

Moreover, (Amaechi et al., 2022) discussed global gender disparities in e-learning, focusing on factors such as self-efficacy, motivation, and performance. Lastly, (Roy et al., 2023) examined knowledge retention among medical students across various teaching methods, emphasizing the critical role of teaching approaches in student success. Literature suggests that online education, while flexible and accessible, faces distinct challenges depending on the subject being taught, the age group involved, and the technical proficiency of both students and teachers. This study aims to analyze and compare these perceptions using MATLAB-based metrics to provide a comprehensive understanding of how educators and students engage with online education.

Methods

The study first conducted surveys among 424 teachers and 4765 students, collecting data on their perceptions of online education. The survey covered demographic details such as age, gender, subject area, and asked participants to rate their perceptions of online education on a scale from 1 to 6, where 6 represented the most positive perception.

After collecting the survey responses, the data was anonymized and categorized into groups based on demographic factors such as age, subject, and prior experience with online education. In total, there were 134 distinct categories for students and 136 categories for teachers. These categories allowed for a more detailed analysis of how different groups experienced online education.

Data analysis was conducted using MATLAB to compute the following metrics:

1. *Traces*: A measure of overall satisfaction, calculated as the sum of the diagonal elements in a matrix.
2. *Means*: The average score representing the general perception of respondents.
3. *Norms*: The magnitude or intensity of the respondents' preferences, offering insights into how strongly they feel about online education.
4. *meansII*: A secondary level of averaging that provides more refined insights into specific demographic categories.

The results were then compared across these categories to identify trends and patterns in satisfaction levels between teachers and students.

Teachers

Group with Maximum Scores – Food and Agricultural Sciences, Ages 25-34, Undergraduate Only (Figure 1-4)

1. *Traces*: 567.52
2. *Means*: 500.99
3. *Norms*: 539.06
4. *meansII*: 27.36

This group exhibited the highest satisfaction with online education. Teachers in technical fields such as food and agricultural sciences benefited from the flexibility of online platforms, which supported their teaching methods, allowed easy access to digital resources, and enabled them to track student progress efficiently.

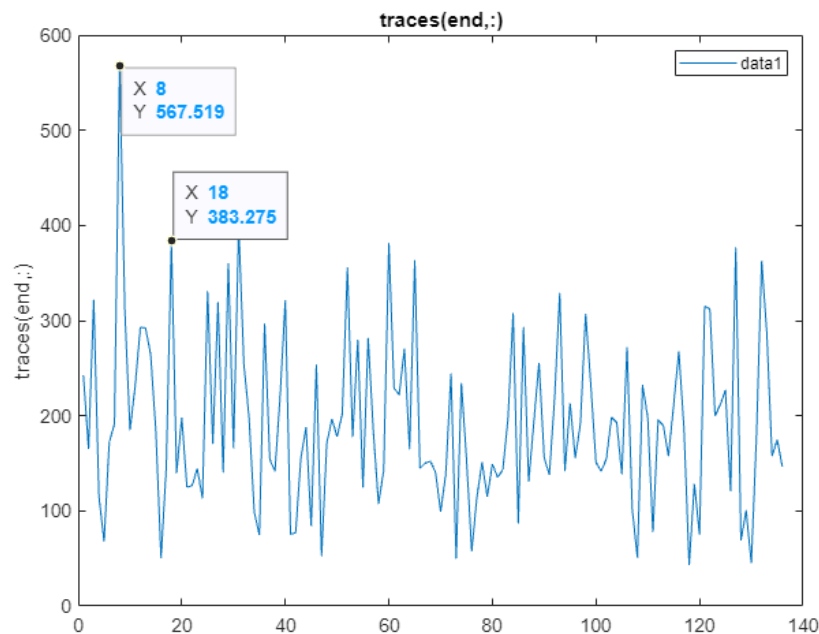


Figure – 1

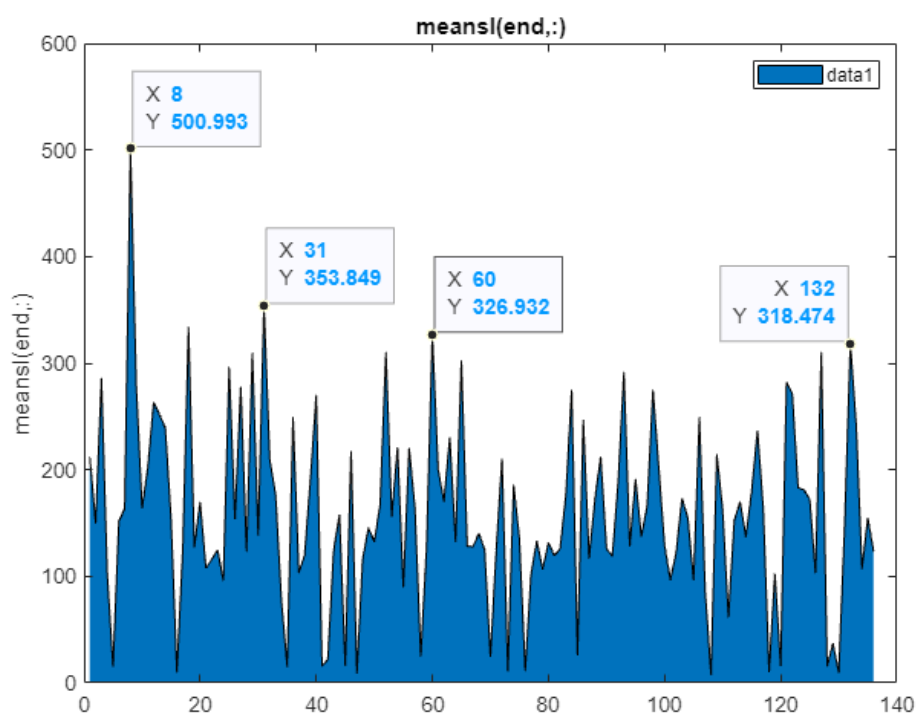


Figure – 2

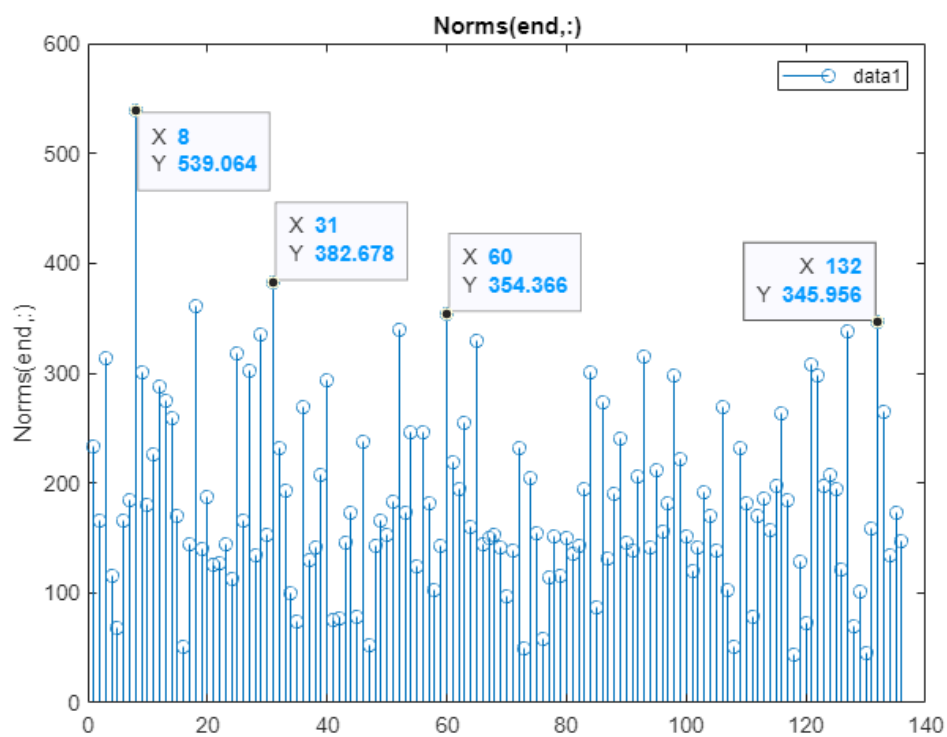


Figure – 3

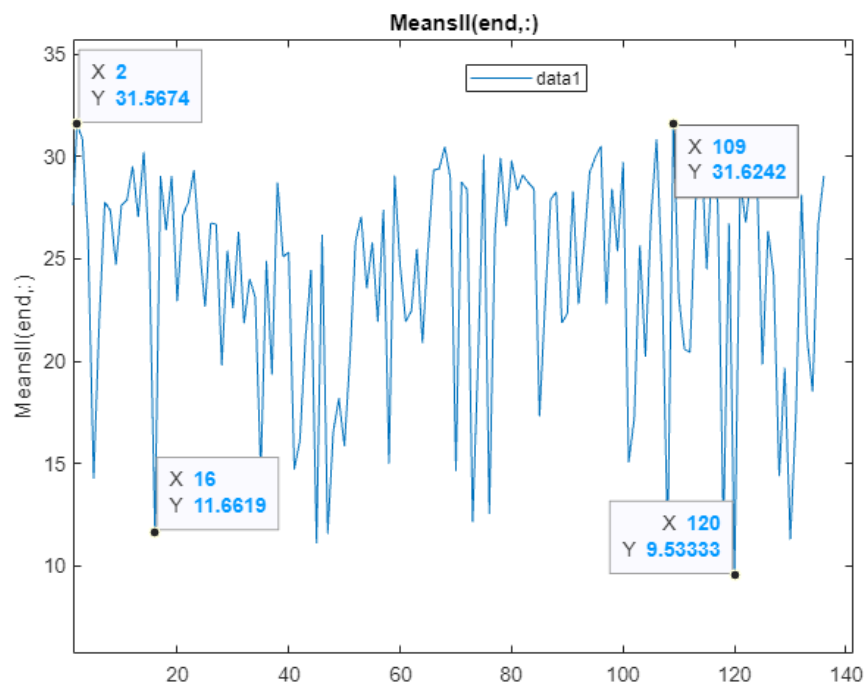


Figure- 4

Group with Lower Scores – Social Sciences, Ages 25-34, Undergraduate Only (Figure 1-4)

- Traces: 50.39
- Means: 9.80
- Norms: 50.39
- meansII: 11.66

Teachers in social sciences expressed dissatisfaction with online education, citing difficulties in replicating interactive, discussion-based learning in virtual environments. The reliance on student engagement and face-to-face interaction made it challenging for these teachers to adapt to the online format.

Students:

Group with Maximum Scores – Sciences and Technology, Ages 25-34, Postgraduate Students

- Traces: 488.70
- Means: 483.85
- Norms: 482.68
- meansII: 30.31

Postgraduate students in technical fields such as sciences and technology reported the highest satisfaction with online education. They benefited from the self-paced nature of online learning and access to virtual tools such as simulations, coding platforms, and technical databases, which enhanced their learning experience.

Group with Lower Scores – Social Sciences, Ages 25-34, Postgraduate Students

- Traces: 45.17
- Means: 9.25
- Norms: 45.17
- meansII: 11.29

Students in social sciences shared similar concerns with their teachers. They found online education less effective due to the lack of real-time discussions and interactions, which are integral to subjects that emphasize critical thinking, debate, and group work. The results indicate a significant divide in satisfaction between technical and applied fields (such as food and agricultural sciences and sciences and technology) and social sciences. Teachers and students in technical fields exhibited a strong preference for online education, with the flexibility and access to digital tools playing a critical role in their positive perceptions. In contrast, those in social sciences found online education less effective, primarily due to the limitations in replicating face-to-face interaction and engagement. Key Insights:

1. *Technical Fields Thrive in Online Education:* Both teachers and students in technical fields benefit from the structured, resource-rich environments that online platforms provide. The ability to access digital labs, research tools, and self-paced learning materials leads to higher satisfaction.

2. *Social Sciences Struggle in Virtual Environments:* The nature of subjects in social sciences, which rely heavily on interaction, discussion, and real-time feedback, makes it difficult for online education to meet the needs of both teachers and students. This leads to lower engagement and overall satisfaction.

Conclusion

This study offers a detailed comparison of the perceptions of teachers and students towards online education, using a MATLAB-based approach to analyze the data. The findings reveal significant differences between technical fields, such as sciences and technology, and more interaction-dependent fields like social sciences. Both students and teachers in technical subjects benefit from the flexibility, self-paced learning, and access to digital tools that online education offers. In contrast, those in social sciences express dissatisfaction with online education, largely due to the difficulty in replicating the interactive and discussion-heavy elements that are crucial to these fields.

Key Insights:

1. *Field-Specific Satisfaction:* Teachers and students in technical fields exhibit higher satisfaction with online learning environments, largely because online platforms provide the necessary tools and resources to conduct labs, simulations, and technical exercises. This highlights the adaptability of such fields to digital formats.

2. *Challenges in Social Sciences:* In subjects like social sciences, where interpersonal engagement, real-time discussions, and critical debates are key components of the learning process, both teachers and students face challenges in adapting to the online format. The lack of face-to-face interaction and difficulties in fostering dynamic conversations online contribute to lower satisfaction levels in these fields.

3. *Role of Experience:* The study also shows that prior experience with online education plays a critical role in shaping perceptions. Teachers and students with previous exposure to online learning environments tend to express greater comfort and satisfaction, underscoring the importance of familiarity with digital tools and platforms.

To improve the online education experience, particularly in fields like social sciences, several actions can be taken:

1. *Enhanced Interaction Tools:* Platforms need to integrate more sophisticated tools that simulate real-time classroom dynamics. Features like virtual breakout rooms, interactive whiteboards, and live feedback systems can enhance engagement and foster collaboration.

2. *Training for Educators:* Teachers, especially those from discussion-heavy subjects, may benefit from additional training on how to effectively utilize digital tools to engage students. Workshops on digital pedagogy could help them create more interactive and effective online learning experiences.

3. *Hybrid Models:* Institutions may consider adopting hybrid teaching models, where online tools are used to supplement in-person interaction. This can provide the flexibility and resource-rich environment of online education while maintaining the engagement and immediacy of face-to-face instruction.

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FINANCIAL ASPECTS OF DEVELOPMENT OF INDUSTRIAL ENTERPRISES IN A CRISIS SITUATION IN AZERBAIJAN

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Abstract

The article examines the financial aspects of the efficient organization of production activities of industrial enterprises in a crisis situation. Issues to be taken into account in organizing the activities of enterprises from the current and strategic point of view were given, and the importance of enterprises benefiting from the anti-crisis economic policy of the state was noted. During the study, the influence of the industrial enterprises of the internal market affected by the global economic processes on the production capabilities of the activity was also reflected. Along with international experience and the role of its application, a generalized author's opinion is given.

Keywords: *crisis, production, financial resources, state policy, internal capabilities of the enterprise*

In recent times, the macroeconomic situation in Azerbaijan has been stable, and this was made possible by the effect of the economic growth achieved in the industry in general. As we know, macroeconomic policy has a significant impact on the activities of enterprises. In this regard, the fact that crisis situations are not caused by internal factors is an important factor from the point of view of the country's economy. However, in any enterprise facing a crisis situation, this is individual in nature. The main areas of activity in Azerbaijan are production, processing and service areas of mining industrial enterprises and companies. Despite this, diversification of the economy has been seriously achieved, and the impact of global economic influences on the activities of enterprises operating in the country has been minimized. Both economic policy and regulatory framework are relevant here. As we mentioned, the legislative framework that regulates the activities of enterprises is important. Adaptation of the relevant normative-legal acts to the reality of the day is carried out and other relevant decisions are taken. After that, the most important issue is to prevent it from becoming general if there is an individual crisis situation in enterprises. This is only the strict control of the compliance of the production and service, as well as financial activities of the enterprises by the state control bodies in the relevant field with the requirements of the legislation.

It should also be noted that at different times the crisis takes on a global character. World prices of energy resources are almost halved. This also sharply affects the development opportunities of oil production industry enterprises. The decrease in oil revenues in the economy of Azerbaijan affects other areas as well. In this regard, serious efforts are being made to reduce dependence on oil income.

The above-mentioned can be considered as one of the traditional factors that can influence the emergence of a crisis situation in the activity of industrial enterprises. However, the new economic era brings new challenges, and enterprises that first integrate into the digital environment have to face new, digital risks. These types of real risks create crisis situations in enterprises, such as digital security breaches, product manufacturing problems or serious supply chain disruptions. Therefore, choosing the right position in crisis situations at the enterprise level, applying a suitable action strategy is decisive for the further activity of the enterprise.

Effective crisis management can protect an industrial enterprise from potential harm, including financial loss, reputational damage and operational disruption. Although it is often considered only from the point of view of its continued presence in the market, effective and optimal crisis management is related to the various capabilities of the enterprise. Businesses that make optimal decisions achieve sustainable manufacturing processes, stronger customer relationships, and clearer strategic direction [1, p. 140].

Recovery from a crisis by implementing management improvements can strengthen the company's business processes and employee cohesion, as well as trust in the company. As a result of this, an enterprise that achieves more sustainable development is formed.

Businesses that can manage crises at an optimal level can attract customers and investors and stand out positively in their industry by highlighting their reliability and efficient management. In addition, the need to solve problems in the crisis process can lead to the formation and implementation of innovations, including new business opportunities or improvements in operational business processes in industrial enterprises. This is also possible by promoting adaptive strategies for functioning in a new environment.

In general, the crisis situation can be evaluated as a test of leadership in the field of industry. Because, when the crisis situation is overcome, both internal and external economic relations of the enterprise are strengthened.

The topic of development of an optimization algorithm for the management of industrial enterprises in a crisis situation in a radically changing macroeconomic situation and toughening markets is particularly relevant and of great application importance. Activities on the financial health of the enterprise are one of the areas of optimization management, which is essentially an activity to control the organization of management and business processes in the enterprise and to prepare proposals for their improvement and increase in efficiency. It would be more appropriate if we divide the system of anti-crisis measures into two levels: external and internal measures:

External measures for the financial recovery of an industrial enterprise include state support measures and private sector efforts to create favorable conditions for the operation of enterprises in a certain industrial field in the market. Internal measures include measures that are specific to a specific enterprise and not industry-wide. Industrial enterprises should not only accept the anti-crisis support measures offered by the government, but should also act accordingly, recognizing the right to make offers to help others.

Eliminating crisis situations and minimizing its effects in developing and territorially small states depends on the state's policy in this area. So, even if enterprises make their own decisions in certain cases, state policy directs the sector. We can present the most relevant directions for the improvement of state policy in the field of regulating the activities of industrial sector enterprises in the form of a scheme in the following form (Figure 1).



Figure 1. Directions for improving the activity of industrial enterprises

Source: compiled by the author

The relevant structures of industrial enterprises should actively participate in the formulation of state policy and send their proposals to the government regarding the improvement of tax and customs legislation. Also, private investors influence the development of the industry by determining investment directions, their volume and timing. Their participation in market regulation has a beneficial effect on the development of business conditions for the industry and allows to minimize the risks of competitive enterprises, as well as the state. However, the main role in the implementation of the task of financial recovery of the enterprise experiencing crisis events belongs to the enterprise itself.

