POLISH JOURNAL OF SCIENCE
№84 (2025)
VOL. 1

ISSN 3353-2389

Polish journal of science:

- has been founded by a council of scientists, with the aim of helping the knowledge and scientific achievements to contribute to the world.
- articles published in the journal are placed additionally within the journal in international indexes and libraries.
- is a free access to the electronic archive of the journal, as well as to published articles.
- before publication, the articles pass through a rigorous selection and peer review, in order to preserve the scientific foundation of information.

1000 copies
POLISH JOURNAL OF SCIENCE
Wojciecha Górskiego 9, Warszawa, Poland, 00-033
email: editor@poljs.com
site: http://www.poljs.com

CONTENT

JURIDICAL SCIENCES

MEDICAL SCIENCES

PEDAGOGICAL SCIENCES

POLITICAL SCIENCES

TECHNICAL SCIENCES

JURIDICAL SCIENCES

SUSTAINABLE CITIES: HOW LEGAL GOVERNANCE SHAPES QUALITY OF LIFE

Alimov A.
3rd course student, Department of Public Administration,
Tashkent State University of Law
DOI: 10.5281/zenodo.15037209

Abstract
The article is devoted to study the interactive ways of forming the concept of sustainable development legal management. The purpose of the article is to reveal the problem of forming the sustainability of the city: how legal management shapes the quality of life. Today, modern cities must be modernized with the latest infrastructures. This provides the opportunity to easily move around the city on foot, by bicycle or by environmentally friendly public transport. The energy that powers urban systems such as the electricity grid, water systems, traffic and transit must be modernized to support the reduction of emissions and improvement of air quality. In this article, the author analyzed the goals for sustainable cities, societies and how cities around the world can implement green practices in the present and future.
Keywords: legal governance, sustainable cities, urbanization, 15-minutes city, concepts of sustainability.

Introduction. I am going to start my article with my favorite quote of Edward Glaeser “Cities are made of people, for people and by people” [1]. By quote of Edward Glaeser said, highlighting the human-centric essence of urban development. Cities, as hubs of economic activity, cultural diversity, and social interaction, reflect the collective aspirations, achievements, and struggles of their inhabitants. They evolve through human creativity, labor, and social structures.

When the pandemic caused city centers to close, it revealed the importance of social connections but in a different way than before. Before the pandemic, many people were so busy with their daily routines that they rarely visited the shops near their homes. They often didn't know their neighbors and were unaware of the parks. The pandemic forced people to stay closer to home, and this change led to the rediscovery of their local areas, improving their quality of life. Let's explore this idea further. Here is a question: why we need cities to live?

In my view, cities have played a central role in civilization and have been fundamental to the success of societies throughout history. Through economics, social and cultural activities, cities provide a multiple of benefits that are needful for modern living. From to job opportunities to culture and efficient infrastructure to social connections, cities offer a diverse array of advantages that make them indispensable to human life. One of the common reasons we need cities to live is the concentration of economic opportunities. Cities include businesses, industries, and entrepreneurs, creating a dynamic environment that fosters innovation and economic growth. The availability of work opportunities in cities call people from different regions and backgrounds, seeking employment and better livelihoods. Moreover, that place as centers of knowledge and education. They are home to universities, research institutions, libraries, and cultural centers, providing access to higher education and intellectual resources. Nowadays most of countries and the most significant universities is located in cities and capitals of the country. Students and scholars come to cities to pursue academic years, join in research, and collaborate with peers. By the way, the percentage of institutions, which is located in city centers, not only enriches citizens, but also activate innovation and gives to increase technological progress.

Methodology. Confidently we can say economic and educational opportunities, cities offer access to a wide range of services that enhance quality of life. From healthcare facilities to recreational spaces, cultural institutions to entertainment locations, cities provide residents with different options for time, wellness, and personal growth. The parks, museums, theaters, restaurants, and shopping centers create main and livable urban environments that diverse needs and interests of inhabitants. In shortly, the way of reason why we want to live in city center is because it gives us a number of opportunities. Think about it: in cities there are many people that’s why all opportunities are there.

Nearly three-fourths of the European Union's populace resides in urban locales: municipalities, towns, and suburban areas, with over 40% inhabiting cities exclusively [2]. The proportion of the urban population in Europe is predicted to escalate to 80% by 2050 [3]. Cities and communities are indispensable for citizens Europe well-being and quality of existence as they serve for economic and social advancement and innovation. They attract multitudes of opportunities for education, employment, entertainment, and culture that abound there. However, this substantial concentration of individuals and wealth frequently accompanies a range of adverse side effects, which can also misunderstand people's quality of life — pollution, traffic congestion, criminality, and housing deprivation are merely a few illustrations. Consequently, cities and communities are perceived as both the source of and solution to economic, environmental, and social challenges and, as such, they may be viewed as a sustainable future. It is for this rationale that SDG 11 calls for actions that assist in rendering cities and communities more inclusive, secure, resilient, and sustainable.

Results. The idea of an ideal city has interested urban planners, architects, philosophers, and writers for hundreds of years. An ideal city is a theoretical model that represents the perfect living conditions for its peo-

ple, combining the best parts of urban planning, architecture, social structure, and environmental balance. The vision of an ideal city often shows the values, dreams, and technological advancements of the time when it is imagined. Although it can be different across cultures and periods, certain common themes usually appear.

Of course, there are principles of an ideal city to live. They include

- Urbanization
- Sustainable development
- Quality of life
- Governance
- 15-minutes city

On the top of principles there is Urbanization, by the way there is a question "Does urbanization has a significant role in concept "The best city to live and what role is it?".

Urbanization plays a significant role in determining the best cities to live in by influencing various factors that contribute to the quality of life [4]. Bellow there are some key aspects of urbanization: economic opportunities, infrastructure and services, transportation and mobility, healthcare and education. Urbanization concentrates businesses and industries, creating job opportunities and boosting economic growth. Cities with high levels of urbanization have a mix of different industries, leading to better job prospects and higher salaries. This contributes to a better standard of living for the residents. On the other hand, urban areas typically provide better infrastructure and services, such as transportation, healthcare, and education. The availability and quality of these services are essential for the daily lives and overall well-being of the people living in the city. By the way, in urbanized areas effective transportation systems are very important. Cities at invest in public transportation and bike lanes can reduce traffic congestion, lower pollution levels, and improve mobility, making them more livable. The last is a healthcare and study. Often quality healthcare and education is generally better in urban areas. Cities often have more hospitals, clinics, schools, and universities, providing residents with better services and opportunities for personal and professional growth.

The second major part to make the best city to live is sustainability. A sustainable city idea uses environmentally-friendly practices, green spaces and supporting technologies in the city environment. The main goal is to reduce air pollution and CO2 emissions, improve air quality, and protect natural resources. These practices lead to a healthier environment for city residents and a lower carbon footprint for the city. Sustainable cities are becoming very important in trying to reverse global climate change.

Actually, there are three concepts of sustainability [5].

- environmental
- social
- economic

Environmental sustainability implies that the quality and protection of the natural environment and successful adaptation to climate change affect opportunities for long-term social and economic development. Environmental degradation, unsustainable use of non-renewable natural resources and the various impacts of climate change have a direct impact on living conditions. They also increase the risk of social friction and reduce the opportunities for economic growth and the distribution of finances.

Social sustainability implies that peace, social justice and inclusiveness are indispensable for sustained economic progress and long-term development. Social disruption caused by discrepancies in the standards of living of different segments of the population — poverty and all its effects could stop economic progress and harm the quality of the natural environment.