In the process of product management, forecasting, business management, production, advertising and other aspects of the marketing process also affect the development of enterprises. Many problems can occur in production management, but poor management is undoubtedly the biggest factor in the crisis [3, p.721].

It is more appropriate to implement intra-enterprise anti-crisis measures to ensure the financial recovery of the industrial enterprise. Accelerated recovery of the liquidity of current assets, which can lead to an increase in cash flow to the enterprise in the short term, is ensured by making and implementing a number of decisions. The first step to be taken is to reduce the period of providing goods, that is, commercial credit to other partners. Others we can present as follows:

- accelerating the collection of the company's receivables;

- liquidation of the portfolio of short-term financial investments;
- reducing the amount of insurance reserves of inventory objects;
- increasing the amount of price reduction in cases of cash payment of the sold product;
- discounts to the demand price level of hard-to-liquid goods and material reserves, ensuring their further sale, etc.

All the steps listed above are for the enterprise to be more efficient and resistant to crisis during the strategic period. The mentioned may not be accepted unambiguously by the partners of the enterprise, but it is appropriate for the sustainable development of the enterprise itself, as well as the industrial sector of the economic system.

Problems and changes in the enterprise and sudden changes in its environment significantly affect the crisis. Events and environmental factors within the enterprise affect each other [2, p. 257]. The optimality of the decisions taken in a crisis situation helps them to strategically preserve the competitiveness of the industrial enterprise and exit with minimal losses. So, in the short term, the basis of strategic development is ensured by the implementation of the following measures:

- sale of the most liquid long-term financial instruments as part of the enterprise's investment portfolio;
- accelerated sale or lease of unused equipment at prices required in the market for the sale of such services;
- operational implementation of back-leasing operations in which the previously purchased fixed assets of the enterprise are sold to the lessor, provided that the financial leasing contract is concluded at the same time;
- lease of equipment, etc., which was previously planned to be acquired in the process of renewal of fixed assets.

The analysis of different periods suggests that it is more realistic to achieve development by providing a place for experts with innovative thinking in all fields, including the industrial sector. There is also a need to organize industrial production with the involvement of potential and high-demand specialists. Taking advantage of the unique industrial production experience of South-East Asian countries, which have achieved a rapid economic breakthrough in recent years, attention should be paid to heavy industry and other related fields, significant practical work should be done on the development of enterprises in free economic zones, which have recently expanded in Azerbaijan. In order to ensure the continuity and competitiveness of the processing activities of large industrial enterprises, in addition to providing financial support to the enterprises, methodical support should be provided to implement their own financial recovery plans.

The analysis of different periods suggests that it is more realistic to achieve development by providing a place for experts with innovative thinking in all fields, including the industrial sector. There is also a need to organize industrial production with the involvement of potential and high-demand specialists. Taking advantage of the unique industrial production experience of South-East Asian countries, which have achieved a rapid economic breakthrough in recent years, attention should be paid to heavy industry and other related fields, significant practical work should be done on the development of enterprises in free economic zones, which have recently expanded in Azerbaijan. In order to ensure the continuity and competitiveness of the processing activities of large industrial enterprises, in addition to providing financial support to the enterprises, methodical support should be provided to implement their own financial recovery plans.

Experience shows that employment is one of the most important challenges caused by the world economic crisis at different times. Different countries allocate large sums of money for industrial enterprises to come out of the crisis with less loss. In certain cases, this only weakens the crisis. The main causes of the crisis are made possible by the adoption of system-important decisions. Allocating a certain amount of funds as state financial aid to large enterprises can be considered as one of the initial steps taken to bring industrial enterprises out of crisis. This decision is important, but it is not enough to eliminate the shortcomings in general. [4, p. 36].

Currently, there are no crisis elements in the economy of Azerbaijan. Looking at the statistical indicators, it seems that there is a certain increase. From this point of view, it would be appropriate to analyze the part of macroeconomic indicators covering the industrial sector. Thus, the comparison of the volume of GDP produced in Azerbaijan in 2023 with 2022 suggests that there was an increase of 1.1%. In terms of manat, this increase was 123,005.5 million manats. The volume of production in the traditional sphere of activity, the oil industry, has decreased. This decrease was 1.7% compared to 2022. The decrease amounted to 45,343.7 million manats. In the non-oil industry, which is the main focus and

is considered a priority, the volume of production is seen to increase by 3.7% compared to 2022. Similarly, this increase is 77,661.8 million manats in terms of manats. In order to note the continuity and comprehensiveness of the analysis, it can be emphasized that the growth rate of GDP created in the field of non-oil production in 2022 was 9.1% [5].

In 2023, the share of the industrial sector in the structure of the gross domestic product was 40.5 percent. This once again gives reason to say that the industrial sector in Azerbaijan and the enterprises representing it continue their development trends. However, this does not mean that activities on crisis scenarios in enterprises should be stopped. The theoretical issues mentioned at the beginning of the article should be taken into account at all stages and periods of enterprise activity. Because Azerbaijan is a full-fledged member of the global market and the global economic system and an integrated constituent element. Compared to the financial crisis of 2008, industrial enterprises may suffer more damage. This is related to the increase in the intensity of the regional and international integration processes of Azerbaijan during the past time. Export-oriented enterprises may face a decrease in income due to a decrease in demand in the foreign market, while enterprises oriented to the domestic market may experience a decrease in income due to a decrease in purchasing power. In such cases, enterprises should take adequate measures according to the market in order to optimize management decisions.

The financial strategy developed to take into account the unfavorable factors determined by the application of various forecasting methods of the enterprise should be the basis of the future continuous high growth rates of its operational activity, as well as neutralize the threat of its bankruptcy in the long term. Thus, improving the financial situation of the enterprise is a systematic and purposeful activity to mitigate crisis events in the enterprise. This activity depends significantly on the opportunities provided by the state policy, as well as on fully mobilizing one's own internal capabilities. Virtually any industrial enterprise can implement financial consolidation if it is guided by the anti-crisis algorithm according to its financial and economic situation.

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Geographical sciences

KHARAZES OF ORDUBAD ADMINISTRATIVE DISTRICT

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Abstract

Today, the Araz plain areas, which are considered economically significant, are continuously exposed to anthropogenic impacts. The main cause of the ecological problems in the area is the issue of water scarcity. In the Ordubad district, water demand has been one of the main problems throughout history, especially during hot periods. Therefore, **kahriz**, a hydro-technical structure, has been used. Since the **kahriz** system differs from surface channels by providing a stable water flow, its water is collected in artificial lakes over a certain period and made available for use.

It is the most efficient water system in nature, being an environmentally friendly and reliable source of water. Considering that today's global environmental problems call for more efficient use of nature, greater attention needs to be given to the preservation and restoration of the kahriz systems, which are environmentally clean, have a continuous flow, are maintained with fewer resources, and meet the population's needs for drinking and irrigation water.

Keywords: Kahriz system, ecological, inclined plain, water resources

Introduction: One of the regions in our country that is least supplied with water resources is the Nakhchivan Autonomous Republic. The main reasons for this are the region's natural climate conditions, the uneven distribution of surface runoff throughout the year, and the continuous droughts in recent years. Additionally, the fact that the per capita freshwater reserve is below the designated norms has highlighted the efficient use of groundwater resources.

From time to time, the local population has used and improved the kahriz system to meet the demand for drinking and irrigation water in the semi-desert and dry steppe climate. I would also like to mention that the oldest kahriz systems in the autonomous republic are located in the Ordubad region. In the Ordubad region, ancient kahrizes such as "Abbas bey," "Mammad Sadiq," "Shikhali khan," "Aga Ali," "Shai," and "Girkhayak" have survived to this day.

These qanats (underground water channels) have met the population's need for drinking water since ancient times, and they have also been used for agricultural purposes. In recent years, due to neglect, many qanats have collapsed and fallen into disrepair. The restoration and reuse of these qanats, along with the detailed study of the flow rate, regime, mineralization level, chemical composition, and other characteristics of working qanats and groundwater, is extremely necessary for solving the region's water supply problem and remains relevant at all times.

The collapse of the socialist economic system, the transition to a market economy, and the emergence of new problems in the use of natural resources in various sectors of the economy have surfaced. The increasing demand of the population for various natural resources, including water, year by year has created the necessity to scientifically study and reassess water sources, including underground water channels (kahrizes). From this perspective, the research of kahrizes is highly relevant and significant today.

Analysis and Discussion:

The terrain of Ordubad is mainly mountainous, with a small portion consisting of foothills and plains. The area's configuration, influenced by the slope inclinations, exposures, and absolute elevations, forms a complex relief structure. This complex results in varying climates, vegetation covers, and hydrological features across the sloping plains.

In terms of geological structure, it consists of sediments from the Jurassic, Cretaceous, Paleocene, Eocene, Oligocene, Pliocene, and Quaternary periods. The rocks from the Jurassic and Cretaceous periods are unevenly distributed throughout the area.

In limited areas, Jurassic period rocks can be found in the form of protrusions. Cretaceous period rocks are more widely distributed in the area. These rocks are more commonly found, especially to the east of the city of Ordubad. The mentioned rocks consist of limestone, aleurolitic clays, as well as sandstone limestone. [1]

Mainly in the plains along the Araz River, Quaternary period sediments and the alluvial, deluvial, and proluvial deposits formed from them can be found.

The complex influence of endogenic and exogenic processes has played a significant role in the formation of the geomorphological structure of the area. This region is characterized by a cold semi-desert and arid desert climate type. Due to the diversity of climatic indicators, the Ordubad sloping plain differs from other regions of the Nakhchivan Autonomous Republic. In the formation of climate elements in the area, the relief factor is the main factor.

The sunniest area in the Republic is the Nakhchivan Autonomous Republic. The number of sunny hours observed in the region can be compared to the plains and foothills of Central Asia. In the Autonomous Republic, these indicators are very high, especially in the Arazboyu plain, which includes the Ordubad sloping plain. In the plains of the Autonomous Republic, including the Ordubad sloping plain, the amount of sunny hours ranges from 2700 to 2800 hours, while in the medium mountainous zone it ranges from 2500 to 2600 hours, and in the high mountainous zone, it ranges from 2200 to 2400 hours. The quantity of sunny periods during the hot season reaches 1700 to 1900 hours in the plains (Ordubad sloping plain) and 1500 to 1600 hours in the medium and high mountainous zones.

Taking into account the above-mentioned, that is, the relationship between altitude and radiation, the average annual amount of radiation in areas of the Ordubad sloping plain, where the altitude varies between 600 and 1000 meters, will be equal to 146-150 kkal/m² per year. The majority of this occurs in the warm part of the year, while a small part corresponds to the cold season. The season with the least amount of total radiation is winter, and the season with the most is summer.

The amount of solar radiation reaches its maximum in June and July and its minimum in December (as well as in other winter months) during the annual course of total radiation. The period in which the quantity of total radiation decreases corresponds to May, which can be explained by the increase in cloud cover during that time

Factors affecting the formation of the climate in the area include geographical location and surface structure. The uneven heating of slopes, valleys, and mountains causes the local air circulation to form. The observations made during the transition of air temperature through various thresholds are of great importance. In the Ordubad sloping plain, the transition cases of air temperature above 10 degrees last for approximately 205 days, starting from April 10 in spring to November 5 in autumn.

The reason for the formation of thermal conditions in the area is attributed to the bare surface cover, the abundance of radiation, the presence of a plateau-like relief form, and the southward orientation. The lowest temperature of the air, that is, the absolute minimum, is -30.2°C. The temperature indicator characteristic of mountainous areas has been recorded in the Ordubad sloped plain. This is explained by the rapid cooling of the heated air in the area and the accumulation of cooling air in the low-lying plains.

As one of the important indicators of climate, precipitation and its distribution in the area, especially in the plain regions, varies.

There is a close relationship between the annual amount of precipitation and altitude. This relationship is more apparent during the cold and warm periods of the year. The height at which maximum precipitation is observed varies depending on the seasons or periods of the year. In the Ordubad sloping plain, this relationship reaches 160 mm during the warm period of the year and 150 mm during the cold period. Most of the precipitation occurs in spring and autumn, with some falling in winter and a small amount in summer.

The formation of snow cover in the plain occurs most rapidly during the second ten days of November, and the latest occurrence is in the second ten days of February. The average melting time of snow in flat areas begins in the second ten days of March. The number of days when the plains are completely covered with snow is about 30-40 days. Despite the low amount of precipitation in the area, the average thickness of snow here is significantly greater than that of the Kura-Araz lowland. During the time when vegetation begins in plants in March-April, moisture reserves are accumulated in the soil.

As the elevation increases, the quantity of relative humidity changes; it increases with altitude. In the average mountainous zone, the relative humidity is up to 40-50%. In the high mountainous zone, it can reach 110-150%.

In the region, primarily local winds are observed. The complex relief conditions and the influx of various air masses into the area from time to time lead to disruptions in the regularity of wind directions.

Speaking of elevation zones, in the high mountainous areas of the region, northern, eastern, and northeastern winds are observed. In this zone, during the cold season of the year, the wind speed can reach 3-7 m/s. The wind direction corresponds to the orientation of the valleys in the area.

One of the characteristic winds for the region is the white wind. During the periods when hot, dry, and white winds blow, humidity sharply decreases, and air temperature rises. These types of winds are observed in low mountainous areas on plains for periods ranging from one month to 49 days, while in the average mountainous zone, they decrease to 10-30 days, and in high mountainous areas, they decrease even further to about 10 days.

In the plains, the wind speed reaches its maximum during the summer months, especially in July and August, as is more clearly seen in the chart. In mountainous areas, however, the opposite occurs, with wind speed reaching its minimum in summer. The wind speed during the cold period can reach 1-2 m/s. Overall, the wind speed increases from February, reaching its maximum in July and August. After this time, the wind speed weakens, reaching its minimum in December.

In the semi-radius area, annual frosts begin in mid-November, with the last frosts observed in early April. The average absolute minimum temperature of the air is 15-18°C, while the absolute minimum can reach 25-28°C.

The hydrographic network of the Ordubad plain has formed over a long period and has undergone many changes. The ancient riverbed remnants of the Aylis, Vanand, and Duykun rivers flowing from the Ordubad plain are a striking example of the changes the hydrographic network has experienced.

The rivers flowing from the Ordubad plain belong to the Araz River basin and are also the left tributaries of the Araz. A total of 10 rivers flow through the area, with 3 of them standing out due to their length. The lengths of these three rivers exceed 50 kilometers. The average density of the river network in the area is 0.33 km². The short length of the rivers flowing from the plain is due to the narrowing of the plain from west to east.

During the summer months, when the rivers dry up, the only reliable and clean water source utilized in the area is the kahriz (underground water channels).

In the Ordubad district, the number of qanats (underground water channels) is 102, with a flow rate of 566.9 liters per second. Most of the qanats are fed by the water layers of the alluvial cones of the Ordubad, Genza, Aylis, Kotam, and Kilit rivers. The flow rates of most qanats range between 3 to 8 liters per second.

The flow rates of the qanats in the years 1955, 1971, and 2003 were 566.9 liters per second, 296.0 liters per second, and 217.5 liters per second, respectively. Accordingly, the flow rate of the qanats has decreased by half, and the number of dried-up qanats has reached 35.

Each kahriz of Ordubad city had one or more qanats. These qanats supplied water to the local population. The northern part of the central square of the city was supplied with water from the Madrasa qanat. The Mingis kahriz of the city used water from the Meyramcha spring, while the Engel residential area utilized water from the qanat of the same name. The Upper Anbaras kahriz used water from the Muhammadgulu qanat, while the residents of the Lower Anbaras relied on the Haji Mammadsadiq, Qirkhayag, and Desert Qanats. The Shora qanat, located in the northern part of the city, provided water for the population living around the winding road.

***The bath fountain**, as its name suggests, served the water needs of the bath located in the Mingis kahriz square and the surrounding population. Some of the qanats (underground water channels) that still operate in the city of Ordubad today are particularly noteworthy in terms of domestic and economic significance:*

***Abbasbey Fountain.** It is one of the significant qanat systems in the city of Ordubad. It is named after a person named Abbasbey who had it constructed. It dates back to the 18th century.*

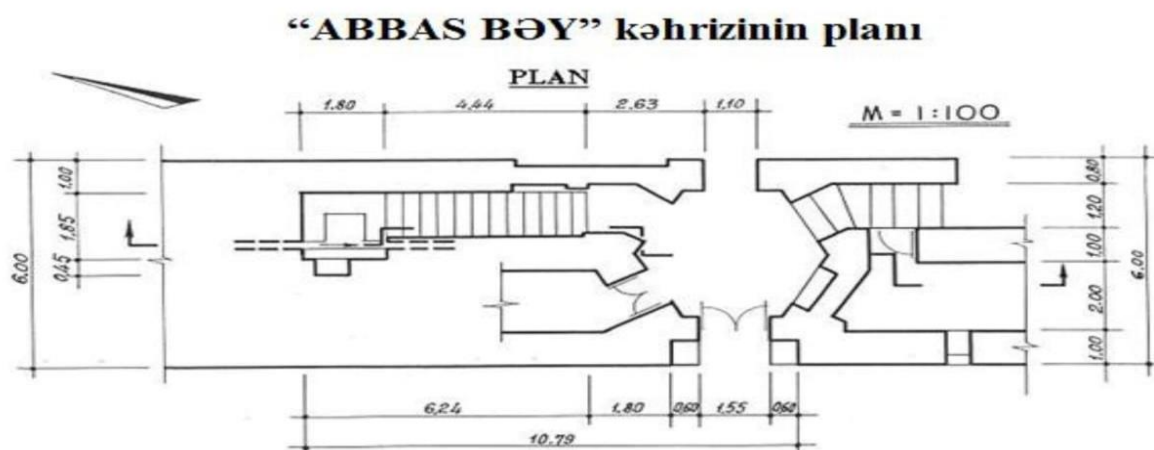


Figure 1. Abbasbey Fountain.

Ali Bay Fountain. Located on Tabriz Street in the city of Ordubad, this qanat (underground aqueduct) was founded by a person named Ali Bay. Therefore, it is referred to as the Ali Bay Fountain among the local population.

Meyramcha Qanat. This qanat, situated on Tabriz Street in the city of Ordubad, is named after the kahriz in which it is located. It has a length of 460 meters and contains 12 wells. The water flow rate is 3-5 liters per second. It was built in the 17th century. To the east of the qanat, there is a mosque of the same name.

Nahar Bashi Qanat. This qanat is located in the northeastern part of the city of Ordubad, in the Uşturləngə kahriz, about 200 meters north of Ağa Square. It has a length of 545 meters and contains 18 wells. The water flow rate is 2-3 liters per second during normal times. It dates back to the 18th century and had a mosque next to it.

Ser Sheher Fountain. Located in the Ser Sheher kahriz of Ordubad, on Qafar Babayev Street, this qanat was built in the 17th century and has forty steps leading up to it.