Economic sustainability implies that macroeconomic and financial stability, as well as the prevention of balance-of-payments crises are a basic requirement for sustained economic and social development. It also implies that human and financial resources must be used in a way that ensures continuous and lasting improvements in standards of living. In case wrongly using and making patterns, and waste of human, natural, and financial resources harm the quality of the natural environment and threaten peace.

This concept first appeared in the report "Our Common Future", prepared by the United Nations World Commission on Environment and Development in 1987. We know that sustainable development the cities will be the best city to live, but here is a question what is sustainable city and what types of criteria does it have?

An eco-friendly city idea uses nature-loving practices, green spaces and supporting technologies in the city surroundings. The main goal is to cut air pollution and CO2 releases, make air quality better, and protect natural resources. These practices lead to a healthier environment for city people and a lower carbon footprint for the city. Sustainable cities are becoming very important in trying to turn back global climate change. Cities today must upgrade their systems - for example, to make sure the city can be easily traveled by walking, cycling or using eco-friendly public transportation. And the energy that powers city setups - like the power grid, water systems, traffic and transit - can be upgraded to support lower releases and better air quality.

A sustainable city ensures good living standards and accessibility to services without any discrimination and harm to the environment. So bellow there are key points of sustainable city:

- Building green nature and walking space are key elements of a sustainable city. Resources like parks, nature preserves and relaxing areas get people out of cars. In fact, the green nature improves mental health.
- Urban farming like Food is second the most needed city resource. Urban agriculture boosts food production, decreases food insecurity, and lessens the environmental impact of food transport. Growing food locally shortens the distance from farm to consumer.
- Efficient public transport. In case, American researches found that around 80% of CO pollution in the U.S. make cars. Cities aiming for sustainability can motivate people to walk, bike, or use metro trains or buses.

- Running on renewable energy, For example: Dubai is one of self-sustainable city in renewable energy. The city is powered by clean energy produced by recycling water and has banned single-use plastic bags.
- By saving water Cities can improve water conservation and waste management because of sustainable urban planning.

In my perspective I can give example cities where I have been last 6 month. I have been in several cities of Europe especially in Brussels, Paris, Berlin, Prague, Amsterdam, Oslo and Stockholm. In my travelling time I compared the class lectures about sustainable city definition, urbanization, 15 minutes city conception. In addition, I can say Amsterdam will stand in 1st place from cities where I have been.

Fun fact that, everywhere you look in Amsterdam, people are pedaling away on their bikes. Before I read that biking is the most popular mode of transportation in this city, I see with my eyes the bikes cruising the streets! And it's no wonder why – Amsterdam has developed a network of bike lanes and parking facilities that make biking accessible and safe for everyone. But it's not just about biking in Amsterdam. The city plans its development very carefully to protect the environment. with a focus on eco-friendly practices that improve the quality of life for its residents. From sustainable building design to green spaces, Amsterdam is a city that cares about the environment. one of the standout features of Amsterdam's sustainable urban planning practices is its emphasis on sustainable building design. The city's architecture is designed to promote natural light and ventilation, reducing the need for artificial lighting and air conditioning. And the best part? This design is not just reserved for fancy buildings – even social housing is designed with sustainability in mind. Green spaces are also very important in Amsterdam. There are parks, gardens, and green roofs all over the city. These green areas make Amsterdam look beautiful. But they also provide homes for plants and animals.

But Amsterdam continuing to make the best city to live. The government has created Circular Strategy 2020–2025 and is currently on the way to implement a digital Circular Economy Monitor (CEM). The CEM monitors progress over time towards the set goals, shows which areas need improvement, and guesses how possible it is to reach the targets. Now that's good governance!

I think that in the future the most important part of the cities will be located 15 minutes away from the city. Every year urbanization and city development are rapidly growing, especially there are two concepts of 15-minute city and 20-minute city. When we say 15-20-minute city, we should imagine a place that can be easily reached in a quarter of an hour. For example: movement between residential buildings, offices, restaurants, parks, hospitals and cultural institutions. The main definition of this concept is improving the quality of life by creating cities where every citizens can reach in less time.

We believe that time plays a huge role in mobility. In this case urban planning will stand in 1st stage. Without question with great urban planning, we can reach that concept which we call 15 minutes. By new urban plan the cities should be built by geographic proximity, meaning the location of people, services, and activities near one another. The idea is that the cities should be designed or represented so within the distance of a 15 minutes, walk or bike ride, people should be able to live the essence of what constitutes the urban experience: to access walk, housing, food, health, education, culture and leisure. Urban life is vibrant and creative cities are places of economic dynamism and innovation. But we have to make urban life more pleasant, healthy and flexible. When I visited to the city hall in Poznan, I heard interesting fact about Poznan. In Poznan, before building something new, such as a bridge, the government listens to the opinions of the citizens: residents vote on whether or not to build the bridge. After hearing a resident's opinion they will build or not. I think it is a top of democracy. I know for some people it will be not a great news, but for me it's an appreciable. That's the point that should be taken into account in building a future city.

Two months ago, I was in France and I understand the first city to adopt the 15-minuts city idea is Paris. The government of France suggested a big bang of proximity, which includes a huge reconstruction and developing new services for each of districts. A reduction of traffic by increasing bike lines into spaces of leisure.

Discussion. Actually, there is a golden rule of 15 minutes city: every square meter that's already built should be used for different purpose.

Here is a new urban model for building the best city to live:

- accessibility,
- walkability,
- density,
- land use mix
- design diversity

A walkable city is a livable city. Urban planners need to ensure that pedestrians can easily move around without fear of accidents or discomfort. This includes well-maintained sidewalks, crosswalks, and pedestrian crossings. Second, accessible public transportation. A reliable and efficient public transportation system is key to reducing traffic congestion and emissions. A good public transportation system should be accessible to all. Also, Green spaces and parks are essential in urban areas. It can be stressful, but having green spaces and parks helps to provide a respite from the hustle and bustle of city life. Parks provide a place for residents to relax, exercise, and enjoy nature. We can't skip Sustainable buildings. That buildings are responsible for a significant amount of energy consumption, which is why sustainable building practices are important. Urban planners should encourage the use of green building materials, efficient lighting systems, and renewable energy sources. On the other hand, a mix of residential, commercial, and retail spaces can create a sense of community and reduce the need for long commutes. Mixed-use development encourages walkability and can reduce traffic congestion. The last this is a smart technology. The use of smart technology, such as traffic sensors and energy-efficient lighting, can improve the efficiency and sustainability of urban areas. Urban

planners should prioritize the integration of smart technology into their plans.

Conclusion. Finally, what should an ideal city be like? The first is location. We need to preserve the natural environment and the history of the city this gives reason people to visit your city because every part of this planet is different and urban planners need to show how a city was formed and make room for people enjoy after work. The city Vancouver is a great example because it has park within a 10-minute walk almost all residents it has been shown that getting in nature helps stay happier and most cities should try to show their unique way of life. Second, we need mixed-use development. But what is mixed-use development, you ask, when we build houses? Now they are built on lands where only houses can be built. And when we build commercial buildings, we do so only on land designated for commercial use. In most cases, commercial development occurs in the city center, and residential development occurs on the outskirts. This creates traffic jams and rush hours for commuters to get to work, making it difficult for everyone. This sometimes happens in European cities, except in the UK.

The next big thing is walking and it normally comes when we start to built a mixed-use community and the city should encourage walkers by making car free streets or making a reason to walk. Fourth thing is biking and you hear me repeat biking and walking a lot later example of Amsterdam. Because biking the most efficient method of transport this starts with making bike lines and everywhere so we can bike to any part of city. Not good exercise it also makes no pollution and it starts off like this. If we want a best city to live, we need to build affordable public transport. Cities might have transit but the part where it's affordable makes a whole difference. The thing is that if we make a walkable city, you can only build it so large and when it gets bigger people start to get car again. I believe, the general mission the best city to live is to make cities happier, healthier and more inclusive. At the end, the best city to live in is one that optimally combines growth and sustainability. It must deliver the economic and social benefits of urban living without compromising the environment and future generations. Cities such as Copenhagen, Singapore and Barcelona demonstrate that good planning and innovation are the key to this balance. After all, the best city is one in which people, infrastructure and nature live together in harmony. I want to finish my article with quote of the best city to live: Less time for commuting, more time for enjoying life.

References

1. Glaeser E. (2011). Triumph of the city. Penguin press. 368 p.

2. Justyna M. Chodkowska-Miszczuk, Agata Lewandowska (2023), Cities facing the European green deal: Urban policy and locals' perspective in the post-socialist area. Environmental Science & Policy. Vol.159. DOI: 10.1016/j.envsci.2024.103823

3. Cysek-Pawlak M. and et al. (2023). Spatial planning needs towards Copernicus Land Monitoring Services: Case studies from Poland and Norway. European Spatial Research and Policy. 2023. P. 235-255.

4. Tsuyoshi Takano et al. (2023). Evaluating the quality of life for sustainable urban development. Cities. Vol. 142. DOI: 10.1016/j.cities.2023.104561

5. Fischer, M. et al. (2023). The Concept of Sustainable Development. In: Sustainable Business. SpringerBriefs in Business. Springer, Cham. DOI:10.1007/978-3-031-25397-3_2

MEDICAL SCIENCES

EFFICIENCY AND AESTHETIC CHARACTERISTICS OF CERAMIC VENEERS

Avdiushkina Iu.
specialist degree, Russian Medical Academy of Continuous Professional Education
DOI: 10.5281/zenodo.15037213

Abstract

This article reviews the efficacy and aesthetic properties of ceramic veneers. Various types of ceramic materials, including lithium disilicate, zirconia, feldspathic, and glass ceramics, are analyzed with a focus on their mechanical and aesthetic properties. Special attention is given to the durability of ceramic veneers, complication rates, and patient satisfaction based on clinical studies. The limitations of ceramic veneers, particularly related to material fragility, the complexity of enamel preparation procedures, and their impact on tooth functionality, are also discussed. The combination of strength and aesthetic properties in lithium disilicate ceramics has shown advantages over zirconia ceramics, though further data on long-term efficacy are required. Feldspathic and glass ceramics exhibit some limitations, particularly regarding technical complications. The article concludes that additional research is needed to optimize material selection and treatment protocols.

Keywords: ceramic veneers, lithium disilicate ceramics, aesthetic dentistry, durability of restorations, adhesive fixation, aesthetic properties.

Introduction

Aesthetic dentistry plays a crucial role in modern medical practice, facilitating both the restoration of dental functions and the enhancement of dental appearance. The placement of dental veneers is one such method of aesthetic correction, allowing for the restoration of tooth shape, color, and alignment with minimal invasive procedures [1]. The global market for dental veneers in 2023 was valued at USD 2,36 billion, and it is projected to reach USD 3,88 billion by 2031, growing at a compound annual growth rate (CAGR) of 7,4% from 2024 to 2031 [2]. The growing demand for aesthetic dental procedures has contributed to the rapid expansion of this market. Advances in material science have significantly enhanced the durability and aesthetic properties of veneers, making them a popular choice among patients seeking to improve their dental aesthetics.

Modern ceramic veneers (CV) are typically fabricated from lithium disilicate (LDC), zirconia ceramics (ZC), glass ceramics, or feldspathic materials [3]. The installation of CV involves minimal enamel preparation, which helps preserve a significant volume of natural tooth structure. In the context of CV application, the main concerns are durability, aesthetics, and the effect on tooth functionality. Durability depends on the mechanical strength, wear resistance, and adhesive bonding quality. Aesthetic properties encompass color stability, compatibility with the natural shade of teeth, and patient satisfaction. The functional impact of veneers is assessed by their ability to maintain chewing efficiency, minimize the risk of pathological processes, and improve the overall dental appearance of the patient.

The aim of this study is to analyze the efficiency and aesthetic properties CV based on available literature. This review will assess modern approaches to the use of CV and systematize data on the durability of various ceramic materials. This article will help identify both the advantages and limitations of this restorative technique.

Main part

When selecting a ceramic material for dental applications, it is essential to consider its properties, as well as the intended use area [4]. Different ceramic materials exhibit specific characteristics that influence their suitability for particular clinical indications (Table 1).

Table 1.

Comparison of the main materials for veneers

Type ceramics	Strength on bending (MPa)	Aesthetic characteristics	Main region applications
Lithium disilicate	350–400	High color stability	Restorations in high load zones
Zirconium	up to 1000	Moderate, lower transparency	Restorations requiring high wear resistance
Feldspathic	approximately 120	High visual appeal	Restorations for anterior teeth
Glass ceramics	160–220	High transparency, color stability	Aesthetic restorations, particularly for anterior teeth

The aesthetic properties of veneer restorations are evaluated using both subjective and objective methods [5]. Subjective methods often involve questionnaires and surveys to gauge patient satisfaction with the restoration's appearance. These studies provide insight into how well the restoration meets patient expectations. Objective methods include spectrophotometric measurements to accurately assess color stability and the alignment of veneer shades with natural tooth colors. Digital technologies such as photographic and scanning

systems enhance the precision of aesthetic assessments and enable documentation of treatment outcomes. Visual analog scales (VAS) are also commonly employed to standardize aesthetic evaluations and facilitate comparison across studies.

Recent studies affirm the high aesthetic and durability outcomes of CV. In 2024, a patient satisfaction survey conducted at the Lema Clinic Dental Clinic (Turkey) revealed that over 90% of patients reported a significant improvement in the aesthetics of their smile post-veneer application, citing improvements in color, shape, and alignment of their teeth. Additionally, patients noted increased self-confidence due to the enhanced appearance of their teeth, with high satisfaction also reported for the durability and comfort of the veneers, which were praised for their natural feel and resistance to discoloration with proper care.

In a study by Yılmaz Umut Aslan, PhD, et al., the long-term clinical efficacy and survival of pressed lithium disilicate (LD) glass-ceramic veneers were assessed through retrospective analysis spanning 5, 10, 15, and 20 years [7]. The study covered 413 veneers placed in the anterior and posterior regions of 51 patients. The average follow-up period was 11,33 ± 4,85 years. The results indicated high veneer survival rates: 98% after 5 years, 95% after 10 years, 91% after 15 years, and 87% after 20 years (Fig. 1).