Shikhali Khan Kahriz: It is located on Samed Vurgun Street in the city of Ordubad, in a private yard. It is named after Shikhali Khan (or Sheikhali Khan), the son of Khan Kelbali I from the Nakhchivan khanate, who dug the spring after the annexation of Nakhchivan to Russia and served as the deputy of Ordubad for a while. In the 19th century, other qanats (underground water channels) were also dug in the city of Ordubad for public use. One of these qanats was dug by Haji Sadiq, a resident of Ordubad and a descendant of Nasir al-Din al-Tusi. For this reason, that qanat is still popularly known as Haji Sadiq Spring.



Figure 2. Kirkhpilla Kahriz

The chemical composition of the kahriz waters in the Ordubad inclined plain is mainly

The waters in the Ganja River have the lowest mineralization (0.2 g/l) and hardness (2.2 mg-eq/l) in the Ordubad region. The water from this river is very soft.

In the villages of Vanand, Volver, Qoruqlar, and Anabad, the mineralization levels of the water used range from 0.5 to 0.7 g/l, while their hardness is between 5.8 and 7 mg-eq/l.

Unlike other regions, the majority of water samples taken from Ordubad did not show the presence of sulfate ions, with only a certain amount detected in the Andemic village and Shorekeshmi.

In the village of Lower Aylis (Veng Bagi, Uzun Chesme, Amrah, Chinar, Aghamali, Darvaza, Deve, Gulbasar, Gosh Lake, Devlet, Tamaya, Gandi Hesar, Ahran place), the mineralization rate has increased almost 2 times the mineralization rate of the Upper Aylis kahriz and is 0.56- 0.7 g/l, and the concentration varied between 3.8-7.2 mg-eq/l.

The mineralization level of the Shora spring under the railway is 1.48 g/L, with a salinity of 11.8 mg-equiv/L. From an ecological perspective, although kariz waters are considered ecologically clean, today, anti-sanitary areas can be found in their feeding sources.

In the waters of the Upper and Lower Aylis karizes, mineralization increases towards the Araz River. The lowest mineralization is found in the Nargesh kariz of Upper Aylis (0.36 g/L), while the highest mineralization is observed in the Qandil (0.73 g/L) and Hesar (0.745 g/L) karizes of Lower Aylis

Conclusion. *In the Ordubad region, the qanats that are still operational today are considered the main source of water for household and agricultural use. However, in order to maintain and protect their functionality, it is advisable to implement the following suggestions:*

The qanat pools, channels, and outlets should be cleaned of silt and debris, and the water outlet should be opened.

The qanat shafts should be cleared of silt and debris.

Damaged and collapsed walls should be restored.

Abandoned wells should be cleaned, and collapsed drainage systems should be repaired.

Wells should be reinforced with reinforced concrete rings, and their openings should be sealed with reinforced concrete covers.

The restoration of qanats in any area of the Autonomous Republic signifies the availability of ecologically clean water, the development of agriculture, and the sustainability of human settlement. It is our duty to study, restore, and pass this knowledge to future generations.

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Historical sciences

INVESTIGATION OF HEYDAR ALİYEV'S LEGACY IN THE PROTECTION OF THE NATIONAL MORAL VALUES SYSTEM IN AZERBAIJAN

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Abstract

One of the problems that needs serious research in the field of full Azerbaijani national history. and the relationship between the state and religion is the educational system of the state. Different religious beliefs existed in the territory of Azerbaijan at different stages of history, B.C. Since the VI century, people who believe in fire worship, Judaism, and Christianity have been here. lived in the 7th-6th centuries of our era, the religion of Islam was dominant in the entire territory of Azerbaijan. what a change. Beginning with the second half of the 9th century, the history of the states that emerged in the territory of Azerbaijan The content of the Islamic religion in domestic and foreign politics and the culture of the people of Azerbaijan It has a special place as part of it. The tragedies experienced by the people of Azerbaijan in the 19th and 20th centuries, the division of their territories, occupation The transfer of the Christian population to the Mus lands, the banning of Islam during the Soviet period, religious buildings The spread of the evils could not separate our people from the religion of Islam.

Therefore, after the restoration of the state independence of the Republic of Azerbaijan in 1991, Bring forward democratic values and principles in the national state building process. For example, with the failure of the atheism system of the Soviet era, the place of the religious factor in the state system was determined. It was solved. After the adoption of the new constitution of the Republic of Azerbaijan in 1995, the national Proclamation of freedom of conscience during the state building process, mosques and other the restoration of monuments, religious interest, religious communities and organizations As a result of their creation, the influence of religion on social life has also increased. . All these are the historically formed national characteristics of the Azerbaijani people and the requirements of the new era. Taking into account the relationship between the state and religion requires the creation of an appropriate model. di.

Heydar Aliyev was the chairman of the Supreme Soviet of the Republic of Azerbaijan on June 15, 1993, on October 3 and after the election of the President of the Republic of Azerbaijan, there is a constructive relationship between the state and religion. He succeeded in creating good relations. The national leader is a representative of the various peoples and religions living in the Republic of Azerbaijan. A unified ideology - the ideology of Azeri independence, tolerance, tolerance and activism The state-religion, united on the basis of the principles of labor and work, will become an example for the whole world today. The religion of Azerbaijan, founded by Heydar Aliyev, created the religious system. Political stability in the society after successfully coming out of the severe trials of the current period, ic It became an important factor of mutual understanding and cooperation. At the moment, human rights and freedoms, including conscience and religion, are being violated in the secular Azerbaijani society. A democratic policy that fully ensures women's freedom is implemented. Universal values - religious tolerance, mutual respect and understanding prevail in public life. Religious and ethnic background in the period after the restoration of state independence in the Republic of Azerbaijan. and no conflict has occurred. All this is the formation of the optimal model of the state-religion relationship in the Republic of Azerbaijan. It confirms his opinion. Based on the experience gained since 1993, the Republic of Azerbaijan In the political context, consider the general trend of the state-religion relationship and the specific political trend. It is possible to make it happen.

Keywords: President Heydar Aliyev, religious policy, tolerance, human values, multiculturalism, reform program, statecraft activity

Article 18 of our Constitution states that religion and state in the Republic of Azerbaijan That is, all religious beliefs are equal before the law, regardless of human personality. It is forbidden to spread and propagate religions that are against the principles of humanity. Historically, Azerbaijan has culture, different worldviews, and its own values. To the various peoples who show their loyalty to the common values by protecting There should be a tolerant attitude towards their cultural values and ethnic-religious identity. Dugu is a unique place. In our modern era, a part of the states is really trying to develop the inter-religious dialogue. Among the representatives of different nations in Azerbaijan, which is ethnically and religiously diverse, There was a tradition of friendship and tolerance. The strengthening of the state of Azerbaijan, the tolerant state, the unity of the people and the He sees it as a factor that ensures his innocence. The basis of this was also laid by Heydar Aliyev, the national leader of the people of Azerbaijan.

Historically, Azerbaijan has lived in its culture, various worldviews, and its special places. To the various peoples who show their loyalty to the common values by protecting There should be a tolerant attitude towards their cultural values and ethnic-religious identity. Dugu is a unique space. In our modern era, a part of the states is really trying to develop the inter-religious dialogue. Among the representatives of different nations in Azerbaijan, which is ethnically and religiously diverse, There was a tradition of friendship and tolerance. The state of Azerbaijan, the strengthening of the tolerant state, the unity of the people and the He sees it as a factor that ensures his innocence.

As President Ilham Aliyev noted, "...a nation living in an atheist state for decades - During the 25 years that the people of Azerbaijan lived in an independent state, they gained great sympathy and respect in the entire Muslim world. it is We earned it with our own labor, work, and effort. We have demonstrated our loyalty to our religion and national cultural values.

The integration of the Republic of Azerbaijan into the world, globalization processes in the country today Comparison of the current state-religion policy with European and world standards It requires detailed analysis. The increasing importance of religion in modern social processes is due to its global influence. Finding an answer is conditioned by the potential. In the background of the global transformation processes taking place in the world, religion in social life It is exposed to certain changes in its role and place, which is adequate to modern challenges. Their scientific value requires a detailed analysis.

President of the Republic of Azerbaijan Ilham Aliyev shows that "... different places of the world it also creates the hearths of conflict. Several countries in the Middle East have fallen into a state of chaos... A deep crisis with migrants in Europe lives. At the same time, this is a crisis of values. In today's situation, in the conditions of very difficult processes going on in the world, it is certainly the case that Azerbaijan is an example. manifests itself in an even more beautiful form. So, it is possible that representatives of all religions live as a family. It is possible that the tendencies of multiculturalism will strengthen. It is possible that there will never be a confrontation on religious and national grounds in a country. There has never been any confrontation or disagreement in Azerbaijan, and I am sure that there never will be. That is, today Azerbaijan shows a very different development model. Not because we want to prove something to anyone. Simply, this is our way of life."

Thus, the religious policy of Heydar Aliyev, the state-religion relationship in Azerbaijan during the period of independence. The study and research of the experience gained in the field is both important scientific and global knowledge.

Heydar Aliyev defined concrete tasks for our country to occupy a worthy place in the modern world. The national cultural heritage entrusted to us by our ancestors from Azerbaijan, the great ta Along with recommending not to forget the past, the existence of national culture of our people He bequeaths to the present and future generations to preserve and preserve his own identity. When Heydar Aliyev values our national culture, our people have been here for centuries. faith and ethics, national culture, customs, etc. He included his personal preferences.

One of the main factors determining the unique nature of our country is the historically formed spiritual and It is our cultural heritage. Historically, Azerbaijan has experienced various religions, cultures, worldviews, and is unique to itself. A diverse people who show their loyalty to the values of society by protecting their values In addition, they are tolerant of their spiritual values and ethnic-religious identity. It is a unique space where the soul exists. Unfortunately, it is the national culture that suffers the most from the processes of globalization and integration. and there are cultural values. In this way, different peoples with their own values and heritage preserve their identity. It turns out that the task of saving money is an important national issue. In fact, today, the considered internal and external political course of the Azerbaijan state is nationally independent. It ensures the protection of the sheep. Azerbaijan is now a place where dialogue between culture and religion has become a reality. It has been converted

into a telecommunication facility. This is confirmed by a number of international cultural events held in our country in recent years.

Heydar Aliyev national cultural heritage is protected and developed. He played an irreplaceable role in finding his approval at the world level, thanks to his activity. In Azerbaijan, the culture of human culture transcends the national-state borders. He has made worthy contributions to the project. Taking place in the spiritual and cultural life of Azerbaijan covering the last 50 years of history, Heydar Aliyev was the main ideologue, initiator and organizer of all innovations and successes. The connection to the national heritage and culture is from its culture and beliefs. He was nourished from the heart and soul. He was connected with his life and heart to the spiritual roots and religion of his people, from them He was inspired by them. Our national leader was well aware that each nation's natural resources, economic power is not a tense, military force, but a system of cultural and spiritual values.

Heydar Aliyev is a prominent statesman and political leader, but also a great politician and politician. was the tag. Heydar Aliyev is one of the supporters of an important scientific doctrine - the doctrine of Azerbaijaniism. Today, this doctrine is the political ideology and strategy of the state of Azerbaijan, the national concept. It is the cornerstone of his work. Today, the successes achieved by our country in all spheres of life, its worldwide recognition. We are loyal to the national ideology left to us by Heydar Aliyev, and we must make it a modern one. It has been possible thanks to our system to further improve the rate. . He is working on and preparing the perfect scientific development strategy of the state of Azerbaijan. He laid the foundation of the concept of new, national and spiritual life.

The scientific and practical ideas of national leader Heydar Aliyev are still relevant today. It is successfully applied in modern society building in Azerbaijan and the Republic of Azerbaijan. . From this point of view, the study of his theoretical-ideological heritage, the study and teaching of his ideas. It is one of the important fields of historiography. On the other hand, the research and dissemination of Heydar Aliyev's legacy is the responsibility of the young generation, the spirit of statesmanship. In terms of his education, the inclusion of his ideas in the structure of public consciousness. Therefore, it acquires important political significance. All these clearly show the relevance of the researched topic. Religion takes place in the global social processes, the transformation of the world in the context. A number of Western, as well as tsarist, soviet and modern Russia research works are devoted to what and role. has been done. In these works, what is the relationship between the state's religious policy, political and religious institutions? –Methodological foundations, influence of religion on ethnic and national identity, political discussion Issues such as the role of women are being investigated.

Currently, researchers, social and humanitarian studies with moral hazard. They consider it as an important part of their life. The works of I. Babichin and O. Radionova, V. Namukin, R. Oliver and other authors. The political aspects of the influence of religion on security have been studied. Global problems of the state, the essence and essence of M. Bogoslovski and A. Verkhovski. He is researching in his works.

The problem of the mutual relations between religion and the state was discussed by M. Agayev, R. Aslanova, N. Bahlul, A. Ahadov, A. Aliyev, R. Aliyev, A. Hasanli, S. Huseynov, S. Khalilov, M. Guliyev (Guluzade's), was also studied in the works of H. Orujov, R. Mehdiyev, A. Mammadov, Z. Mammadov, E. Samadov and others.

The legacy of Heydar Aliyev, the spiritual and cultural aspects of this legacy as an example of social science in Azerbaijan. It is one of the most requested topics. The national significance of Heydar Aliyev, which is an important area of Aliyev's scientific research. Development strategy has been the object of research by a number of Azerbaijani scientists. The rich scientific heritage of Heydar Aliyev was analyzed in the works of Academician R. Mehdiyev. , in the development of public opinion in Azerbaijan, in the establishment of national statehood, In preparation of the ideology of Azerbaijan and its backbone, the ideology of Azerbaijan. His services have been illuminated.

Explain the place and role of academician Y. Mahmudov. Heydar Aliyev in the history of Azerbaijan. He is the author of a number of important works. In his monographs and books, Heydar Aliyev's political activity is a series of events. protection of our national cultural heritage, religious values and His work in the field of art has been extensively analyzed.

Preservation and development of Heydar Aliyev's national cultural heritage. Various aspects of the strategy implemented in the field, the important part of this strategy. K.Abdulla, T.Afandiyev, A.A.Al-Fahrah. In the works of R. Aliyev, R. Khalilov, S. Khalilov, R. Mamedov, Z. Sardarov, a series. It has found its reflection in collective works and a collection of articles. It is dedicated to the history of Islam in Azerbaijan and the analysis of the religious situation in the country in the modern era. There are many facts about Heydar Aliyev's religion in these works.

Research related to Heydar Aliyev's political and statecraft activity, scientific heritage a number of authors who have conducted s - in the context of the functional context.

Political-ideological analysis of the national leader, Azerbaijani ideology N. Ce's ideas related to the scientific foundations and spiritual values of our people. It was analyzed in the works of Farov, R. Aslanova, S. Khalilov and others.

The religious policy implemented by Heydar Aliyev, the state religion in the Republic of Azerbaijan Several doctoral and doctoral dissertations on various aspects of the relationship has been the object of research. Organization of the Islamic Conference of Azerbaijan in the dissertation of S. Quliyev (2011) Heydar Aliyev in the development of the relationship with the Islamic Labor Organization since vin services have been researched. A. Gasimov's monograph summarizes the experience gained in the field of protection and development of national and cultural values in the autonomous republic in the years 1991-1993, when Heydar Aiyev headed the Nakhchivan MR, as well as during the years when he acted as the President of Azerbaijan.

There are very interesting materials related to the problem in the generalized works on the history of Azerbaijan, the 2-volume "Heydar Aliyev" monograph and the two-volume "History of the Republic of Azerbaijan".

Although the mentioned works play an important role in the study of the scientific-theoretical legacy of President Heydar Aliyev, with certain exceptions, some aspects that are unique to all of them are evident. In relation to the problem investigated in these works, more theoretical-ideological considerations and subjective opinions prevailed, historical research methods were not used enough. During Heydar Aliyev's leadership of Azerbaijan in 1969-1982, revival began in the national spiritual life of our people as well as in all fields. As Y. Mahmudov noted, "...the great historical significance of all the magnificent construction works implemented by Heydar Aliyev at that time was that national pride and national self-consciousness were awakened in our people, feelings of freedom and independence arose. This is Heydar Aliyev's unparalleled service in the history of the independence struggle of our people." From this point of view, M. Qasimli's monograph is of special importance. Based on the sources and literature included in the scientific circulation for the first time, the author studied Heydar Aliyev's activity in the field of achieving the unity of Azerbaijanis, protection and development of historical-cultural, national-spiritual values from a scientific-historical point of view. All this once again proves the existence of logical connection and dialectical unity between the first and second periods of Heydar Aliyev's leadership of Azerbaijan. Finally, most of these works are not distinguished by the richness of the source base. This is considered one of the important factors for historiographical scientific and historical studies.

The analysis of the literature on the subject shows that although a lot of work has been done in the field of historical aspects of religious policy, which is an important component of Heydar Aliyev's national moral development strategy, in recent times, the religious policy of our national leader, in both periods of his leadership in Azerbaijan, the protection and development of our national moral values - sin's activity was not a separate research object. All-national leader Heydar Aliyev is still in charge of the government in the Soviet period, with the person holding various positions. He tried to influence the meaning and morality of his activities. Heydar Aliyev, who prioritized spiritual and moral values in his work, said: "I Throughout my life, I have been on the side of cleanliness, honesty, and decency." As far as Hakimiyya is concerned, he behaves in accordance with moral norms even more than ordinary people. He started demanding money. The moral norm of Heydar Aliyev's position in the plenum of the Central Committee of the Communist Party of Azerbaijan dated August 5, 1969 He said about them: "We manifest ourselves and We cannot turn a blind eye to inappropriate situations and manifestations of corruption."

Heydar Aliyev believed that if the rich national cultural heritage of our people is known, the cultural The higher the level, the more successful they will be in Azerbaijan and in their actions. Heydar Aliyev aimed at the promotion of cultural heritage and the growth of people's interest in art. He approached the field with special care.

Ilham Aliyev, President of the Republic of Azerbaijan, Great leader Heydar Aliyev led in the 70s and 80s While evaluating his work and activities, he said: "Heydar Aliyev is a genius it is personal. He has served the people of Azerbaijan with merit in all periods. During the Soviet period - in the 1970s and 1980s, a great development process took place in Azerbaijan under his leadership. The great industrial potential created in those years serves the successful development of independent Azerbaijan today. In those years - during the Soviet era, the great leader paid great attention to national values. His activity in this field is highly valued by the people. Heydar Aliyev has always been very attached to his people, and

his famous saying "I am proud that I am Azerbaijani" Today, it shows the way for every Azerbaijani." Heydar Aliyev, who attaches special importance to national spiritual values, is the high national culture of the people of Azerbaijan. its heritage, greatness, superiority, skill, high culture and rich history He has always revealed what he has.

Throughout history, schools and education have played an important role in the progress of every nation and its national self-awareness. Because national self-awareness cannot be formed to preserve and develop national meaning. The preservation of national cultural heritage is closely connected with the education system. Heydar Aliyev, who understands these truths deeply, is a source of education and education for the people of Azerbaijan. He paid special attention to the language. In particular, the activities of Heydar Aliyev in the field of education are carried out in the country. It was a part of composition. The measures he implemented in the field of education, his cultural heritage will develop. In Sin, an invaluable strategic activity in the field of education and training of national staff is the main indicator. A wise personality, science and education in public relations, culture and arts, and health. He showed special care to his wife. A wide network of cultural and educational, science, health, and social service facilities in Azerbaijan He was born. The development of education, the organization of the training of national staff is completely new in this period. reached the level. In general, during the period of 1969-1982, when he was the leader of Azerbaijan, all his experiences Some of them were considered for the formation of the future independent Azerbaijan. The great leader brought the new philosophy of state administration and culture to Azerbaijan, independent Azerbaijan.

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Jurisprudence

LEGAL ASPECTS OF THE DIGITAL ECONOMY

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Abstract

Forming a new vision for the regulation of the digital economy, re-evaluating the subject and mechanisms of legal regulation is now on the agenda. In this field, empirical changes that precede theory require prompt responses in strengthening the legal framework. Evaluating the limits and capabilities of the state's regulatory capabilities in the digital economy segment is a complex task in itself. The concept of borders in the digital economy has taken on new shades, making it much more difficult to coordinate national legislation and international practice. Currently, various states and international organizations are actively working to improve the ecosystem of the digital economy and develop relevant new mechanisms. At this time, the issues of determining jurisdiction, storage and protection of personal data, management of the domain name system of companies, as well as taxation of e-commerce are brought to the fore as the current problems of internet regulation. In this article, taking into account the relevance of the issues listed above, the importance of the digital economy and its legal aspects are examined.

Keywords: digital economy, regulation digital economy, legal aspects, taxation, e-commerce

1. Introduction

The level of development of digital infrastructure is an important factor determining efficiency in the digital environment. It is the infrastructure that allows taking into account the demands of the developed and near-term perspective that can make it possible to realize the advantages of the digital environment. The multi-level regulation of the Internet is related to infrastructure provision and the state of online services. The formation of large platforms in the discussed global network, obtaining the expected benefits from financial technologies, online payments, and the application of blockchain technologies depends on the legal regulation based on the comparative analysis of multivariate approaches in the development of infrastructure. The realization of those opportunities is possible thanks to the creation of a perfect regulatory mechanism and adequate legal protection (Firat M, 2020: 29).

Digital transformation has brought about the digital economy, and the development of the digital economy has brought about new legal issues and discussions. This study aims to examine the new business models and technologies of the digital economy under a concept in terms of trade and competition law, and to construct a new field called "Legal Aspects of the Digital Economy". In a field where economy, technology and law intersect, first of all, mastering the concepts and institutions of different fields, ensuring systematic integrity, and reaching the right results by relating the issues to each other required a difficult and tiring process (Jiang, 2020: 334).

2. Digital economy

Modernization is a dynamic process of modern times that is developing at a dynamic speed and has an impact on national economies and societies in one way or another. Today, it can be said with certainty that information and communication technologies have entered a new stage of development and have the power to transform all areas of our lives.

The experience of advanced countries also shows that the digitalization process has a positive effect on the economy by opening new jobs, improving the quality of life, increasing productivity, ensuring transparency, as well as contributing to the development of small and medium enterprises.

But what is the digital economy? The digital economy is an economic activity based on computer technologies, which is the result of billions of daily Internet connections between people, businesses, devices, data and processes. The area in question is a factor affecting economic processes as a whole. The most important thing that distinguishes the digital economy from the traditional economy is that it

is an economy based on digital technologies, which include Machine Learning and Artificial Intelligence, Internet of Things, Big Data, AR (Augmented Reality) and VR (Virtual Reality), etc.

In recent times, the scope of the digital economy has been expanding at an unprecedented rate, and it is penetrating almost all areas of economic activity at different rates. In this regard, a number of important tasks arise in front of us in order to strengthen the positive effects of digitalization on our economy and society and to develop this process in a sustainable manner. Building a digital economy, applying modern technologies and innovations are among the priority issues in the world. The experience of advanced countries also shows that the digitalization process has a positive effect on the economy by opening new jobs, improving the quality of life, increasing productivity, ensuring transparency, as well as contributing to the development of small and medium enterprises (Katsufumi, 2021: 30).

In recent times, the scope of the digital economy has been expanding at an unprecedented rate, and it is penetrating almost all areas of economic activity at different rates. In this regard, a number of important tasks arise in front of us in order to strengthen the positive effects of digitalization on our economy and society and to develop this process in a sustainable manner (Kolesnikov, 2020:525)

3. Taxation in the Digital Economy

The digitalization of the economy has made it increasingly difficult to tax the profits of Multinational Enterprises (MNCs) and has also left the economies of European countries facing a "technology frontier." Productivity gains in the economies of countries at the technological frontier have begun to run out, and economic players have been unable to continue growing unless they can innovate in both their technologies and business models (Nellen, 2015:).

The rapid development of information and communication technology has led the global economy to enter the digital age, and many countries have published digital economy development strategic plans, aiming to develop a digital economy to enhance national competitiveness. The growth of the global digital economy has renewed concerns about declining tax revenues in countries where consumers reside (Cockfield, 2020:353). The development of the digital economy has changed the traditional approach by enabling firms to provide a wide range of services in source jurisdictions and to generate revenue from the provision of these services without having any presence in the source jurisdictions. The ease of communication over the Internet, combined with the ability to attribute significant value to intangible assets and rights, has enabled multinational corporations to shift profits from host countries to countries with no or low taxation through transfer pricing.

According to the Organisation for Economic Co-operation and Development (OECD) model convention, business profits should generally be taxable only in the country where the business is resident. However, if a business operates in another country through a permanent establishment, it can be taxed on the profits it makes in that other country (Ooi, 2021:1-4). Digital economy companies are gradually and fundamentally changing entire sectors of the economy with their intensive reliance on digital technologies and innovative business models. This means that there are various forms of taxation of digital economy activities: corporate income tax on digital economy companies, value added tax on various activities in this economy, taxation of venture capital, special taxes on research, development and telecommunications operators, which play a decisive role in innovation and growth of digital economy companies (Collin and Colin, 2013:1-3).

Taxation is one of the most important challenges in the development of the digital economy. Taxing the digital economy has been extremely difficult both nationally and internationally, requiring countries to make joint decisions in the development of international tax system rules. Because multinational companies needed to integrate rapidly into the global supply chain. The digitalization of commercial transactions has greatly affected the erosion of the tax base and the change in profits.

Countries' own tax systems are having difficulty adapting to the dizzying changes in the digital world, and existing practices are not sufficient. For this reason, it has become necessary to take global measures rather than regulations in the national tax system, to increase transnational cooperation and tax harmonization, and tax regulations have been reconsidered with the "Action Plan on Base Erosion and Profit Shifting (BEPS)", which was initiated under the leadership of organizations such as the OECD and G-20 (Group of 20). The 2015 BEPS Report stated that the taxation of the digital economy should be planned "impartially, efficiently, definitively, simply, effectively, fairly and proportionately" (OECD, 2015:17).

It is a fact that the whole world is experiencing various problems in terms of taxing the digital economy. In fact, there is no regulation that includes elements such as "digital trade and workplace" in the agreements made to prevent double taxation and in almost all of the domestic legislation of the countries. The difficulties encountered in taxing international digital activities, especially in recent years,

have made the issue more complicated than it already is. This situation has brought countries together around the OECD's BEPS Action Plan (Diclehan, 2016:153).

In the international tax policy arena, attention is drawn to the importance of data in taxing commercial profits. There are two options in adjusting tax systems according to data. The first is to accept that it is impossible to reflect the value of data. Such an acceptance will require a fundamental tax reform with options ranging from destination-based cash flow to residence-based shareholder taxation, as suggested by scientists. The second option is to distribute profits according to the arm's length principle based on a separate business approach (Olbert and Spengel, 2019:21-22).

They are quite difficult to integrate into the existing domestic policy order. Taxation is one of the most controversial issues. Many countries apply VAT collected from sellers. Consequently, it is argued that domestic online service providers, who are not subject to such taxes in importing countries, may be disadvantaged compared to foreign service providers. In this regard, many countries have followed the BEPS Action 1 recommendations and implemented a mechanism for collecting VAT on services received by private consumers from non-resident suppliers/sellers (if possible) or from consumers at the time of payment, since most of these payments are made by a small number of actors in the financial sector.

Another more controversial issue is corporate tax. The traditional understanding is that cross-border service providers are treated as exporters of goods and therefore pay corporate tax in their home country, not in the countries of destination. However, it is not very clear where the giant international platform operators make their profits. How they design and operate their value chains is often not disclosed in detail. There are concerns about tax arbitrage practices that exploit tax rate differences between countries to avoid paying taxes. The number of users of multinational gaming companies is increasing day by day and they are making huge profits; however, not paying corporate tax where they are not resident puts local gaming companies at a disadvantage.

4. Legal regulations for e-commerce

The spread of the digital economy brings with it significant benefits, leading to increased economic growth, employment and overall well-being. At the same time, the growth of the digital economy also creates many new challenges for economic policy, especially tax policy. These challenges arise for both domestic and international tax policy, personal data and its protection, accounting and regulatory issues. Among the digital tools used by tax authorities, the introduction of new generation cash registers is a very significant event in terms of further improving the business environment in the world and entering a qualitatively new level of entrepreneurial activity. The most important of the benefits brought by this innovation is related to the increase of the transparency factor, which is in the interest of both entrepreneurs and the state. The use of new cash registers makes it possible to conduct settlements more transparently, to prevent the illegal circulation of goods, and to ensure circulation control (Tsindeliiani, 2019: 133).

The scope of e-commerce law covers a very wide area due to the high amounts it involves, the wide area it addresses and the diversity of its parties; on the other hand, the current legal regulations surrounding the problems of the rapidly developing information technology in general are quite inadequate. Among these problems whose scope cannot be determined:

- Problems falling within the scope of Consumer Law*
- Problems related to Cyber Security and Cyber Crimes*
- Protection of Intellectual Property Rights on the Internet*
- Privacy of Personal Data*
- Problem of Determining Jurisdiction (Substantive Problems)*
- Problem of Validity of Proof and E-Documents (Procedural Problems)*
- Problem of Validity of Digital Signature*
- Problem of Electronic Approval Regarding Delivery*
- Problem of Determining Legal Status and Actual Situation of E-Commerce Companies*
- Problem of Provisions Contrary to the Principle of Honesty in Standard Form Contracts*
- Problem of Lack of a Direct Higher Authority as an Application Regarding E-Commerce*
- Problem of Taxation of E-Commerce*
- Legal Regulations Regarding Payment Systems*

The scope to be determined does not remain limited to e-commerce but also includes cybercrimes, international We encounter a habitat that extends to the field of procedural law. As there are different economic structures and different cultures and traditions around the world, it seems quite impossible to reach a concept such as a "good-ideal judicial system" in the international sense. Because, although countries aim for judicial unity in the international arena, rightfully none of them seem ready to give up

their own economic interests, cultures and traditions. However, as a result of global trade and the information age, economic relations have gone beyond the territorial dimension and gained an international dimension, which has forced countries to enter the international market and has led them to resort to some international regulations and model laws, going beyond their own domestic laws. E-commerce, which has become an indispensable element of national and international trade, has also been affected by these infrastructural developments and has made the existence of some regulations inevitable (Rukundo, 2021: 16).

EU DIRECTIVES:

-Electronic Commerce Directive 2000/31

-Distance Selling Directive 97/7

-Privacy Directive 2002/58

Laws Relating to the Legal Status of Electronic Signatures in the USA:

- Standard Electronic Transactions Act, model law, adopted by about 30 states, sets the basic framework for the use of electronic signatures under state law.

- Electronic Signatures in National and International Trade Act (E-Signature), sets the principles for a national framework.

- The Government Paperwork Reduction Act is a federal law that imposes certain obligations on public institutions in the use of electronic records and signatures.

Main Directives on Electronic Commerce and Electronic Signatures in the EU:

- The Electronic Commerce Directive, numbered 2000/31 EU, dated 8 June 2000, prepared to ensure the free movement of information society services between member states, includes important issues regarding electronic contracts and their legal consequences.

- The Electronic Signature Directive, numbered 1999/93 EU, dated 13 December 1999. EU member states are required to enact the necessary laws, regulations and administrative provisions to comply with this Directive by 19 July 2001. The purpose of the Directive is determined as facilitating the use of electronic signatures and contributing to their legal recognition. The principles regarding electronic signature certificates, certificate service providers and their supervision are included in this Directive.

UNCITRAL Model Laws:

- The Model Electronic Commerce Law dated 1996 includes provisions regarding the legal recognition of electronic data and contracts.

- The Standard Provisions for Electronic Signatures, dated 2001, set out the general principles regarding electronic signatures.

Conclusion

The digital economy, along with rapidly developing technologies and new business models, is constantly transforming the global economic structure and taxation systems. Therefore, effective management and implementation of tax planning in the digital economy is of great importance for businesses and tax administrations. Tax planning in the digital economy is an important tool for expanding the tax base and increasing tax revenues. However, tax planning in the digital economy presents a number of challenges and opportunities for businesses and tax administrations. The rapid development of the digital economy and the continuous technological change require tax planning and practices to be constantly updated and adapted. Therefore, businesses and tax administrations should evaluate the challenges and opportunities they encounter in tax planning in the digital economy and adopt strategies to develop more effective and sustainable tax policies and practices within this framework.

The emergence of new digital technologies at all times and their constant movement bring deregulation with them. This irregular environment can radically affect socioeconomic structures in terms of the effects it creates. At this point, the digital economy, which develops independently of physical factors, directly drags taxation into this vortex. Therefore, this emerging digital revolution has also created some new problems for the legal discourse on international taxation and has necessitated urgent measures to solve these problems. This study, which aims to provide a broad perspective in terms of solutions for digital taxation, aims to address this problem within the framework of current and new digital technologies, taking into account their pros and cons. In this sense, the study, which takes a proactive stance, claims that the most appropriate solution that can be applied in the taxation of the digital economy is the digital service tax.

Solution suggestions for the problems experienced in taxing the digital economy can be listed as follows:

- Countries should establish a good digital tax system that will ensure fair sharing of digital tax revenues. Politicians need to develop appropriate political tools for this.
- It has been observed that some multinational companies are structured in a way that allows them to illegitimately benefit from favorable tax regulations in target countries, which significantly reduces the tax burdens of corporate groups. Country tax administrations should design their digital taxes by considering such legal but undesirable situations. Regular and strict implementation of state aid laws by countries can serve as an effective deterrent against unfairly favorable treatment and tax incentives that may lead to the disruption of digital markets.
- Digital taxes should be designed in a way that does not violate the provisions of international agreements.

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Mathematical sciences

AN OVERVIEW OF METHODS FOR SOLVING CONVEX PROGRAMMING PROBLEMS

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Abstract

Thousands of publications in the world literature are devoted to the problem of optimization without constraints, dozens of different methods have been proposed. Unfortunately, all of them guarantee finding a solution (global optimum) only for convex objective functions with additional conditions that are difficult to verify in practice. If the function has a complex non-convex relief, then the iterative procedure will at best converge to one of the local extrema.

Keywords: convex, programming, solving, functions, optimization.

Introduction

Nonlinear programming problems arise in various fields of activity when the linear approximation of real dependencies is too rough. A huge number of problems of this kind arise in the automation of design and optimization of technological processes. For example, a nonlinear model for optimizing the chemical process of ethylene glycol synthesis is described, which has 22 variables, 7 equality constraints, 12 inequality constraints and a full set of constraints on the variables from above and below [1].

Unlike linear programming, where the objective function was the simplest linear form and there were no problems with its definition, here various options are possible. In real problems, the objective function can be specified:

- by an analytical expression, which can be arbitrarily complex;
- by a calculation algorithm, including a program for simulating a certain process;
- a full-scale experiment. Thus, the calculation of the objective function value for given values of independent variables, not to mention its optimization, can be a certain problem and require considerable labor costs.

The set $D \subset R^n$, defined by the set of constraints (2), is called the feasible decisions set or (in Russian literature) the set of plans.

When the number of variables is two, the mathematical programming problem can be easily interpreted geometrically. The feasible decisions set will be a certain region on the plane, and the objective function $f(x_1, x_2)$ has the form of an uneven surface with hills and depressions. It can be depicted as a three-dimensional picture or, similar to how terrain is depicted on geographic maps, as a family of lines of equal values - isotarget lines. As we will see later, finding a global extremum point (minimum or maximum) for such functions can be very difficult; the search algorithm can get lost in the highly jagged terrain.

Main part

In nonlinear programming, everything is much more complicated.

First, the set of plans may not only be non-convex, but even disconnected. An example of such a set is shown in Fig. 2, a. It is defined by the following inequalities 1:

$$\begin{aligned} g_1(x_1, x_2) &= x_1 x_2 \leq 1, \\ g_2(x_1, x_2) &= x_1 + x_2 \geq 2.2, \\ x_1, x_2 &\geq 0. \end{aligned}$$

Secondly, the extremum can be located either on the boundary or inside the region. In the example in Fig. 1, b, the objective function is the simplest quadratic form of two variables, the isotarget lines of which are concentric circles with a common center at the point $\rightarrow X^* = (a, b)^T$:

$$\begin{aligned} f_1(x_1, x_2) &= (x_1 - a)^2 + (x_2 - b)^2 \rightarrow \min, \\ g(x_1, x_2) &= x_1 + x_2 \leq 1, \\ x_1, x_2 &\geq 0. \end{aligned}$$

Depending on the values of a and b , the optimal plan is located at the extreme point, on the boundary, or inside the triangular region of plans.

Thirdly, the objective function can have several local extrema, as demonstrated by the example in Fig. 1, however, the main task of nonlinear programming is to find the best of them - the global optimum.

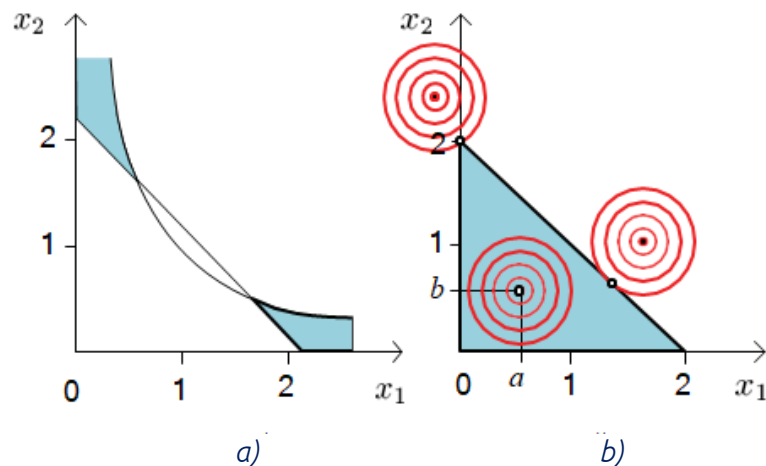


Fig. 1. Difficulties caused by nonlinearity

Due to the above difficulties, there are no general methods for solving any problems of mathematical programming. Hundreds of different methods have been invented, but none of them can compare in strength and universality with the simplex algorithm of linear programming. It has long been noted that if there are many medicines for a certain disease, then this is a sure sign that this illness is radically incurable. Therefore, the only possible way in this situation is to identify specific classes of nonlinear problems and look for their own approaches for each of them.