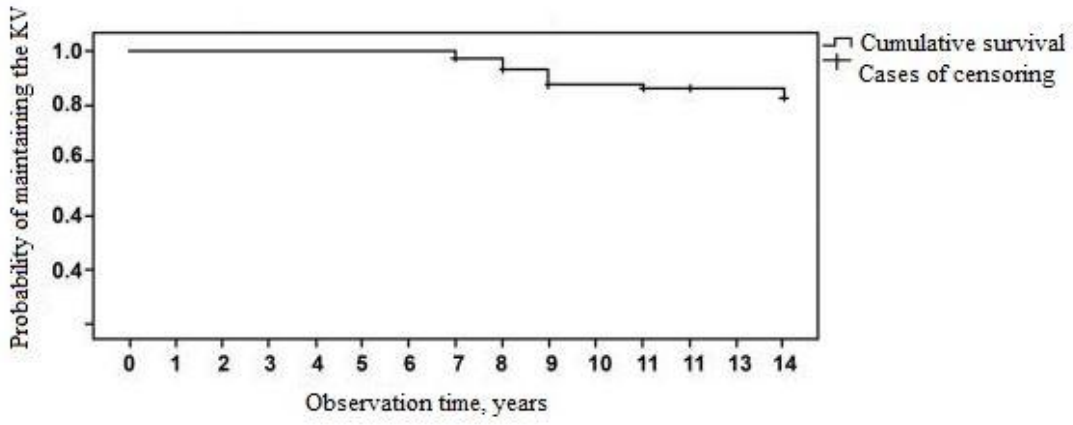


Figure 1. Durability of LD CV[7]

The primary complications observed included chipping (1,45%) and detachment (2,18%), while no cases of secondary caries were reported. Esthetic parameters such as color matching and anatomical shape were rated highly, achieving a score of 0 according to the United States Public Health Service (USPHS). Patient satisfaction was 97% for functional outcomes and 98% for aesthetic outcomes. The study highlights the reliability and long-term effectiveness of LD veneers in restoring dental aesthetics.

In a systematic review by Patrick Klein et al., a study was conducted to evaluate the durability and complication rates of veneers made from various materials, including feldspathic, leucite-reinforced glass ceramics (LRGC), LDC, and ceramics, with follow-up periods categorized as short-term (1-3 years), medium-term (4-6 years), and long-term (≥7 years) [8]. A total of 29 clinical studies were analyzed, encompassing 7753 veneers in 986 patients with follow-up periods ranging from 1 to 20 years. The short-term survival rate was 97,76% (95% confidence interval (CI): 96,42%-99,01%), medium-term survival rate was 97,12% (95% CI: 95,22%-98,79%), and long-term survival rate was 96.05% (95% CI: 93,87%-97,46%). Among the materials, LDC exhibited the lowest complication rates: technical complications 6,1% (95% CI: 0,60%-16,60%), aesthetic complications 1,9% (95% CI: 0,45%-11,72%), and biological complications 0,45% (95% CI: 0,12%-1,16%) at a mean follow-up of 10,4 years. Feldspathic and SCL materials demonstrated slightly higher complication rates: technical complications were 41,48% and 29,87%, respectively, while biological complications were 6,51% and 4,4%. Ceramic crowns showed 100% survival with no complications in the short term; however, long-term data are still lacking. The primary conclusion of the study is that CK is a reliable and minimally invasive dental restoration method, and LDC is recommended as the material with the lowest risk of complications for long-term use. Further studies are necessary to evaluate the long-term efficacy of ceramic crowns veneers.

Limitations of the use of KV

Despite the advantages, CV have several limitations that should be considered when planning restorative treatments. Ceramic materials are brittle, making them susceptible to mechanical damage under localized overloads, such as strong chewing pressure, sudden temperature changes, or impacts from hard objects (instruments, adjacent teeth, or dentures) [9]. The effectiveness and durability of CV largely depend on the area of application and how well the selected material meets functional and aesthetic requirements. Feldspathic or glass ceramics are preferable for the restoration of anterior teeth; however, their use is limited by lower bending strength. For molars and premolars, which are subject to greater chewing forces, LDC or ceramic crowns are the optimal choices. However, ceramic crowns are less aesthetically appealing due to its reduced transparency, limiting its use in the smile zone.

The installation of CV requires precise and minimally invasive enamel preparation. Any deviation from established protocols, including excessive removal of hard dental tissue or inadequate surface treatment, can

result in reduced adhesion, excessive damage to dental tissue, and less conservative treatment outcomes.

Discussion

The use of CV for restoring both aesthetic and functional characteristics of teeth is a reliable and effective method. Analysis of the available data suggests that the material selection for the fabrication of veneers directly influences their durability and clinical effectiveness. Among the materials, LDC demonstrates the most balanced combination of preservation, mechanical strength, and aesthetic appeal, making it the preferred material for restorations in both the anterior and posterior regions of the dentition. Retrospective analyses of cases using LDC indicate a high level of veneer preservation over extended periods (up to 20 years), supported by the material's stability and a low incidence of complications such as chipping and detachment. Additionally, the absence of secondary caries in the studied patient cohort underscores the high quality of adhesive fixation and the biocompatibility of this material.

A systematic review of literature data confirms that all types of ceramic materials show high short-term and medium-term survival rates. However, LDC consistently demonstrates the lowest incidence of technical, aesthetic, and biological complications, emphasizing its significant potential for long-term clinical use. Conversely, the higher incidence of complications with feldspathic and SCL veneers indicates their limited applicability, primarily in the restoration of anterior teeth where the mechanical load is minimal.

The limitations of ceramic crowns are mainly related to their moderate aesthetic appeal and the lack of long-term data regarding their clinical efficacy. However, short-term studies indicate that ceramic crowns perform well without complications, suggesting high potential when strict protocols for fixation and material selection are adhered to. These findings underscore the necessity for further research to assess the long-term efficacy of ceramic crowns.

Conclusions

The use of CV represents a reliable and minimally invasive method for restoring both the aesthetics and functionality of teeth. The analysis of available literature confirms the high durability and aesthetic appeal of materials such as LDC, which offer an optimal combination of strength, biocompatibility, and color stability. However, the limitations related to material fragility and the technical complexity of installation procedures highlight the need for strict adherence to treatment protocols. Long-term clinical data are necessary to confirm the clinical effectiveness of ceramic crowns. Further research is required to optimize material selection and establish standardized protocols for the use of CV in various clinical scenarios.

References

1. Durán Ojeda G, Bresser RA, Wendler M, Gresnigt MMM. Ceramic partial laminate veneers in anterior teeth: A literature review. J Prosthodont Res. 2024;68(2):246-254.

2. Dental Veneers Market Size by Product, by Application, by Geography, Competitive Landscape, and Forecasts. Text: electronic. URL: https://www.marketresearchintellect.com/ru/product/global-dental-veneers-market-size-forecast/ (date of access: 27.11.2024).

3. Araujo E, Perdigão J. Anterior Veneer Restorations - An Evidence-based Minimal-Intervention Perspective. J Adhes Dent. 2021;23(2):91-110.

4. Villalobos-Tinoco J, Jurado CA, Sanchez-Hernandez RA, Elgreatly A, Alshabib A, Tsujimoto A. Injectable Flowable Resin-based Composite Veneers Prior to Ceramic Veneers. Opera Dent. 2023;48(4):351-357.

5. Kelleher M. Myths and falls about ceramic veneers. Br Dent J 2024;236(5):359.

6. Dental Veneers Satisfaction Survey. Text: electronic. URL: https://lemaclinic.com/ru/ (date of access: 27.11.2024).

7. Aslan YU, Uludamar A, Özkan Y. Clinical performance of pressable glass-ceramic veneers after 5, 10, 15, and 20 years: A retrospective case series study. J Esthet Restor Dent. 2019;31(5):415-422.

8. Klein P, Spitznagel FA, Zembic A, Prott LS, Pieralli S, Bongaerts B, Metzendorf MI, Langner R, Gierthmuehlen PC. Survival and Complication Rates of Feldspathic, Leucite-Reinforced, Lithium Disilicate and Zirconia Ceramic Laminate Veneers: A Systematic Review and Meta-Analysis. J Esthet Restor Dent. 2024.

9. Alghazzawi TF. Clinical Survival Rate and Laboratory Failure of Dental Veneers: A Narrative Literature Review. J Function Biomater. 2024;15(5):131.