The simplest convex nonlinear problem is the quadratic programming problem (QP), in which the minimum of a multidimensional quadratic function is sought under linear constraints. Using the Kuhn-Tucker conditions, the quadratic problem can be reduced to linear programming and an exact solution can be obtained in a finite number of steps.

Unfortunately, for more complex cases, exact finite methods for finding a solution are unknown. At the same time, there are a great many approximate iterative procedures based on certain assumptions and successful heuristic techniques.

Traditionally, problems and methods of nonlinear optimization are studied from simple to complex, from particular to general. As we shall see later, a significant proportion of iterative procedures are based on reducing a multidimensional search to a sequence of search steps along a given direction, i.e. on methods for finding the extremum of a one-dimensional function. This class of one-dimensional problems is far from trivial and deserves detailed consideration. The next most complex class of problems pertains to the case where there are no constraints, i.e. the variables being optimized can take any values. On the one hand, these unconstrained optimization problems are relevant in themselves when it follows from the substantive formulation that the constraints are unimportant. On the other hand, they create an ideological basis for solving problems with constraints.

Results

By now, the best-studied class of problems is convex programming, in which the objective function and constraints are specified by convex functions [2]. The most important property of such problems is the uniqueness of the extremum, that is, the coincidence of the local extremum with the global one. For convex problems, it is possible to construct a general theory, which we will study in Chapter 9. It generalizes the classical method of Lagrange multipliers and reduces the problem of finding an extremum in the presence of constraints to solving a certain system of equations and inequalities (Kuhn-Tucker conditions). As is known, linear functions are also convex, so from a theoretical point of view, linear programming can be considered a special case of convex programming. Some lecture courses intended for pure mathematicians are structured exactly like this, from the general to the particular. However, from a practical point of view, this approach gives little, since only the specificity of linear problems allows constructing super-efficient numerical methods similar to the simplex method.

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Pedagogical sciences

FACTORS DETERMINING THE EFFECTIVENESS OF EDUCATION IN IMPROVING THE EDUCATIONAL PROCESS

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TƏDRİS PROSESİNİN TƏKMİLLƏŞDİRİLMƏSİNDƏ TƏHSİLİN EFEKTİVLİYİNİ ŞƏRTLƏNDİRƏN AMİLLƏR

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Abstract

Appropriateness- Appropriateness is accomplished by evaluating with the end goal. The initial assessment is designed and the goals it will serve are selected, the essence, technical material and main features of the information collected about the student are given, the directions of information collection and analysis are found, and the content of the final result is revealed. The end of the evaluation shows the objectives revealed. The correctness of the two-way between the decisions taken into account and the information brought into the form of a set is fulfilled. The evaluation stages are arranged internally and get a general picture.

Evaluation of success and effective conditions in education from two sides - with the help of appropriate accelerators, the following information is collected about effective conditions in education - in the classroom with accelerators - the mastery of the teacher, the essence of training, stages of development, assessment management, the time set for training, materials that meet the needs of the student and advantages of things used in teaching.

- Accelerators directly related to education - matchings, educational materials, spending on education intended for each person:

- with other accelerators - household issues:

Ensuring the qualitative compatibility and reliability of the obtained information (unity and relevance) - the quality of the information guarantees the compatibility of the adopted decisions and actions. A student's success is evaluated based on the stages of information in a holistic way that he/she performs in a specific place in an effective environment designed for him/her.

Xülasə

Məqsəduyğunluq- Son məqsədlə qiymət vermə ilə uyğunlaşma yerinə yetirilir. İlk qiymətdə layihələşdirilir və onun qulluq edəcəyi məqsədlər seçilir, şagird və onunla bağlı toplanılan informasiyaların mahiyyəti, texniki materialı və başlıca xüsusiyyətləri verilir, informasiyaların yığılması və təhlili istiqamətləri tapılır, son nəticənin məzmunu açılır. Qiymətdəyişimin sonu üzə çıxarılmış məqsədləri özündə göstərir. Hesaba alınmış qərarlar və toplum şəklinə gətirilmiş informasiyalar arasında ikitərəfliyin düzgünlüyü yerinə yetirilir. Qiymətdəyişim mərhələləri daxilədən sıra ilə düzülür və ümumi şəkil alır.

Uğurların və təhsildə səmərəli şəraitin iki tərəfdən qiymət verilməsi-uyğun sürətləndiricilərin köməyi ilə təhsildə səmərəli şəraitlərlə bağlı aşağıdakı informasiyalar yığılır- sinifdə daxilində də sürətləndiricilərlə - müəllimin ustalıq, təlimin mahiyyəti, inkişafın, qiymətdəyişimlərin idarə edilməsi mərhələləri, təlimlə bağlı müəyyən olunmuş zaman, şagirdin ehtiyaclarını qarşılayan materiallar və tədrisdə istifadə olunan şeylərin üstünlükləri.

-birbaşa təhsillə bağlı olan sürətləndiricilər - uyğunluqlar, tədris materialları, hər bir adam üçün nəzərdə tutulan təhsilə istiqamətlənən xərcləmələr:

-digər sürətləndiricilərlə - məişətlə bağlı məsələlər:

Əldə olunmuş informasiyaların keyfiyyətcə uyğunluğunun və etibarlılığının təmin edilməsi (vahidlik və relevantlıq)- informasiyaların keyfiyyəti qəbul edilmiş qərar və fəaliyyətlərin uyğunluğuna zəmanət verir. Şagirdin uğuru onun üçün düzəldilmiş səmərəli şərait içində müəyyən edilmiş yerdə icra etdiyi bütöv şəkildə məlumatların mərhələlərinə əsasən qiymət verilir.

Keywords: information, quality, teaching, education

Açar sözlər: informasiya, keyfiyyət, tədris, təhsil

Qiymətvərmə məqsədləri və nəzərdə tutulmuş müvafiq informasiyalar fərqli zamanlarda istifadə edildikdə, eyni cür nəticəyə gəlməyə şərait yaradır və olduqca dözümlü və möhkəmdir; qiymətləndirmədə düzgünlük, ədalətlik, iki tərəfli razılaşma və əməkdaşlıq. Informasiyaların yığılı, müəllimin istifadə etdiyi qiymətləndirmə meyarları və hətta onun özünün peşəkarlıq səviyyəsi şəffafdır və qiymətləndirmə tapşırıqlarında şablonların, fərziyyələrin, şagirdlərin diqqətini yayındıran digər məsələlərin istifadəsinə yol verilmir. Onlar şagirdlərin maraqlarına və imkanlarına görə müxtəlif kontekstlərdə (etnik xüsusiyyətlər nəzərə alınmamaq şərti) qurulur. Sağlamlıq imkanları məhdud uşaqlar üçün qiymətləndirmə tapşırıqları müvafiq qaydada uyğunlaşdırılır. Məzmunla bağlı uyğunluqlar integrativ təlim sonluqları olub, şagirdin müəyyən edilmiş qabiliyyət və üstünlüklərə sahib olmaqla mərhələ-mərhələ dəyişməsinə imkan yaradır.

Qiymətdoyma uyğunluqları məzmun uyğunluqlarının hansı mərhələdə həyata keçirildiyini müəyyən etməklə, olmuş fərqliliklərin üstünlüklərini təyin edir.

Qiymətdoyma uyğunluqlarının müəyyən edilməsində imtahan əsaslanan yollarla hər iki tərəflərin razılaşması əsasında müəyyən olunmuş siniflər üzrə milli mərhələdə son qiymətdoyma aparılır, sonluqlar araşdırılmaqla, uyğunluqlar müəyyən edilir. Məsələn:

minimum - şagirdlərin 90-100 faizi tərəfindən nail olunan standartlar;

yüksək - şagirdlərin ən yaxşı halda 30 faizi tərəfindən nail olunan standartlar.

Qiymətvərmə uyğunluqlarının müəyyən edilməsində kurikulum yonunlu yollara daha çox yer verilir. Bu metoda görə:

-qiymətdoyma uyğunluqları milli kurikulumda öz əksini tapmış nəticələrə əsaslanır və real olaraq şagirdlərin qabiliyyətlərinə dair dəyərlərə deyil, usta ixtisasçıya və onun yürütdüyü fikirlərə söykənir.

Demək olar ki, məktəblərin, müəllimlərin mövqeyini əks etdirən müəssisələrin və başqa diqqəti cəlb edən tərəflərin mühakimələri əsasında uyğunluqlara düzəlişlər olunur və arzu edilən uğurlar mərhələlərinə görə bütöv fikir yaranır.

Qiymətdoyma uyğunluqları 4 mərhələlərlə qiymətvərmə planı şəklində hazırlanır. Qiymətvərmə göstəriciləri qiymətdoyma şkalasıdır ki bu da iki mühüm sualı özündə birləşdirir:

1. Mən nəyə qiymət qoymalıyam? (əşya, məzmun, istiqamətlər, hər iki tərəflər, xüsusiyyətlər)?

2. Aşağı, orta və yuxarı uğur mərhələlərinin imkanlarını nə cür təyin etmək olar?

1-ci mərhələ və 2-ci mərhələ çoxlu sayda şagirdlər, 3-cü mərhələ və ələlxus 4-cü mərhələ isə daha da qabiliyyətli şagirdlər üçün nəzərdə tutulmuşdur. 1-ci mərhələ aşağı, 4-cü mərhələ isə yüksək qabiliyyəti özündə birləşdirir.

Qiymətləndirmə sxemləri qiymətin verilməsinin daha ədalətli, düzgün və şəffaf keçirilməsinə imkan yaradır, tədris üstünlükləri ilə bağlı müəllimləri önəmli informasiyalarla təmin edir və tələb edir ki, hər bir müəllim müəyyən edilmiş şərtlər əsasında öz göstəricilərini müəyyən etsin. Qiymətdoyma şkalası şagirdin işinə qiymət vermək məqsədilə müəllimin xərclədiyi zamanı azaldır, üstün mərhələlərin köməyi ilə fərqli qabiliyyətə malik şagirdlərin təhsil aldığı sinifləri nəzərdə tutmağa imkan yaradır.

Qiymətləndirmə sxemləri əməyə qiymət verilməsi vaxtı istifadə olunan göstəricilərlə bağlı şagirdlərin öyrədilməsi, onların fəaliyyətinə və əməyinə nə cür qiymət verilməsi və onlardan nəyin tələb olunduğunu açıq formada göstərməklə, qısaca məqsəd və qarşıya qoyulan göstəriciləri təyin edir. Bu sxemlər şagird əməyini daha da yaxşı dəyərləndirməklə, təlim zamanı inkişafın qiymət verilməsi üçün sərhəd müəyyən edir, əməyin səmərəliliyi ilə bağlı digər tərəfə informasiyanın verilməsini təşkil edir.

Şagirdlərin məzmun uyğunluqlarına hansı mərhələdə sahib olduqlarını yoxlamaq və əldə edilmiş bacarıqlar üzrə son qiymət qoymalar aparmaq üçün qiymətdoyma yollarının, məsələn, testlərin hazırlanması müəyyən formaya uyğun yerinə yetirilir:

-qiymətvərmə vasitələrinin (testlərin) düzəldilməsi zamanı testlərin məqsəduyğunluğu (məhz "nəzərdə tutulmuş" qiymətləndirməsi) və etibarlılığı (real məlumatlara əsaslanması);

-effektivlik üçün hər bir sinif üzrə bir az (<10) və bir az çox (>10) məzmun uyğunluğuna sahib olan iki fənn qrupunun təyin edilməsi:

-son testlərdə bütün uyğunluqların sahiblik seçiminin əhatə olunması;

-sonda olan testlərdə bütün mərhələlər üzrə də sahiblik seçiminin yerinə yetirilməsi (1-ci mərhələ üzrə suallar 20%, 2-ci mərhələ üzrə suallar 30%, 3-cü mərhələ üzrə suallar 30%, 4-cü mərhələ üzrə suallar 20%).

İndi bir çox yelərdə təhsildə innovativ qiymətkoyma modellərinin yaranması, şagirdlərin təhsil uğurlarının hesabının aparılması və təhsil pillələri üzrə buraxılış imtahanlarının keçirilməsi ilə bağlı yeniliklər aparılır. Onlara məxsus xüsusiyyətlər bu cür müəyyən edilir:

-qiymətvermə və təhsildə yeni mövqelərin istifadəsi və inkişafı, bununla bağlı olaraq vaxtı ötmüş mövcud yollardan uzaqlaşmaq;

-imtahanların düzgün və ədalətli aparılması istiqamətində daha qabaqcıl yolların müəyyən olunması;

-yeni qiymətkoyma yollarının həyata keçirilməsi üzrə təhsildə müəyyən müəssisələrin və qurumların formalaşdırılması;

-yeni qiymətkoymanın inkişaf etdirilməsinə təhsil yeniliklərinin əsas hissəsi, vacib ərazisi kimi yanaşılması və onun kurikulumların hazırlanması fikri ilə əlaqəli baxışda nəzərdə qalması.

Təhsilalanın təlim nailiyyətinin düzgün qiymətləndirilməsi həm onun özü, həm də müəllim üçün vacibdir. Təhsilalanın qiyməti müəllim üçün də əhəmiyyətli olub, onun həmin uşaqla işləmək perspektivlərini əks etdirməlidir. Bəzi müəllimlər qiymətə yalnız uşağın fəaliyyətinin nəticəsi kimi baxaraq bu cəhəti dəyərləndirmirlər. Aparılmış araşdırmalar nəticəsində müəyyənləşdirilmişdir ki, müasir şəraitdə tədris-təlim prosesinin keyfiyyətinin yüksəlməsinin ən mühüm şərtlərindən biri elmi, pedaqoji və psixoloji cəhətdən əsaslandırılmış qiymətləndirmənin aparılmasıdır.

Çox vacibdir ki, müəllimin qiymətləndirmə fəaliyyəti uşağın sosial-psixoloji inkişafı maraqlarında həyata keçirilsin. Buna görə də müəllimin qiymətləndirmə fəaliyyəti adekvat, ədalətli və obyektiv olmalıdır. Müəllimlər hər dəfə qiymət verdikdə, onu mövcud kriteriyalara və məntiqə uyğun əsaslandırmalı, obyektiv faktorlara əsaslanaraq təhsil alanları müxtəlif xarakterli konfliktlərdən uzaqlaşdırmalıdır.

Aparığımız elmi-tədqiqat işi aşağıdakı elmi-pedaqoji nəticələrə gəlməyə imkan verir:

1. Qiymət-müəllimin ixtiyarında olan təlimi stimullaşdıran, müsbət motivasiya yaradan, şəxsiyyətə təsir edən fəaliyyət vasitələrindən biridir. Məhz obyektiv qiymətləndirmənin təsiri ilə şagirdlərdə özünüqiymətləndirmə, öz uğurlarına kritik münasibət yaranır.

2. Təhsilalanların təlim nailiyyətlərinin qiymətləndirilməsinin pis təşkil olunması təhsilin keyfiyyətinə mənfi təsir göstərən səbəblərdən biridir. Qiymət təlim və tərbiyə fəaliyyətində işlənən və onun uğurunu təyin edən spesifik stimuldur.

3. Qiymətvermə və təlimə təhsilin bir-biri ilə yaxın münasibətdə olan iki tərəfi kimi baxılır. Qruplaşmış və ardıcıl mahiyyət kəsb edən qiymətkoyma təlimin son nəticələri ilə maraqlı tərəflərlə faydalı əks-əlaqə amili olaraq aşağıdakı elementləri əhatə etməklə düzəlir: qiymətləndirmə məlumatları, məlumatların toplanması, qiymətləndirmə nəticələri, qiymətləndirmə standartları.

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UDC 811.111

THE USE OF ARTISTIC AND AESTHETIC TECHNOLOGIES IN ENGLISH LESSONS**Kismetova Galiya***M.Utemisov West Kazakhstan University, Uralsk, Kazakhstan***Saule Akylbekkyzy****Abstract**

The article shows the possibility of using art techniques to increase motivation to learn English, as well as to increase the level of learning by using various channels of perception of students (visual, auditory, tactile and motor) based on various art objects.

Keywords: *art technologies, artistic and aesthetic direction, listening, kinesthetics, audios, visuals, methods of teaching English, quest, web quest, music, films, art.*

With the advent of new information technologies and modern devices, art is more necessary than ever for a person, especially children and adolescents, because it is able to comprehensively influence people. Moreover, most children are cut off from big cities and are unable to visit art galleries, museums and concert halls for objective reasons. In the modern educational process, school teachers and psychologists have been using the means of art for many years to solve the problems of development, upbringing, education and psychological support for children. The use of various genres of art in the classroom, in our opinion, is able to enliven and enrich the sometimes routine educational process with new colors, make the pedagogical process more intense and interesting, as well as ensure the effective achievement of the results of pedagogical activity [1, p. 1]. We believe that it is art that offers one of the most popular and effective methods of work on English lesson — the method of art technology. Art technologies include the use of means of illustrative visualization (illustrations of paintings by artists, photographs of sculptures, objects of applied creativity); watching videos, listening to musical works, creating collages on various topics, learning poems, rhymes, songs, artistic composition, staging, performing various roles in dialogues and role-playing games. All this stimulates students' interest in learning English, accelerates the pace of their intellectual development. Spontaneity, creativity and creativity are the most important components of art technology. The inclusion of art technologies in the learning process allows the teacher to increase the motivation of students, and consequently improve their academic performance. Practice shows that a child learns the material more successfully in the lesson when he is interested, if the child is happy and feels a sense of joy from the work done. The use of elements of art technologies in teaching a foreign language gives a lot: they awaken the imagination, develop imaginative thinking, create a situation where children live the studied material, teach students various types of situational behavior, accelerate the development of speaking and communication skills, develop phonemic hearing and listening skills[1, p. 1].