ДВУСТОРОННЕЕ ТОРАКОАБДОМИНАЛЬНОЕ РАНЕНИЕ

Бурмистров М.В.
Доктор медицинских наук, профессор
Заместитель главного врача
Республиканская клиническая больница
Министерства здравоохранения Республики
Татарстан, Казань

BILATERAL THORACOABDOMINAL INJURY

Burmistrov M.
Doctor of Medical Sciences, Professor
Deputy Chief Physician Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan, Kazan
DOI: 10.5281/zenodo.15037219

Аннотация
Несмотря на развитие хирургии, активном внедрении эндоскопических вмешательств, лучевых методов диагностики проблема выбора оптимальной тактики лечения пациентов с торакоабдоминальными ранениями является актуальной и на сегодняшний день. Нет общепризнанной тактики, существует ситуативный алгоритм действий при наличии того или иного признака. В данной статье представлен клинический случай пациента с множественным торакоабдоминальным ранением с оказанием медицинской помощи на различных этапах, начиная с районной больницы, заканчивая республиканской клиникой.

Abstract
Despite the development of surgery, the active introduction of endoscopic interventions, radiation diagnostic methods, the problem of choosing the optimal tactics for treating patients with thoracoabdominal wounds is still relevant today. This article presents a clinical case of a patient with multiple thoracoabdominal injury with medical care at various stages, from the district hospital to the republican clinic.

Ключевые слова: торакоабдоминальное ранение, травма грудной клетки, повреждение диафрагмы, видеоторакоскопия, эмпиема плевры.

Keywords: thoracoabdominal injury, chest trauma, diaphragmatic rupture, videothoracoscopy, empyema pleurae.

Ведение

Торакоабдоминальные ранения представляют собой особую группу сочетанных ранений органов грудной клетки (ОГК) и брюшной полости с единым раневым каналом со сквозным повреждением диафрагмы и относятся к наиболее тяжелым повреждениям груди и живота с летальностью, достигающей 13–20%. Частота повреждения диафрагмы в мирное время составляет 10–50% от числа пострадавших с проникающими ранениями ОГК. Сложность диагностики и выбора наиболее оптимального алгоритма лечения обусловлена возникновением повреждений в разных анатомических областях (плевральной полости, средостения, брюшной полости, забрюшинного пространства), что часто сопровождается множественными ранениями полых и паренхиматозных органов, жизнеугрожающим кровотечением, недостаточной информативностью имеющихся способов диагностики [1].

Современный диагностический алгоритм пациентов с травмой ОГК, в зависимости от состояния пациента, предусматривает применение ультразвукового исследования плевральной полости, органов брюшной полости и забрюшинного пространства, лучевых методов исследования (обзорная рентгенография органов грудной клетки в стандартных проекциях, спиральная компьютерная томография с внутривенным контрастированием); электрокардиографии и ЭХО-КС; диагностической видеолапароскопии и видеоторакоскопии. Выбор проводимого обследования зависит от состояния пациента, наличия и объема кровотечения, характера и тяжести повреждения, от времени получения ранения [3]. Обследование должно проводиться оперативно и максимально в достаточном объеме, для принятия правильной хирургической тактики. Ошибки и отсутствие оперативности в диагностике могут привести к таким осложнениям, как дислокация органов брюшной полости органов в грудную полость с летальностью 4,4–48,1%, геморрагическому шоку, перитониту. Частота не диагностированных повреждений диафрагмы составляет 15-20% случаев у пациентов с колото-резаными ранениями нижней части торакоабдоминального отдела [4].

Актуальной проблемой, наряду с проведением интенсивной терапии, является выбор оптимального алгоритма хирургической коррекции полученных повреждений. В подавляющем большинстве случаев, первым этапом выполняется дренирование плевральной полости с последующей оценкой отделяемого по дренажам. При подозрении на ранение ОГК и средостения, сердца и крупных сосудов, что сопровождается массивным внутриплевральным кровотечением, выполняется экстренная торакотомия. Одной из возможных, но не абсолютной, аль-

тернативой торакотомии является видеторакоскопия (ВТС). В большинстве случаев применение ВТС можно расценивать как диагностический этап, что позволяет, при отсутствии серьезных повреждений в плевральной полости, предотвратить торакотомию. Чаще всего, при торакоабдоминальных ранениях, на абдоминальном этапе используется лапаротомия. Основными показаниями для ее проведения являются: наличие признаков повреждения полого или паренхиматозного органов, массивное внутрибрюшное кровотечение, явления травматического шока. В случае стабильной гемодинамики, отсутствия данных о серьезных повреждениях органов брюшной полости, но при подозрении на абдоминальную патологию возможно выполнение видеолапароскопии [3]. При сквозном повреждении диафрагмы выполняется трансдиафрагмальная ВТС с ревизией ОГК или трансдиафрагмальная видеолапароскопия. Как видно из всего вышеперечисленного, на сегодняшний день нет общепризнанной тактики при торакоабдоминальной травме, существует скорее ситуативный алгоритм действий при наличии того или иного признака повреждения органов брюшной и грудной полостей.

Клиническое наблюдение

Мужчина, 27 лет доставлен в тяжелом состоянии с жалобами на боли в области послеоперационных ран ОГК, брюшной полости, выраженную слабость. В области грудной клетки с обеих сторон, в брюшной полости имеются дренажные трубки, по которым эвакуируется скудное серозно-геморрагическое отделяемое. Два дня назад, после множественных ножевых ранений грудной клетки и брюшной полости, доставлен в хирургическое отделение ЦРБ с диагнозом: множественные колото-резанные торакоабдоминальные ранения грудной клетки передней и задней поверхности, резаные раны правой кисти, правого плеча, геморрагический шок 3 степени. Поле проведения рентгенографии ОГК, УЗИ плевральной полости, КТ ОГК, ОБП – выявлен двусторонний гемопневмоторакс, гемоперитонеум. Выполнена операция: двусторонняя торакотомия. При ревизии ОГК выявлено: в правой плевральной полости - ранение верхней доли правого легкого, в левой - ранение перикарда, нижней доли левого легкого. Выполнено ушивание раны перикарда, ран обоих легких. Вторым этапом выполнена лапаротомия, выполнено ушивание ран печени, желудка. На этом этапе допущена диагностическая интраоперационная ошибка. Вследствие несоблюдения алгоритма хирургического осмотра не выявлены дефекты диафрагмы с обеих сторон, ранение левой доли печени. На вторые сутки послеоперационного периода по дренажам левой плевральной полости появилось мутное отделяемое коричневого цвета до 1500 мл, что явилось основанием заподозрить повреждение пищевода. Введенный перорально раствор бриллиантового зеленого выделился по дренажам из плевральной полости слева. Также повязки в области правого подреберья скудно пропитались желчным отделяемым. Выполнена рентгеноскопия пищевода с водорастворимым контрастом, КТ ОГК, по данным которых убедительных данных за повреждение пищевода не выявлено, но диагностировано поступление контраста в левую плевральную полость. Выполнена ФГДС, на которой патологи не выявлено. Состояние пациента оценивалось, как стабильное, тяжелое. Было принято решение о переводе пациента в торакальное отделение ГАУЗ «РКБ» МЗ РТ.

Поступил в тяжелом состоянии с жалобами на боли в области послеоперационных ран грудной клетки, брюшной полости, в области установленных дренажей, выраженную слабость. Из-за тяжести состояния был госпитализирован в ОРИТ. Общий анализ крови: эритроциты – $3{,}54*10^9$/л, гемоглобин 108 г/л, лейкоциты $8{,}1*10^9$/л. Выполнена КТ головного мозга, ОГК, ОБП с пероральным и внутривенным контрастированием - по ходу пищевода затека контраста и пузырьков воздуха не выявлено. Дно желудка плотно прилежит к куполу диафрагмы слева, стенка утолщена. Мелкие пузырьки воздуха между желудком и левым куполом диафрагмы. По задней поверхности дна желудка определяется затек контраста в плевральную полость. Гиподенсная жидкость в плевральной полости слева толщиной слоя 28 мм в задне-нижнихи в задне-верхних отделах неоднородной плотности геморрагического характера с пузырьками воздуха по периферии. Жидкость в малом тазу толщиной слоя 34 мм. Кости таза без травматических изменений. Контуры мочевого пузыря ровные, четкие. Тазовая клетчатка структурная, лимфатические узлы не увеличены.

Заключение компьютерной томографии: КТ признаки затека контраста на уровне дна желудка в левую плевральную полость. Ателектаз нижней доли слева. Гемоторакс слева. Субплевральная тяжистая инфильтрация правого легкого. Жидкость в малом тазу. Гиподенсные линейные участки пониженного накопления контраста на уровне задней поверхности селезенки.

Был выставлен диагноз: Несостоятельность швов ушитой раны желудка. Ранение диафрагмы с формированием желудочно-плеврального сообщения.

Учитывая признаки затека контраста из желудка в левую плевральную полость, принято решение о необходимости повторного хирургического лечения в экстренном порядке. Выполнена релапаротомия. В брюшной полости обнаружена желчь в объеме до 500 мл. Обнаружено колото-резанное ранение диафрагмы справа над левой долей печени до 3,5 см, которое ушито узловыми швами. На диафрагме слева обнаружены две колото-резанные инфицированные раны, размером 3,0*0,6 см и 2.5*0,4 см с подтеканием через них желудочного содержимого и остатков пищи с фибрином из плевральной полости в брюшную полость. В области дна желудка имеется раневой дефект, диаметром до 2,0 см. Через дефект желудка, левую половину диафрагмы контрастное вещество поступало в левую плевральную полость, что было ранее выявлено по данным КТ ОГК (рис. 1).

Рис. 1. Компьютерная томограмма в сагитальной проекции с затеком контраста в плевральную полость через дефект желудка и диафрагмы

Обнаружено колото-резанное ранение левой доли печени с желчеистечением. В левом поддиафрагмальном пространстве имеется абсцесс с фибрином, кровью и желудочным содержимым. В области верхнего полюса селезенки имелось ранение с образованием гематомы. Выполнена операция в объеме: атипичная резекция желудка, ушивание ран диафрагмы, ушивание дефекта печени, спленэктомия, дренирование брюшной полости, редренирование левой плевральной полости. Выполнена трансдиафрагмальная ВТС слева, санация, дренирование плевральной полости. Проводилась интенсивное комплексное лечение в ОРИТ. На вторые сутки переведен в отделение. В раннем послеоперационном периоде отмечалась положительная динамика, легкие расправлены.

На 5-6 сутки было отмечено нарастание лейкоцитоза (до 15-17 $*10^9$/л), СРБ (до 200-250 г/л). По дренажам брюшной, плевральной полости – скудное серозное отделяемое. Выполнена КТ ОБП, ОГК, на которой выявлено снижение воздушности паренхимы нижних долей обоих легких, ателектаз нижней доли левого легкого; скопление свободной жидкости в правой плевральной полости толщиной 35 мм, скопление негомогенной жидкости в медиабазальных отделах левой плевральной полости толщиной слоя 58мм с распространением по междолевой борозде и наличием воздуха на уровне дренажа. Заключение: Инфильтрация задних отделов нижних долей. Ателектаз левой нижней доли. Учитывая данные КТ, лабораторных методов исследования выставлен диагноз: левосторонняя эмпиема плевры. Принято решение выполнить ВТС слева. При ревизии плевральной полости слева обнаружено осумкование с гнойно-фибринозной жидкостью в объеме около 350 мл в наружном синусе и парамедиастинально над диафрагмой. Субтотально в плевральной полости имеется скопление сгустков фибрина. Нижняя доля покрыта швартой толщиной около 2-2,5 мм. Верхняя доля фиксирована к средостению и грудной стенке. Выполнена операция декортикация нижней доли легкого, санация и дренирование плевральной полости двумя дренажами.

Проводилась интенсивная терапия, антибиотикотерапия. Послеоперационный период протекал без осложнений. Операционные раны зажили первичным натяжением. Дренажи из плевральной полости удалены на 4 и 6 сутки послеоперационного периода. Контрольная рентгенография ОГК: легочные поля воздушны, костодиафрагмальные синусы свободны, признаков свободного воздуха и жидкости в плевральной полости нет (рис. 2). Рентгеноскопия пищевода и желудка с водорастворимым контрастированием – признаков затека контраста в средостение, брюшную полость нет. Был выписан в удовлетворительном состоянии, с жалобами на периодические боли в области послеоперационных ран. Время нахождения в стационаре – 20 дней.

Рис. 2. Рентгенограмма органов грудной клетки на момент выписки

Заключение

Вопросы хирургической тактики при торакоабдоминальных ранениях, определения оптимальных хирургических доступов и очередность их выполнения на данный момент окончательно не решены. Хирургическое лечение таким пациентам предпочтительнее оказывать в многопрофильном учреждении с участием мультидисциплинарных бригад в составе врачей торакальных, абдоминальных хирургов, реаниматологов, рентгенологов. Адекватная оценка тяжести травмы, состояния раненого позволяет правильно составить алгоритм оказания хирургической помощи, с возможным применением стратегии Damage control у пациентов с крайне тяжелыми повреждениями с целью временного гемостаза и устранения бактериальной контаминации полостей.

Устранение повреждений внутренних органов, по нашему мнению, должно начинается со стороны грудной клетки, особенно слева, при признаках повреждения сердца и крупных сосудов, что может привести летальному исходу за короткий промежуток времени. При плевральном доступе устраняются жизнеугрожающие последствия ранения, в случае необходимости, возможно наложение зажима на аорту с целью достижения временного поддиафрагмального гемостаза, что дает маневр временем для доступа к устранению внутрибрюшных последствий ранения. Дренирование плевральных полостей при ранениях грудной клетки чаще всего остается окончательным методом хирургического лечения.

Выявленные признаки повреждения органов живота в абсолютном большинстве нуждаются в активном хирургическом вмешательстве с целью их исключения или подтверждения и устранения. Использование эндовидеотехнологий при лечении торакоабдоминальных ранений является выбором оперативного лечения в специализированных торакальных отделениях. Алгоритм диагностики должен быть универсальным с учетом состояния пациента и возможности клиники, а выбор хирургического алгоритма лечения – индивидуален, с учетом тяжести повреждения органов грудной клетки и брюшной полости, состояния пациента, интенсивности и тяжести кровопотери.

Список литературы

1. Хаджибаев А.М., Шукуров Б.И., Алтыев Б.К., Кучкаров О.О. Хирургия торакоабдоминальных ранений: 15-летний опыт одной клиники. // Вестник экстренной медицины. – 2019. -№4. – С.9-16.

2. *Котив Б.Н., Самохвалов И.М., Маркевич В.Ю. и соавт. Колото-резаные торакоабдоминальные ранения: современная хирургическая тактика.*// Вестник хирургии, 2019. - №1. – С. 34–38.