The forms and techniques of modern art technologies are different, they can be used in lessons not only to reveal the subject content, but also as a means of teaching. To realize creative abilities, to translate acquired knowledge, skills and abilities into practical activities, you can use the "Quest". A web quest is a problematic task with elements of a role-playing game using Internet information resources. This teaching method was developed in 1995 by Professors Bernie Dodge and Tom March from San Diego State University. Since the late 90s of the last century, it has become widespread and widely used in Kazakhstan. The topics of web quests are diverse, ranging from travel to regular quizzes[2]. Taking into account the individual psychological characteristics of students associated with the most developed channels of perception, there are 3 main groups: "visuals", "audials" and "kinesthetics", all three groups of students are present in all English language groups. Moreover, sometimes there are groups where most children are not "visual" at all, but "kinesthetics". And there are even fewer "audials". This is especially observed with the increasing hyperactivity of children. And to understand this, it is enough to just look at one test to determine the leading channel of perception [3, p.2]. For example, the description of an ordinary kinesthetic "it is very difficult for him to write, his artwork is untidy, does not walk calmly, but rushes, can cause anxiety, because it interferes with neighbors at the desk, likes to fool around, it is easy he gets distracted and remembers poorly." However, the textbook materials are mainly focused on "visuals". Watching them, it turns out that indeed, "audiales" do a good job of listening, but they have problems with writing and memorizing information that is presented visually. Visual artists have a good memory for memorizing words presented using visual aids (pictures, diagrams, collages, tables), but they

are worse at listening and remembering information presented by ear. "Kinesthetics" are worse at assimilating information presented by ear or visually. What they read or hear, they definitely need to "feel", but it is not enough just to read or hear. It is even better if the learning process is creative and will be woven into some kind of activity - creating a collage, creative project, theatrical activity, pantomime [3, p.3]. Given all these features, we believe that it is necessary to implement various art technologies in English lessons to correct the forms of presentation of new material, repetition and the consolidation of what has been studied. Thus, it is art technologies that make it possible to assimilate the material in the best way, using various channels of perception of students.

Choosing art technology, it is necessary to pay attention to the age characteristics and interests of students.

We can confidently call music one of the most effective means of motivating learning a foreign language. In our opinion, it is music that develops listening, vocabulary, and aesthetic development. Cinema and television also have a beneficial effect, as students learn a lot of interesting things, get acquainted with the culture of native speakers, replenishing the linguistic and cultural potential. In our practice, we have borrowed exercises and tasks with reference to art materials [4, p.294], which we use when learning English at the Nurbolashak training center. To train the simple past tense, we use, for example, the song from the cartoon "Shrek" "I'm a believer" Smash Mouth [5].

I thought love was
Only true in fairy tales
Meant for someone else
But not for me
Love was out to get me
That's the way it seems
Disappointment haunted
All my dreams
And then I saw her face
Now I'm a believer
And not a trace
Of doubt in my mind
I'm in love
I'm a believer
I couldn't leave her
If I tried
I thought love was more or less a given thing
But the more I gave the less I got, oh yeah
What's the use in trying?
All you get is pain
When I wanted sunshine
I got rain
And then I saw her face
Now I'm a believer
And not a trace
Of doubt in my mind
I'm in love
I'm a believer
I couldn't leave her
If I tried
What's the use in trying?
All you get is pain
When I wanted sunshine
I got rain
And then I saw her face
Now I'm a believer
Not a trace
Of doubt in my mind
I'm in love
I'm a believer

I couldn't leave her
 If I tried
 Then I saw her face
 Now I'm a believer
 Not a trace
 Of doubt in my mind
 Now I'm a believer
 Yeah, yeah, yeah, yeah, yeah, yeah
 Now I'm a believer
 Then I saw her face
 Now I'm a believer
 Not a trace
 Of doubt in my mind
 I'm a believer
 Now I'm a believer

1. Write the verbs on the board: "to be", "can't", "to get", "to give", "to haunt", "to mean", "to need", "to see", "to seem", "to think", "to try".

2. Students rewrite these verbs and put them in the past tense.

3. We play a song for the students to listen to and correct, if necessary.

4. Next, we distribute texts with missing words to students and ask them to fill in the gaps using the words they wrote.

You can work with the same song for many lessons, giving it only 5-7 minutes. If there was no work on the song in the group, you can start the lesson by clarifying the students' attitude to music and songs in general. For example: Music is a part of our live. People often listen to music and sing. "And what about you?". "Do you like listening to music and singing? Why?" You can ask what is more important to them than music or lyrics and why.

Also, in our practice of learning English, we use films in the original or translated into English. The main thing is that the students are interested in the picture. To do this, we use the task "True or false". A fragment of the film is included in the students' attention, during which they must write down three sentences related to this fragment, they can be true and false. After watching the film, we ask you to read the statements, and the rest must determine whether it is true or false. This task is useful because students not only delve into the meaning of a video fragment, practicing listening, but also develop writing, learn how to correctly build sentences and express their thoughts.

It should be noted that using art materials in English lessons not only enriches students with knowledge about the language, grammar, vocabulary and syntax, but also provides an opportunity to learn the culture of the country of the language being studied.

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Philological sciences

EVOLUTION OF IDIOMS IN MODERN AMERICAN MASS MEDIA

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Abstract

This paper analysis the transformation and development of an idiom in the context of American mass media: “spill the beans”, and its modification. This article offers a thorough, proper examination of linguistic changes and their cultural ramifications, drawing on a sizable sample set from movies, books, television shows, and social media platforms. Using terms as COCA, Sketch Engine, Ngram Book Viewer, and dictionaries, the frequency of both the original and modified idioms, as well as their contextual usage, were undergone examination. For instance, “spill the tea” or “tea” instead of “spill the beans”. For example, the phrase “spill the tea” indicates a modern adaptation that reflects evolving cultural narratives. Furthermore, the paper discusses the implications of these transformations for understanding shifts in societal communication patterns and their representations in contemporary discourse. This analysis highlights the dynamic nature of language withing mass media and the continual interplay between idiomatic expressions and cultural identity.

Keywords: transformed idioms, mass media, corpus, Sketch Engine, Ngram Book Viewer.

Introduction

Several studies have addressed idiom modification. According to Džanić & Berberović (2020), for an idiom to undergo modification, its components must each hold individual meanings and contribute to the idiom's overall intelligibility. However, semantic transformations such as word substitution or addition do not necessarily compromise the comprehensibility of idiomatic expressions, as noted by Mancuso et al. (2020) and Tabossi et al. (2009)

In the context of popular communication, conventional phrases might undergo structural changes, cultural adaptations, or reinterpretations, resulting in transformed idioms in mass media. Idioms are linguistic constructs rich in cultural meaning that influence language usage by reflecting social and cultural norms and values and briefly communicating complicated ideas. Proverbs, sayings, catchphrases, and slogans are example of idiomatic idioms that can be used to create a range of effects, including surprise, irony, novelty, and humor (Glaser, 1986; Naciscione, 2010). Their usage for “filling empty contextual slots or for pure enjoyment of language play” is highlighted by Omazic (2008).

Idioms present both opportunities and challenges for language learners and scholars when they change. The term “phraseological actualizer” was first used by Kunin (1064) to describe a word, phrase, sentence, or collection of phrases that are semantically connected to idioms and serve as transformation cause. Altered idioms are frequently used in journalism, especially in newspaper headlines, to readers' interest. They are also often used to make slogans in commercial advertising more memorable (Glaser, 1986). They can be found in both fictional and non-fictional texts, as well as in public discourse, since they are not limited to particular contexts or forms. Furthermore, the study by Aimagambetova & Suleimenova (2017) highlights the flowing nature of language in the media, with a focus on how journalists aimly change.

By examining the phenomenon of transformed idioms in American mass media, this study develops on previous studies. Through an examination of modified idioms as “spill the tea”, as well as its frequency, transformation types, and contributing factors, this research examines to advance our understanding of how idiomatic expressions change on modern media contexts.

Literature Review

Studies Related to Transformed Idioms in English Encountered in Mass Media

Studies of English idioms conducted using electronic corpora show that their forms are relatively variable (Moon, 1998; Cignoni et al., 1999). The changes undergone by some of these idioms include lexical substitution, addition, ellipsis, pluralization, passivization, nominalization, etc. For instance, in her database comprising 6,776 fixed expressions and idioms, Moon (1998: 120) found that around 40% of

units have lexical variations or what she terms as institutional transformations (the latter including negation, passivization and nominalization). According to Natsir M.(2020) explored Instagram, and claimed that young generation tend to change words, especially in social networks. Also the results from Aimagambetova's research showed that humor and cultural references played significant roles in the transformation process highlighting the contribution of transformed idioms to the comedic and relatable aspects of media content.

Chen (2019), on the other hand, explored the role of transformed idioms in social media platforms, specifically on Twitter. By examining a large collection of tweets, Chen observed how users creatively modified idioms to fit within the constraints of character limits and to convey nuanced meanings (ibid.). The findings emphasized how transformed idioms have become an integral part of the online discourse, giving rise to new forms of expression in the digital age. This approach was a clear reminder of Moon's 1998 study, which presented an influential model to explore what Moon called 'fixed expressions and idioms' (FEIs). Her corpus findings show that almost 40% of English FEIs allow for lexical variation or transformation, with a smaller percentage having two or more variations (ibid). However, Moon (1998) differentiates between fixed expressions, a term that is similar to Weinreich's (1969) stable collocations, and idioms. Thus, unlike in 'fixed expressions', the term 'fixed' is not applicable to idioms, which Moon (1998) defines in terms of characteristics such as compositionality and institutionalization; change can, therefore, be observed in idioms.

All this research adds to our knowledge of how English idioms are transformed in the context of mass media, as it shows how modified idioms appear in a variety of contexts. They can be impacted by marketing tactics, the need to create a comedic effect, the target audience's cultural background and, in very specific contexts, the need to observe the constraints placed on the number of characters allowed (in the case of social media). Transformed idioms provide linguistic originality, capturing the attention of the listener and conveying ideas more efficiently through the subtleties or cross-references they may contain. In mass media, transformed idioms are often used to create memorable campaigns. In this study, however, we focus primarily on popular idioms found in newspapers, and explore their modifications.

Research Question

RQ1: What type of transformation shows an altered idioms 'spill the tea' ?

RQ2: Which techniques are reliable in identifying modified English idioms in mass media contexts?

RQ3: What factors contribute to the modification of idioms within the context of mass media?

Method and Materials

This study took a mixed approach, using qualitative approaches to address RQs 3 and 1 and quantitative methods to address RQs 2. Three quantitative tools were utilized for this purpose: Sketch Engine, which gave a clear picture of word frequency, COCA, which gave a comprehensive picture of word frequency, and Ngram Viewer, which allowed the investigation of diachronic fluctuations of favorite words and expressions. The reason COCA was selected was because, according to Davies (2010), it is the only comprehensive corpus of American English that covers a wide range of genres, including spoken language, fiction, popular magazines, newspapers, academic texts, TV and movie subtitles, blogs, and other online pages—all of which are relevant to the goals of this study. We then added the Sketch Engine to this.

We supplemented this with the Sketch Engine, a text analysis program and corpus manager that provides access to texts in more than 100 languages. The Ngram Viewer was used to determine the frequency of the three idioms selected for this in-depth analysis. COCA and Sketch Engine were then used to gather further usage statistics. Next, we examined the kinds of changes that the root forms underwent. To put this into perspective, we also conducted a statistical analysis to complete the frequency with which this type of modification happens in comparison to other types. COCA and Sketch Engine to obtain more usage data.

Critical Discourse Analysis (CDA) was used in the qualitative research to investigate how language use reflects and maintains power dynamics and cultural norms. In order to get how messages are equally communicated by non-verbal ways, semiotic analysis was also utilized to examine the visual and multi modal components of mass media discourse, particularly in advertising, television shows, and internet platforms. In order to capture a wide range of language use and discourse practices, the data gathered for sampling was chosen from a diverse range of American mass media texts, including TV episodes, news articles, ads, social media content, and online chat forums.

Results

1.1 Analysis of Idiom 'Spill the Beans' and Its Transformed Version 'Spill the Tea' and 'Tea'

According to Oxford English Dictionary, 'spill the beans' means to tell somebody something that should be kept private or secret. Although it is believed to have originated from the Ancient Greek voting system, where black and white beans were used to cast positive or negative votes and the act of spilling them would mean revealing the winner, the English idiom earned an active usage only in the late 20th century (see Fig. 1).

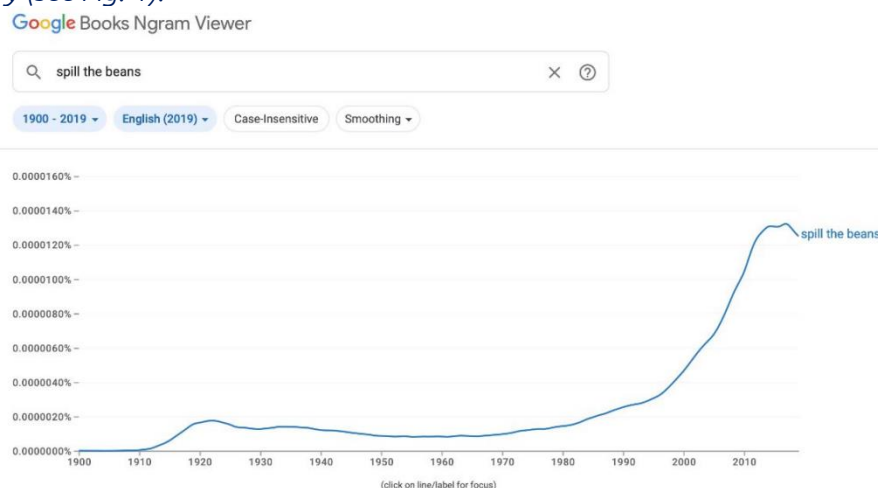


Figure 1. Analysis of the Idiom 'Spill the Beans'

Source: https://books.google.com/ngrams/graph?content=spill+the+beans&year_start=1900&year_end=2019&corpus=en-2019&smoothing=3

A version of the switch from 'spill the beans' to 'spill the tea' was mentioned by Khalis & Rifhan (2019), who believed that the isolated lexical item 'tea' did not stand for the drink, but for the letter T. They recount that, in a 1994 interview with the drag queen, Lady Chabliss, the latter referred to T meaning 'truth' when using the modified idiom, implying that what was being revealed should have been kept private. The term, nonetheless, resonated with the public, and its use increased considerably with the advent of the internet. The transformed idiom has been in use since 1700s. The rise in the usage of the transformed idiom from the end of the 20th century can be noticed in Fig. 8.

Examples:

1. We don't want to spill the beans yet.
2. She made the mistake of spilling the tea on her sister's love life.

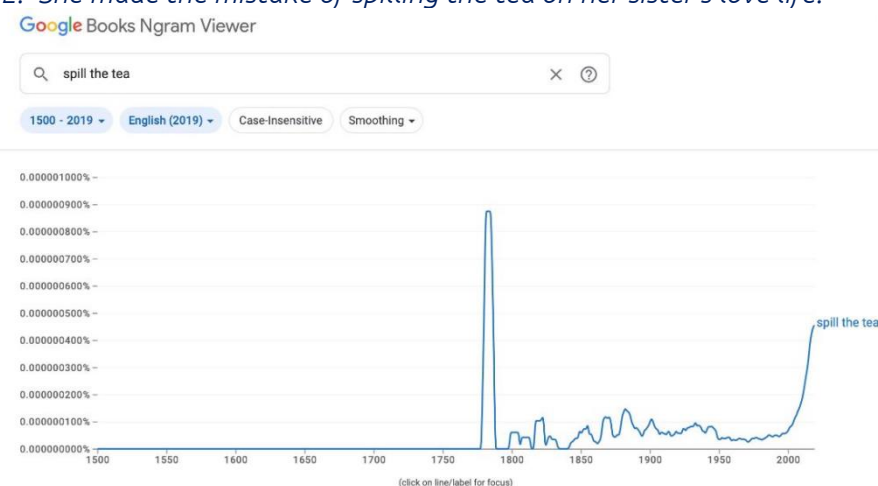


Figure 2. Analysis of the Idiom 'Spill the Tea'

Source: https://books.google.com/ngrams/graph?content=spill+the+tea&year_start=1500&year_end=2019&corpus=en-2019&smoothing=3

"Spill the tea" is used more deliberately and with enthusiasm about the upcoming discovery, whereas "spill the beans" tends to suggest an accidental or unintentional disclosure. Both idioms underline the act of disclosing information. With regard to frequency of usage, Sketch Engine shows 18,366 hits for 'spill the beans' (see Table 1), which demonstrates its popularity among English speakers, but only 1,215 hits for its modified form (Table 2).

Table 1.

Occurrences in the Corpus for the Idiom 'Spill the Beans'
"Spill the Beans"

Number of hits	18,366
Number of hits per million tokens	0.3
Percent of whole corpus	0.00002982%
Corpus size (tokens)	61,585,997,113

Source: Sketch Engine

Table 2.

Occurrences in the Corpus for the Idiom 'Spill the Tea' (source: Sketch Engine)
"Spill the Tea"

Number of hits	1,215
Number of hits per million tokens	0.02
Percent of whole corpus	0.000001973%
Corpus size (tokens)	61,585,997,113

Source: Sketch Engine

While both 'spill the beans' and 'spill the tea' are frequently used in combination with the preposition 'on', 'spill the beans' tends to be even more frequently followed by the preposition 'about' (Fig. 3), while 'spill the tea' is followed most prominently by 'over' (Fig. 4).

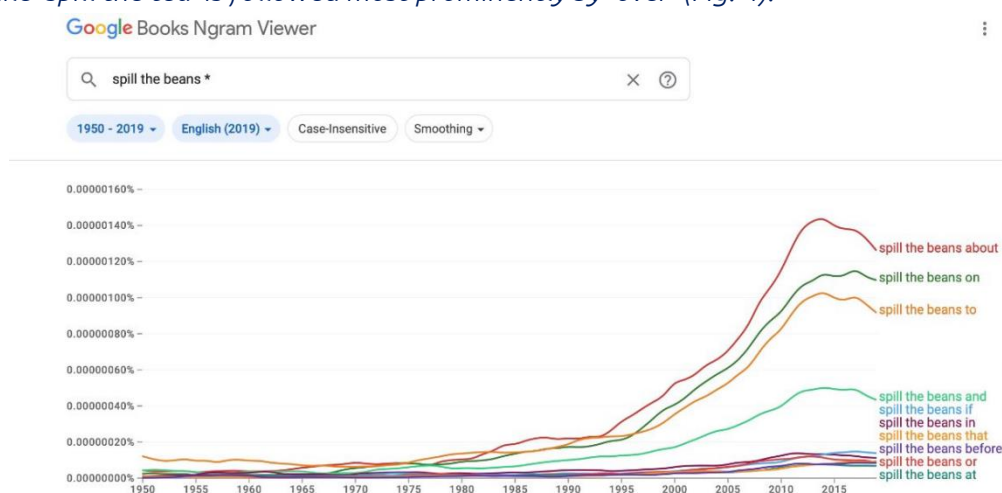


Figure 3. Analysis of the Most Common Elements After 'Spill The Beans'

Source: https://books.google.com/ngrams/graph?content=spill+the+beans+*&year_start=1950&year_end=2019&corpus=en-2019&smoothing=3

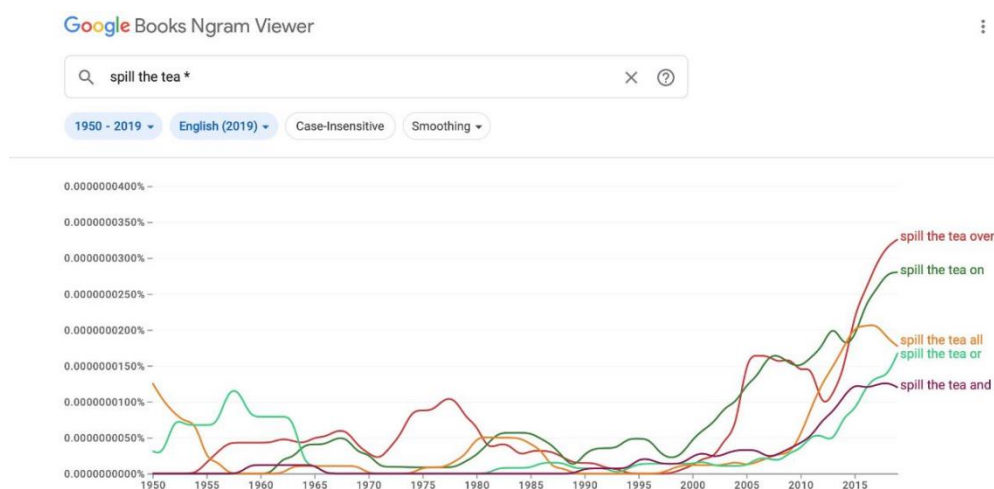


Figure 4. Analysis of the Most Common Prepositions Used in the Context of "Spill The Tea"

Source: https://books.google.com/ngrams/graph?content=spill+the+tea+*&year_start=1950&year_end=2019&corpus=en-2019&smoothing=3

The idiom 'spill the beans' is typically followed by the prepositions 'about,' 'on,' and 'to,' while the idiom 'spill the tea' often goes with 'over,' 'on,' and 'all.' The examples that support these usages according to COCA can be seen below (see Fig. 5 and Fig. 6).