3. Амарантов Д.Г., Заривчацкий М.Ф., Холодарь А.А. и соавт. *Современные подходы к оперативному лечению торакоабдоминальных ранений.*// Вестник хирургии, 2018. - №2. – С. 100-104.

4. BagheriR., Tavassoli A., Sadrizadeh A. Et al. The Role of thoracoscopy for the diagnosis of hidden diaphragmatic. Injuries in penetrating thoracoabdominal trauma // Interactive CardioVascular and Thoracic Surgery.–2009. –Vol. 9 - P. 195–198.

PEDAGOGICAL SCIENCES

A SYSTEM OF VISUALIZATION AIMED AT ENSURING THE UNITY OF PUPILS' ANALYTICAL AND HEURISTIC ACTIVITIES

Ibrahimov F.
Doctor of Pedagogical Sciences, Professor
Shaki Branch of Azerbaijan State Pedagogical University,
Azerbaijan
Abdullayeva G.
PhD in Philology, Associate Professor,
Shaki Branch of Azerbaijan State Pedagogical University,
Azerbaijan
Karimova S.
Senior Lecturer,
Shaki Branch of Azerbaijan State Pedagogical University
Azerbaijan
DOI: 10.5281/zenodo.15037223

Abstract

The article refers to the "dialectical approach of system analysis" and considers the process of "regulating pupils' analytical and heuristic activities" as a subsystem of the "implementation of pupil-centered education" system. It is deemed appropriate to accept the unity of visualization and speech as one of its educational resources.

In this work, the unity of visualization and speech as a type of resource is kept in focus as a structural element of the subsystem "Regulating Pupils' Analytical and Heuristic Activities." It is logically considered consistent with the emergent nature of the system, as each part is a subsystem in itself and cannot carry functions that contradict the nature of the system it is part of.

The article presents the necessary parameters for determining the forms of unity (integration) of visualization and speech.

Keywords: whole, part, system, emergent property, educational resource, analytical and heuristic activity, action, communication, belonging, opportunity, interest.

Relevance of the Research Topic

Currently, in response to the challenges of the Fourth Industrial Revolution, the "identification of theoretical and technological foundations for the implementation of pupil-centered education" has emerged as a relevant issue. Among the cognitive problems that condition the solution to this issue, the problem of "determining the ways to regulate pupils' analytical and heuristic activities" holds a special place.

In order for the research object to be viewed as a system, the necessary requirements are met by the "process of implementing pupil-centered education," which is a system that includes the "process of regulating pupils' analytical and heuristic activities" as a subsystem.

The term "educational resources" is a structural element of this subsystem, and it has various types, one of which is the "unity of visualization and speech as a resource type." The selection of this resource type as a structural element of the "regulation of pupils' analytical and heuristic activities" subsystem, consistent with its emergent nature, and the adjustment of its necessary parameters for its dialectical unity with other structural elements in this system, plays a special role in solving the cognitive problem of "determining the ways to regulate pupils' analytical and heuristic activities."

Nevertheless, we argue for the relevance of the research on the topic of "The System of Visualization Aimed at Ensuring the Unity of Pupils' Analytical and Heuristic Activities."

Methodological Basis of the Research

In the research process, based on L.Bertalanffy's "System Analysis Idea" (*which is explained as the attempt to study the properties of an object based on the properties of its parts* - italics are ours - I.F., A.G., K.S.), the "System-Structure Approach," which has developed into an alternative level as an important branch of dialectics, as well as the empirical, empirical-theoretical, and theoretical methods of scientific cognition, the internal connections of the forms of scientific cognition, and various pedagogical and psychological research generalizations have been used as the methodological foundation.

Interpretation of Generalizations Regarding the Research Materials

First, in order to clarify our position regarding the title of the article (the formulation of the research topic), we find it necessary to provide a brief comment.

We acknowledge that there may not be consensus in the views of researchers who intend to oppose the use of the term "directed system" by us; it is even possible that the phrase "directed system" may be interpreted as a "distortion" or "misrepresentation" in relation to the concept of "system." Therefore, it is necessary to justify the following: 1) The implementation of teaching and education is a system; 2) The requirement to ensure the "unity of visualization and speech" in teaching does not justify its evaluation at the "principle" level; 3) The "unity of visualization and speech" is a component of the system in which it is contained, and

it fulfills a specific function in the realization of the system's goal (regulating pupils' analytical and heuristic activities) in a manner adequate to the mentioned "association," in other words, it performs the mission of "possibilism."

As emphasized in scientific sources, a system is the unity of the interrelations of the elements that constitute it, and in terms of its logical scope, it belongs to a group of general concepts that can be applied to any object, event, or process. The relationship between "whole" and "system" is often explained in terms of "species-genus," sometimes used synonymously, and different aspects of the same object are noted. Sometimes, the whole is considered the peak of a system that is just beginning to form. [5;104-107] In our opinion, a part is a component of the system that is relatively independent; the whole is a system that encompasses parts that are interconnected and possesses certain properties that are not always present in the individual parts; a system is whole because it contains both its elements and the relationships between them; when the nature of the elements of the system is mentally separated, and attention is focused on the relationships between them, we encounter the concept of "structure" of the system.

For the research object to be considered as a system, it must meet the following requirements: 1) The object (whole) must consist of subsystems (parts); 2) The combination of subsystems into one system should contribute to the correct formulation of the problem (research goal); 3) There must be a property that defines the interrelationship between the subsystems in the system; 4) The system must be a part (subsystem) of a larger system. [9;8]

Despite the above, teaching is a complex system with interrelations between its elements. These relations include: the interaction between pupil and teacher activities in teaching; the interaction between teaching tasks; the relationship between the content and tasks of teaching; the connection between the teaching task and the pupil’s learning capabilities; the link between teaching and the school environment; and the connection between teaching and the social environment, etc. The regularities of teaching are manifested in these interrelations and dependencies. [8;120-121]

Although teaching is an important characteristic of educational activity, it does not encompass all of its aspects. Teaching, in the broadest sense, refers to the acquisition of new knowledge, skills, and habits. However, acquisition and teaching activities are essentially different phenomena. Acquisition is an inseparable part of every activity area, not just the teaching process. Teaching activity, on the other hand, is a type of activity and a specific form of the individual's social activity. The concept of teaching activity (D.V. Elkonin, V.V. Davydov, and others) distinguishes the following components within the structure of teaching activity: 1) teaching situation (or tasks); 2) teaching operations; 3) control; 4) assessment. As can be seen, both teaching and the teaching process can be viewed as a system during research, organization, and management. [3;150]

The invariant dependencies of the teaching system determine its existence, as well as the regulation of the dialectic between its parts in accordance with its emergent nature. These invariant dependencies are regularities. Observing and adhering to the fundamental requirements arising from these regularities in the organization and management of teaching is a logical approach, and these requirements are referred to as the principles of teaching.

There are many scientific considerations in the literature regarding the influence of the principles, which cover both the teacher's and the pupil's activities, on the content, methods, and organizational forms of teaching. This shows that the problem of teaching principles has been addressed by many specialists (Y.A. Komenski, I.H. Pestalozzi, A. Disterweg, K.D. Ushinsky, Y.N. Medinsky, B.P. Esipov, M.A. Danilov, I.T. Ogorodnikov, Y.K. Babansky, N.I. Boldyrev, G.I. Shukina, M.N. Skatkin, I.Y. Lerner, D.O. Lorkipanidze, M.M. Mehdizade, N.M. Kazimov, B.A. Ahmadov, A.Kh. Pashayev, F.A. Rustamov, and others). For detailed information, see: [1-8; 14].