ID	Year	Source	Context
1	1999	FIC BkEveningNews	party a kid from school had given him Do n't spill the beans game he already had. When he ripped off the
2	2018	MAG Ars Technica	report. These companies, too, seemed almost eager to spill the beans and explain that they made very little of the legal
3	2012	WEB ferretbrain.com	person you're interrogating about the face and demanding they spill the beans to stuff which would look like a weird
4	2008	SPOK NPR_TalkNation	about it. CONAN: I ca n't ask you to spill the beans , you know . Ms-TYLKOWSKI: Well... CONAN:
5	1997	SPOK NBC_TodaySat	, do n't worry, we wo n't ask you to spill the beans here today So . Dr. Amador, I take
6	1998	MAG SportingNews	this list, I do n't. Somebody asks ; I spill the beans exactly no one, least of
7	2018	FIC Fan Fic	that day to visit her friend Via, Auggie decided to spill the beans to her about a supposed money problem their paren
8	2003	FIC Power	dash for the phone to see who would be first to spill the beans to the admiral ; # Amid all this confusion,
9	2012	BLOG diaryofdaedalus.com	but when congress subpoenas him, he li be first to spill the beans ; This conspiracy shi is a blast. # John
10	2012	BLOG diaryofdaedalus.com	but when congress subpoenas him, he li be first to spill the beans ; # Well , this is the first nontriviality of
11	2012	BLOG truthdig.com	ensure that a captured Bin Laden is shot before he can spill the beans about who planned NINE ELEVEN, no one but the
12	2012	WEB huffingtonpost.com	prisoner, maybe they wanted to silence him before he could spill the beans on some secret deal american profiteers. remember
13	2012	BLOG blogs.ajc.com	too bad we all now know they are being expected to spill the beans ; Hopefully they realize the truth will set them free
14	1991	MAG NatlReview	hear Ivan Boesky, or at least a Boesky associate , spill the beans on Michael Milken. Yet when Judge Wood at last
15	2009	FIC Analog	and disappointed? "I am honor bound not to spill the beans . Unless you have something worthwhile to trade for
16	2012	BLOG uclearfissionary.com	is counting all kwhs as useful.) But then they spill the beans by reporting their grid capacity was about 8 percent!
17	2003	FIC AntiochRev	took it on her own miserable self to call D.V. and spill the beans ; # Right now I'm listening to the sound
18	2002	SPOK CBS_Sybil	feeling if there were all these Iraqis who cant wait to spill the beans , they would have already? No question they'd be

Figure 5. Usage of 'Spill the Beans According to Contexts

Source: <https://www.english-corpora.org/coca/>

ID	Year	Source	Context
1	2008	FIC Bk-RedWolfConspiracy	with a painful noise -- CHRRCK! -- heavily making Pazel spill the tea . The man had an appetite, too: four
2	2012	BLOG straightfromthea.com	woman. Heard it might be that Porsche Stewart chick-Michelle, spill the tea , plz and ty ! # You say that Kim
3	2013	MAG Atlantic	, frosted doughnuts, cookies. It is very easy to spill the tea when you pour or take a sip, a feature

Figure 6. Usage of 'Spill the Tea According to Contexts

Source: <https://www.english-corpora.org/coca/>

Even nowadays the youth prefer to say just "T" or "Tea" about gossiping or for latest news. The notion about 'Tea'

According to the Urban Dictionary, the slang term "Tea" comes from "the custom in the South of women who gather in the afternoon to drink tea and gossip. "T" or "Tea" is slang for gossiping about situation, story, news, or some juicy information. Instead of saying "What is the new drama today?" Of course, in my word, I would answer, I am drinking Earl Grey de la Creme". If you see a friend and it looks like something is bothering them, you can say, "Whats your tea?" This shows you are concerned about them and are interested in hearing the details. Source: (<https://uptownteashop.com/blogs/teatalk/tea-slang-funny-tea-terms>)

Conclusion

The study's conclusions address the research issues by emphasizing how common place and changing idioms are in American mainstream media. While modified idioms are more prevalent in digital communication, traditional idioms are still commonly utilized throughout all statistics. According to Khassanova (2024) The idiom 'spill the beans' is still commonly used, but its modified form, 'spill the tea' or 'tea' is becoming more and more common, especially on the internet.

These changes are primarily due to the internet and mass media, which have made idioms more relevant to contemporary communication contexts. Corpus analysis tools such as Sketch Engine and COCA have proven useful in identifying and comparing idiom usage frequencies.

As we progress in a technologically advanced society, our everyday language will also change and reflect the shifting nature of communication. To demonstrate the dynamic character of language, educators might use both traditional and modified idioms into their lesson plans. By emphasizing the impact of culture and technology, educators, philologists, linguists may show students how idioms

change over time. Through the exploration of idiom usage in several situations and media, learner can develop their research skills through the use of digital tools as Sketch Engine and COCA. This method not only enhances the educational process but also fosters media literacy, critical thinking, and a greater comprehension of modern communication.

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Conflict of interest

This research has no conflict of interests.

Availability of data and material

Data will be available on request.

Ethical issues

The professional ethics or ideology of reporters reflect the institutional and organizational context of the media. The reliability of the copyright status of resources used in this study is deemed satisfactory. Ethical principles and considerations were adhered to during the processing and analysis of COCA data.

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Physical sciences

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PHYSICS AS A TOOL FOR COMPREHENSIVE INTELLECTUAL DEVELOPMENT

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УДК 372.853

ФИЗИКА КАК ИНСТРУМЕНТ ВСЕСТОРОННЕГО ИНТЕЛЛЕКТУАЛЬНОГО РАЗВИТИЯ

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Abstract

The article examines how physics in modern education is becoming an important tool for the comprehensive intellectual development of students, which forms not only scientific thinking, but also develops creativity, critical thinking and practical skills in schoolchildren. The main directions of physical laws affecting biological, chemical and even social processes are indicated. Interdisciplinary approaches that contribute to a deeper understanding of complex systems and problems faced by humanity are analyzed.

Аннотация

В статье рассмотрены, как в современном образовании физика становится важным инструментом для всестороннего интеллектуального развития учащихся, который формирует не только научное мышление, но и развивает креативность, критическое мышление и практические навыки у школьников. Указаны основные направления физических законов, влияющих на биологические, химические и даже социальные процессы. Анализированы междисциплинарные подходы, способствующие более глубокому пониманию сложных систем и проблем, с которыми сталкивается человечество.

Keywords: skills, intelligence, systematization, individual, philosophical, method, formation, thinking, materialism, laws, hypothesis.

Ключевые слова: навыки, интеллект, систематизация, индивидуальный, философский, метод, формирование, мышление, материализм, законы, гипотеза.

Введение. Понимание значения обучения физике для интеллектуального развития учащихся появилось практически одновременно с самим обучением физике в средних школах. Физика, как наука о природе, изучающая закономерности, управляющие нашим миром, давно вышла за рамки простого учебного предмета. В современном образовании физика становится важным инструментом для всестороннего интеллектуального развития учащихся [1].

Основная часть. В этой статье мы рассмотрим, как физика формирует не только научное мышление, но и развивает креативность, критическое мышление и практические навыки [2]:

- формирование научного мировоззрения. Изучение физики способствует развитию научного мировоззрения у учащихся. Понимание физических явлений, таких как сила гравитации или закон сохранения энергии, помогает сформировать сознание, основанное на логике и рациональности. Учащиеся учатся наблюдать, формулировать гипотезы и проверять их с помощью экспериментов. Это важный этап в развитии критического мышления, нужного для решения сложных задач в различных областях знаний;

- развитие креативности. Физика не сводится только к изучению формул и законов. Она заставляет учащихся искать нестандартные решения и подходы к решению задач. Например, в проектной деятельности, где необходимо применить физические знания для создания прототипов или устройств, учащиеся развивают креативное мышление. Такие практические задания способствуют более глубокому пониманию предмета и формируют навыки, которые будут полезны в будущем [3];

- улучшение математических навыков. Физика тесно связана с математикой. Решение физических задач требует применения математических методов, что, в свою очередь, укрепляет навыки учащихся в этой области. Понимание математики как языка физики помогает углубить знания, а также развивает аналитические способности, которые необходимы в любой профессии;

- применение междисциплинарного подхода. Физика обучает учащихся видеть связи между различными науками и дисциплинами. Физические законы влияют на биологические, химические и социальные процессы. Такой междисциплинарный подход способствует более глубокому пониманию сложных систем и проблем, с которыми сталкивается человечество [4];

- развитие практических навыков. Физика предлагает множество возможностей для проведения экспериментов и исследований. Это не только развивает технические навыки, но и способствует формированию упорства и готовности к практике. Учащиеся учатся работать в команде, анализировать результаты и делать выводы, что является важным элементом их социального и профессионального развития[5].

Выводы:

Физика — это не просто учебный предмет, а ключ к всестороннему интеллектуальному развитию учащихся. Она формирует научное мировоззрение, развивает креативность, улучшает математические навыки, применяет междисциплинарный подход и развивает практические навыки. Понимание физики как важного инструмента обучения помогает подготовить новое поколение к вызовам современности, вдохновляя их на исследование и открытия в различных областях жизни. Будущее, пронизанное физическими знаниями, — это будущее, где молодежь сможет уверенно решать сложные проблемы и вносить вклад в развитие человеческого общества.

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Technical sciences

STUDY OF CHARACTERISTICS OF EXPANDER-GENERATOR PLANTS AT NATURAL GAS PRESSURE REDUCTION POINTS

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ИЗУЧЕНИЕ ХАРАКТЕРИСТИК ДЕТАНДЕР-ГЕНЕРАТОРНЫХ УСТАНОВОК НА ПУНКТАХ ПОНИЖЕНИЯ ДАВЛЕНИЯ ПРИРОДНОГО ГАЗА

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Abstract

The article discusses the need to study the characteristics of expander-generator units and the choice of the optimal method for heating gas at the inlet of the expander-generator unit, which largely determines the specific fuel consumption for electricity generation. Various parameters of the expander-generator unit used as an autonomous unit for remote gas distribution stations and gas control points are analyzed, taking into account the methods of heating the gas before expansion, such as the use of boilers and exhaust gases from gas turbine units. Calculations have shown that with insignificant heating, it is preferable to use heating in the boiler, and with an increase in the gas heating temperature, the use of flue gases from the gas turbine unit becomes more economically advantageous.

Аннотация

В статье рассматривается необходимость изучения характеристик детандер-генераторных установок и выбор оптимального способа подогрева газа на входе в детандер-генераторный агрегат, который в значительной степени определяет удельный расход топлива на выработку электроэнергии. Анализируются различные параметры детандер-генераторного агрегата, использующегося в качестве автономной установки для удаленных газораспределительных станций и газорегуляторных пунктов, с учётом методов подогрева газа перед детандированием, таких как использование котлов и выхлопных газов от газотурбинных установок. Расчеты показали, что при незначительном подогреве предпочтительнее использовать подогрев в котле, а при повышении температуры подогрева газа экономически более выгодным становится использование дымовых газов от газотурбинной установки.

Keywords: natural gas, gas expansion, gas heating, power generation, gas heating in a boiler, gas turbine plant, expander-generator unit, exhaust gases of a gas turbine plant.

Ключевые слова: природный газ, расширение газа, подогрев газа, выработка электроэнергии, подогрев газа в котле, газотурбинная установка, детандер-генераторный агрегат, выхлопные газы газотурбинной установки.

Введение. В последнее время растет интерес к детандер-генераторным агрегатам (ДГА), применяемым для производства электроэнергии. Эти устройства работают на основе перепада давления природного газа на газораспределительных станциях (ГРС) и газорегуляторных пунктах (ГРП). Эффективность их работы во многом зависит от способа подогрева газа [1-4]. В данной статье анализируются различные параметры ДГА в качестве автономных установок для удаленных ГРС и ГРП, с учётом методов подогрева газа перед детандированием, таких как использование котлов и выхлопных газов от газотурбинных установок (ГТУ).

Отдельно стоящая установка представляет собой детандер-генератор, который не имеет организационной или технологической связи с газоиспользующими предприятиями. Включение таких агрегатов не оказывает влияния на работу газоиспользующих установок, за исключением возможных изменений в расходе газа, вызванных изменением его температуры на выходе, и потребления электроэнергии для собственных нужд. Основное назначение таких установок — производство электроэнергии для нужд предприятия или её передача в внешнюю сеть.

При включении ДГА изменение расхода газа на газопотребляющее оборудование пропорционально изменению располагаемой теплоты газа, выраженной формулой

$$Q_{\text{рт}} = Q_{\text{нтс}} + h_{\text{г}} - h_0,$$

где $h_{\text{г}}, h_0$ - энтальпия газового топлива при заданных температуре и давлении, и при 0°C и давлении 0,1 МПа соответственно, а $Q_{\text{нтс}}$ - низшая теплота сгорания топлива. Изменение расхода топлива в газопотребляющем оборудовании будет учитываться с учетом работы ДГА.

Основная часть. Один из наиболее простых методов подогрева газа перед детандером — это использование специализированного котла (рис. 1).

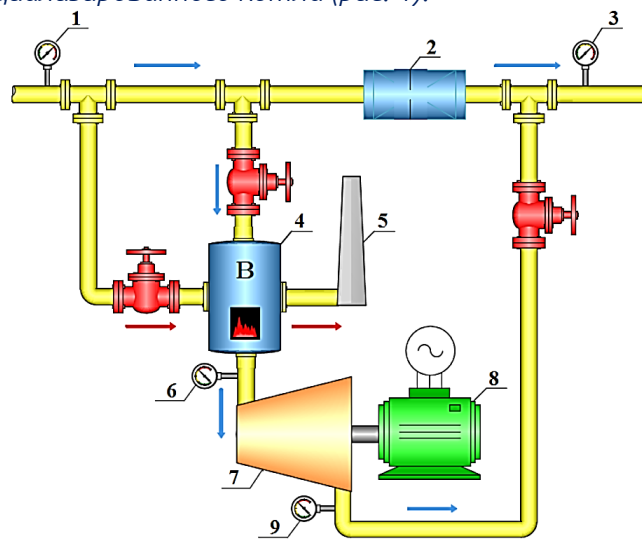


Рис. 1. ДГА с подогревом газа в котле:

1-манометр на входе в установку; 2-дроссельное устройство; 3- манометр на выходе из установки; 4-котел; 5-дымовая труба; 6-манометр на входе в детандер; 7-детандер; 8-генератор; 9-манометр на выходе из детандера

В случае если энтальпия газа на выходе из детандера h_2 такая же, как на входе в установку, $h_{\text{ВХ}}$, то мощность детандера $N_{\text{ДГА}}$ и расход топлива на подогрев газа перед детандером $VG_{\text{топ}}^{\text{пер}}$ определяются из выражений [5,6]:

$$N_{\text{ДГА}} = G_{\text{топ}} \cdot (h_1 - h_2)$$

и

$$VG_{\text{топ}}^{\text{пер}} = \frac{G_{\text{топ}} \cdot (h_1 - h_2)}{Q_{\text{нтс}} \cdot \eta_{\text{к}}},$$

а удельный расход топлива при выработке электроэнергии установкой $G_{\text{урт}}$ рассчитывается как

$$G_{\text{урт}} = \frac{1}{Q_{\text{нтс}} \cdot \eta_{\text{к}}},$$

где $\eta_{\text{к}}$ - КПД котла, который предварительно подогревает газ перед его поступлением в детандер;

$G_{\text{топ}}$ - расход топлива в трубопроводе;

h_1 и h_2 - энтальпия газа до и после детандера, соответственно.

Если $h_{\text{BX}} \neq h_2$ и изменение энтальпии газа при его поступлении в газопотребляющую установку влечет изменение его расхода (как, например, при использовании газа в качестве топлива), то формулы примут следующий вид:

а) новый расход газа на газопотребляющую установку $G_{\text{топ}}^{\text{нов}}$ (изменяется обратно пропорционально располагаемой теплоте топлива):

$$G_{\text{топ}}^{\text{нов}} = G_{\text{топ}} \cdot \frac{Q_{\text{нтс}} + h_{\text{BX}} - h_0}{Q_{\text{нтс}} + h_2 - h_0},$$

где h_{BX} – энтальпия газа на входе в установку;

б) расход топлива на подогрев газа в котле $VG_{\text{топ}}^{\text{под}}$:

$$VG_{\text{топ}}^{\text{под}} = \frac{G_{\text{топ}} \cdot (h_1 - h_{\text{BX}})}{(Q_{\text{нтс}} + h_2 - h_{\text{BX}}) \cdot \eta_{\text{к}}};$$

в) общее изменение расхода газа $VG_{\text{топ}}$:

$$VG_{\text{топ}} = VG_{\text{топ}}^{\text{под}} + G_{\text{топ}}^{\text{нов}} - G_{\text{топ}} = \frac{G_{\text{топ}} \cdot (h_1 - h_{\text{BX}})}{(Q_{\text{нтс}} + h_2 - h_{\text{BX}}) \cdot \eta_{\text{к}}} \cdot \left[1 + \frac{(h_{\text{BX}} - h_2) \cdot \eta_{\text{к}}}{(h_1 - h_{\text{BX}})} \right];$$

г) мощность ДГА:

$$N_{\text{ДГА}} = G_{\text{топ}} \cdot \frac{Q_{\text{нтс}} + h_{\text{BX}} - h_0}{Q_{\text{нтс}} + h_2 - h_0} \cdot (h_1 - h_2);$$

д) удельный расход топлива на выработку электроэнергии (все изменение расхода топлива относится на выработку электроэнергии):

$$G_{\text{урт}} = \frac{VG_{\text{топ}}}{N_{\text{ДГА}}} = \frac{1}{(Q_{\text{нтс}} + h_2 - h_0) \cdot \eta_{\text{к}}} \cdot \frac{(h_1 - h_{\text{BX}})}{(h_1 - h_2)} \cdot \left[1 + \frac{(h_{\text{BX}} - h_2) \cdot \eta_{\text{к}}}{(h_1 - h_{\text{BX}})} \right]. \quad (1)$$

Полученные результаты. Результаты расчета удельного расхода топлива для производства электроэнергии, выполненные с использованием формулы (1), представлены на графике (рис.2). Эти результаты демонстрируют зависимость удельного расхода от температуры газа перед детандером и различных входных давлений газа в детандер при фиксированных значениях ($p_2 = 1,5 \text{ кг/см}^2$ и $\eta_{\text{к}} = 0,9$).

Из графика следует, что температура газа оказывает минимальное влияние на удельный расход топлива. Существенное влияние на изменение расхода оказывает эффективность котла, используемого для подогрева газа.

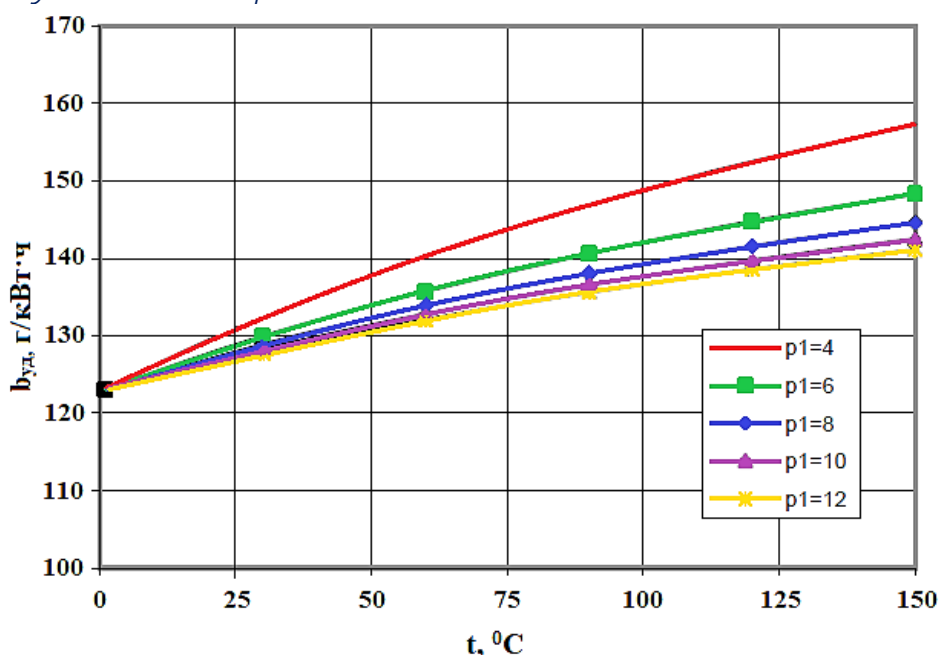


Рис.2. Удельный расход топлива на выработку электроэнергии

Если изменение энтальпии газа на входе в газопотребляющую установку не оказывает влияния на расход газа, то формулы упрощаются и принимают вид:

а) общее изменение расхода газа $VG_{\text{топ}}$ равно расходу топлива на подогрев газа в котле $VG_{\text{топ}}^{\text{под}}$:

$$VG_{\text{топ}} = VG_{\text{топ}}^{\text{под}} = \frac{G_{\text{топ}} \cdot (h_1 - h_{\text{BX}})}{(Q_{\text{HTC}} + h_{\text{BX}} - h_0) \cdot \eta_k};$$

б) мощность ДГА:

$$N_{\text{ДГА}} = G_{\text{топ}} \cdot (h_1 - h_2);$$

в) удельный расход топлива на выработку электроэнергии:

$$G_{\text{урт}} = \frac{1}{(Q_{\text{HTC}} + h_{\text{BX}} - h_0) \cdot \eta_k} \cdot \frac{(h_1 - h_{\text{BX}})}{(h_1 - h_2)} \approx \frac{1}{Q_{\text{HTC}} \cdot \eta_k} \cdot \frac{(h_1 - h_{\text{BX}})}{(h_1 - h_2)}. \quad (2)$$

Использование теплоты, которая выделяется уходящими газами газотурбинной установки, может быть одним из способов подогрева газа перед турбодетандером [7,8], (рис.3).

При оценке характеристик такой установки рассмотрим ситуацию, когда энтальпия газа на выходе из детандера равна энтальпии на входе в установку.

Для расчета мощности, необходимой газотурбинной установке, применяется следующий принцип: если энтальпии на входе и выходе из установки равны, то количество тепла, подведенное к газу, $Q_{\text{подв}}$ соответствует мощности детандер-генераторной установки $N_{\text{ДГА}}$.

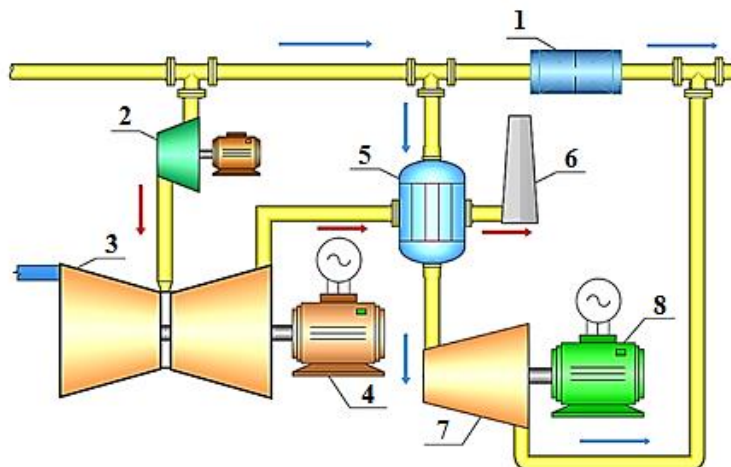


Рис.3. Подогрев газа уходящими газами ГТУ

1-дроссельное устройство; 2-компрессор; 3-газотурбинная установка;
4-электродвигатель; 5-теплообменник; 6- дымовая труба; 7-детандер; 8-генератор

Общее количество тепла, передаваемое дымовыми газами $Q_{\text{дг}}$ после их прохождения через газотурбинную установку, должно быть равно сумме мощности детандер-генераторной установки и тепла, которое теряется с газами после их прохождения через теплообменник.

$$Q_{\text{дг}} = N_{\text{ДГА}} + Q_{\text{урт}}, \quad (3)$$

где: $N_{\text{ДГА}}$ - мощность ДГА;

$Q_{\text{урт}}$ - теплота уходящих газов.

Величина $Q_{\text{урт}}$ равна:

$$Q_{\text{урт}} = Q_{\text{дг}} \cdot (1 - \eta_{\text{ту}});$$

$$\eta_{\text{ту}} = Q_{\text{подв}} / Q_{\text{дг}},$$

где: $\eta_{\text{ТУ}}$ – коэффициент полезного действия теплообменника-утилизатора, в котором подогревается газ;

$Q_{\text{подв}}$ – теплота, подводимая к газу перед детандером.

Значение $\eta_{\text{ТУ}}$ можно оценить по формуле:

$$\eta_{\text{ТУ}} = \frac{h_{\text{дг}} - h_{\text{уг}}}{h_{\text{дг}} - h_{\text{хв}}} \cong \frac{t_{\text{дг}} - t_{\text{уг}}}{t_{\text{дг}} - t_{\text{хв}}},$$

где: $h_{\text{дг}}, h_{\text{уг}}, h_{\text{хв}}$ – энтальпия дымовых газов на выходе ГТУ, уходящих газов после теплообменника-утилизатора и при температуре холодного воздуха соответственно;

$t_{\text{дг}}, t_{\text{уг}}, t_{\text{хв}}$ – температура дымовых газов на выходе ГТУ, уходящих газов после теплообменника-утилизатора и при температуре холодного воздуха соответственно;

Минимально допустимая температура уходящих газов $t_{\text{уг}}$ равна точке росы и, следовательно:

$$Q_{\text{уг}} = Q_{\text{дг}} \cdot \frac{t_{\text{уг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{хв}}}. \quad (4)$$

Подставив выражение (4) в (3), можно получить требуемое значение $Q_{\text{дг}}$ ГТУ:

$$Q_{\text{дг}} = N_{\text{ДГА}} \cdot \frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \quad (5)$$

и мощность ГТУ составит:

$$N_{\text{ГТУ}} = N_{\text{ДГА}} \cdot \frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}},$$

где $\eta_{\text{ГТУ}}$ – КПД газотурбинной установки.

Если принять $\eta_{\text{ГТУ}} \approx 0,3$; $t_{\text{дг}} \approx 500^\circ\text{C}$; $t_{\text{хв}} \approx 20^\circ\text{C}$; $t_{\text{уг}} \approx 100^\circ\text{C}$, то требуемая мощность ГТУ составит более 50% от мощности ДГА.

Удельный показатель такой установки в виде удельного расхода топлива на выработку электроэнергии $G_{\text{урт}}$ установки равен:

$$G_{\text{урт}} = \frac{G_{\text{ГТУ}}}{N_{\text{ГТУ}} + N_{\text{ДГА}}} = \frac{1}{Q_{\text{нтс}} \cdot \eta_{\text{ГТУ}}} \cdot \frac{1}{\left(1 + \frac{t_{\text{дг}} - t_{\text{уг}}}{t_{\text{дг}} - t_{\text{хв}}} \cdot \frac{1 - \eta_{\text{ГТУ}}}{\eta_{\text{ГТУ}}}\right)}.$$

Если энтальпия газа на выходе из детандера отличается от энтальпии на входе в газопотребляющую установку, рассматриваются два сценария: один с изменением расхода газа в установку после включения ДГА, а другой без такого изменения.

И тогда выражение (5) будет иметь вид:

$$Q_{\text{дг}} = G_{\text{топ}}^{\text{нов}} \cdot (h_1 - h_0) \cdot \frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}},$$

где $G_{\text{топ}}^{\text{нов}} = G_{\text{топ}} \cdot \frac{Q_{\text{нтс}} + h_{\text{вх}} - h_0}{Q_{\text{нтс}} + h_2 - h_0}$ – расход газа после включения детандера.

Мощность ГТУ составит:

$$N_{\text{ГТУ}} = G_{\text{топ}} \cdot \frac{Q_{\text{нтс}} + h_{\text{вх}} - h_0}{Q_{\text{нтс}} + h_2 - h_0} \cdot (h_1 - h_{\text{вх}}) \cdot \frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}},$$

а расход топлива на ГТУ будет равен

$$G_{\text{ГТУ}} = \frac{N_{\text{ГТУ}}}{(Q_{\text{нтс}} + h_{\text{вх}} - h_0) \cdot \eta_{\text{ГТУ}}} = G_{\text{топ}} \cdot \frac{(h_1 - h_{\text{вх}})}{Q_{\text{нтс}} + h_2 - h_0} \cdot \frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \cdot \frac{1}{1 - \eta_{\text{ГТУ}}}.$$

Общий расход топлива, включая изменения в расходе на газопотребляющее оборудование, будет равен:

$$VG_{\text{топ}} = G_{\text{топ}} \cdot \frac{(h_1 - h_{\text{BX}})}{(Q_{\text{HTC}} + h_2 - h_0)} \cdot \left(\frac{t_{\text{дГ}} - t_{\text{XB}}}{t_{\text{дГ}} - t_{\text{YГ}}} \cdot \frac{1}{1 - \eta_{\text{ГТУ}}} + \frac{h_{\text{BX}} - h_2}{h_1 - h_{\text{BX}}} \right).$$

Общая мощность газотурбинной установки и детандер-генераторной установки (ДГУ) может быть определена после выполнения некоторых простых преобразований следующим образом:

$$N_{\text{УСТ}} = G_{\text{топ}} \cdot \frac{Q_{\text{HTC}} + h_{\text{BX}} - h_0}{Q_{\text{HTC}} + h_2 - h_0} \cdot (h_1 - h_2) \cdot \left(\frac{t_{\text{дГ}} - t_{\text{XB}}}{t_{\text{дГ}} - t_{\text{YГ}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}} \cdot \frac{(h_1 - h_{\text{BX}})}{(h_1 - h_2)} + 1 \right).$$

Удельный расход топлива на выработку электроэнергии (все изменение расхода топлива относится на выработку электроэнергии):

$$G_{\text{УРГ}} = \frac{1}{(Q_{\text{HTC}} + h_{\text{BX}} - h_0)} \cdot \frac{\left(\frac{t_{\text{дГ}} - t_{\text{XB}}}{t_{\text{дГ}} - t_{\text{YГ}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}} \cdot \frac{h_{\text{BX}} - h_2}{h_1 - h_{\text{BX}}} \right)}{\left(\frac{t_{\text{дГ}} - t_{\text{XB}}}{t_{\text{дГ}} - t_{\text{YГ}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}} \cdot \frac{h_1 - h_2}{h_1 - h_{\text{BX}}} \right)}. \quad (6)$$

На графике (рис. 4) представлены результаты расчета удельного расхода топлива для выработки электроэнергии, выполненные по формуле (6). Эти результаты показывают, как изменяется удельный расход в зависимости от температуры газа перед детандером и различных давлений газа на входе в детандер для данного случая ($p_2 = 1,5 \text{ кг/см}^2$, $\eta_{\text{ГТУ}} = 0,3$).

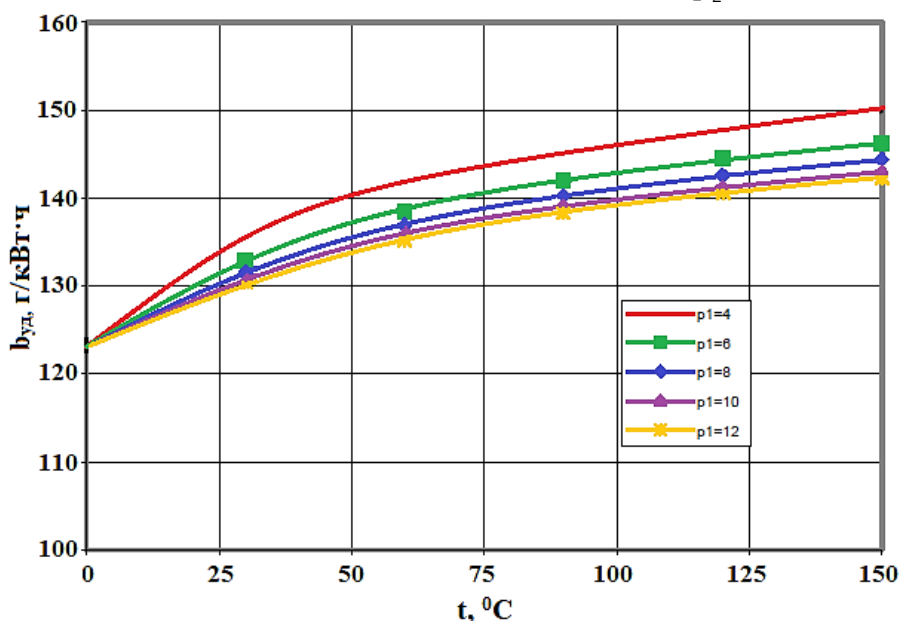


Рис.4. Изменение удельного расхода топлива при повышении температуры газа перед детандером

Из графика следует, что при повышении температуры газа удельный расход топлива изменяется незначительно, что соответствует изменению, показанному на рис. 2.

Если изменение энтальпии газа на выходе из детандера не оказывает влияния на расход газа в газопотребляющем оборудовании, то формулы принимают следующий вид:

а) расход топлива:

$$\Delta G_{\text{топ}} = G_{\text{ГТУ}} = G_{\text{топ}} \cdot \frac{(h_1 - h_{\text{BX}})}{(Q_{\text{HTC}} + h_{\text{BX}} - h_0)} \cdot \frac{t_{\text{дГ}} - t_{\text{XB}}}{t_{\text{дГ}} - t_{\text{YГ}}} \cdot \frac{1}{1 - \eta_{\text{ГТУ}}};$$

б) электрическая мощность:

$$N_{\text{уст}} = G_{\text{топ}} \cdot (h_1 - h_2) \cdot \left(\frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}} \cdot \frac{(h_1 - h_{\text{вх}})}{(h_1 - h_2)} + 1 \right);$$

в) удельный расход топлива на выработку электроэнергии:

$$G_{\text{урт}} = \frac{1}{(Q_{\text{нтс}} + h_{\text{вх}} - h_0)} \cdot \frac{\left(\frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \cdot \frac{1}{1 - \eta_{\text{ГТУ}}} \right)}{\left(\frac{t_{\text{дг}} - t_{\text{хв}}}{t_{\text{дг}} - t_{\text{уг}}} \cdot \frac{\eta_{\text{ГТУ}}}{1 - \eta_{\text{ГТУ}}} + \frac{(h_1 - h_2)}{(h_1 - h_{\text{вх}})} \right)}. \quad (7)$$

Обсуждение. Анализ эффективности различных методов подогрева газа перед детандером предполагает, что расход газа до включения ДГА остается неизменным для всех рассматриваемых вариантов.

Проведены расчеты мощности, расхода топлива и удельного расхода топлива для различных методов подогрева газа. В анализе предполагается, что изменение температуры газа на выходе из детандера не влияет на расход газа в газопотребляющую установку.

Полученные результаты расчета относительной мощности при разных вариантах подогрева показали, что наибольшую мощность обеспечивает использование дымовых газов от газотурбинной установки (ГТУ) для подогрева газа.

Анализ относительных значений расхода топлива (относительно расхода на газопотребляющую установку до включения ДГА $\Delta G_{\text{топ}} / G_{\text{топ}}$) для подогрева с использованием котла и дымовых газов ГТУ показал, что при увеличении температуры подогрева газа относительное изменение расхода топлива более выражено для варианта с ГТУ, чем для котла. Это обусловлено тем, что ГТУ обеспечивает большую мощность. Следует также отметить, что при равенстве $\eta_{\text{к}} = \eta_{\text{ты}} \cdot (1 - \eta_{\text{ГТУ}})$ расход топлива при подогреве с помощью выхлопных газов ГТУ и в котле одинаков.

Заключение. Таким образом, результаты расчетов удельного расхода топлива на выработку электроэнергии при различных давлениях газа и температурах подогрева показали, что при незначительном подогреве предпочтительнее использовать подогрев в котле. А при повышении температуры подогрева газа экономически более выгодным становится использование дымовых газов от газотурбинной установки (ГТУ).

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