In addition to including the principle of visualization among the principles of teaching, it was even considered the "golden rule" in pedagogy for a long time. Like many other teaching principles, the "discovery" of the principle of visualization was once one of the major successes in pedagogical thought. This principle, in certain socio-historical conditions, deeply influenced school practice and, in fact, became the very foundation of every teacher’s pedagogical thinking.

Since the mid-20th century, the idea of applying visualization as a means to activate children's cognitive activities has been proposed. The well-established principle of visualization in pedagogy has served the purpose of organizing pupils' observation and ensuring more effective assimilation of new knowledge. Even K.D. Ushinsky (1824-1870), when discussing visualization in teaching, wrote that “visual teaching” is teaching that is not based on abstract concepts and words, but rather on concrete images directly perceived by the child (whether these images are formed under the guidance of the educator during the teaching process or initially through the child’s independent observation). [12; 281-282]

The principle of visualization was not discovered experimentally, but empirically, and was closely related to the rules of classical sensualism. In their everyday experience, people believed more in what they saw than in what they heard. Teachers, too, relied on this truth in their own practice. As long as schools were fighting illiteracy, the effects of the principle of visualization were undoubtedly positive. However, when schools faced the challenges of scientific and technological progress, difficulties arose in the application of the visualization principle... Since the 1970s, psychological literature began to examine the principle of visualization from a critical perspective. [3; 86-87]

The principle of visualization relies on the power of sensory cognition; the importance of sensory cognition is not denied. However, psychologists are rightly interested in the heuristic possibilities of the principle of visualization: "Does the principle of visualization condition the formation of a particular type of thinking in pupils?"

Today, the principle of visualization is evaluated with new pedagogical thinking criteria. According to psychologists' firm belief, while the principle of visualization may seem attractive in itself, one aspect is undeniable: its practical application leads to heavy, "tragic" (V.V. Davydov) outcomes in terms of pupils' cognitive development. After all, the principle of visualization requires moving from the concrete to the abstract in teaching, not from the abstract to the concrete. This, at best, results in the formation of empirical thinking in pupils. [3; 87]

It is well known that in a learner-centered education system, the roles of teachers and pupils, who are at the center of the pedagogical process, change. Their activities are built based on predetermined outcomes. Along with integrated plans that align with the curriculum, the teacher prepares new technologies or selects the most suitable ones from existing ones. In determining these technologies, both the teacher and the pupil serve as the leading subjects of the teaching process. Relationships are established in a horizontal direction, following the "subject-subject" formula. At this time, pupils are the organizers of their own thinking, while teachers act as the organizers of the conditions for the pupils' development. The leadership role of teachers changes, and their activity in providing information becomes more limited. Instead, they transform into subjects who organize the pupils' independent cognitive activity and active creativity, coordinating and directing the learning process in the classroom.

In the proper organization of the pedagogical process, important didactic principles are referenced. In the organization of the pedagogical process in accordance with new curricula, the following principles are considered essential:

1. **Completeness of the pedagogical process** - The pedagogical process implements the goals of teaching in a complex manner (developmental, educational, and formative), encompassing the activities of both teachers and pupils that culminate in tangible outcomes.

2. **Creation of equal opportunities in education** - The same learning environment is provided for all pupils, and the pedagogical process is regulated considering their potential capabilities.

3. **Learner-centeredness** - The pupil is at the center of the pedagogical process. All teaching and educational work is aimed at meeting the pupils' interests and needs, developing their talents, abilities, and potential capabilities.

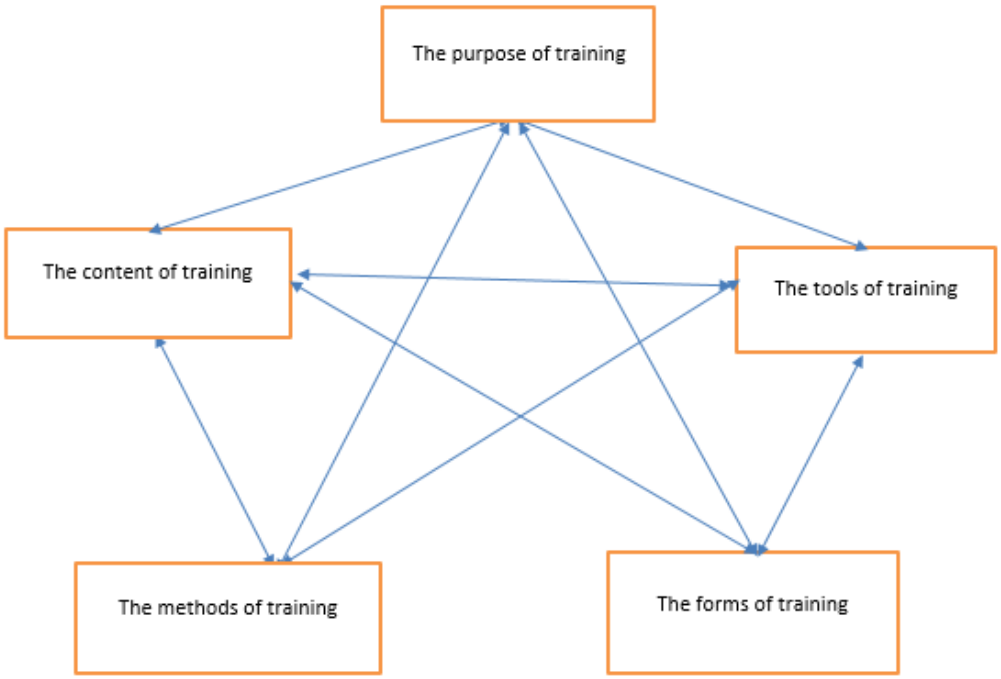
4. **Development orientation** - Pupils' cognitive activity is regulated, their achievements are analyzed, and the development level of their knowledge, skills, and habits is adjusted.

5. **Stimulating activity** - To ensure the effective and efficient organization of the pedagogical process, all progress in the pupils' activities is recognized and evaluated, increasing their interest in learning and ultimately guiding them towards more successful educational outcomes.

6. **Creation of a supportive environment** - The organization of the pedagogical process, based on an adequate material-technical base and a healthy moral-psychological environment, creates a favorable and safe learning condition that enhances quality and efficiency. [11; 281-282]

By the way, it should also be noted that, along with these principles, the determination of specific methodological principles in the teaching of individual subjects is considered to be of didactic importance.

As seen, among these principles, the "Principle of Visuality in Teaching" is not included. We appreciate this and strongly believe that the "integration of words and visuality" should be considered as a structural element within the system of teaching resources. It is possible to clearly see the dialectical interdependency relationships with other components in the methodological system of teaching a particular subject from the schematic description below, which is included in the system of resources (Figure 1).



In this diagram, the visual representation of the interrelationships between the components of the methodological system is reflected. The teacher designs the teaching process in terms of the formulated goal (the goal is the system-creating component, the "movement model"). The selected content of the teaching material, the development level, interests, teaching tools, psychological conditions, national mentality, etc., of all pupils and each one individually serve as the carrier of the teacher's well-thought-out activities, which, in a certain sense, holds the potential. These factors are participants in the creation of a new quality—the pupil's desired state of improvement. Undoubtedly, the person who can identify these potentials is the one who can design the teaching process.

The most important issue here is determining the place and form of the "reconciliation of the word and visuality" as a resource in the implementation process of education, just like other resources, and applying it in a way that will positively influence the efficiency of teaching.

An analysis of scientific sources clearly shows that this resource has not been used to its desired level. Let's look at some examples that may be sufficient to argue our point.

L.V. Zankov highly appreciates the necessity of combining the word and visuality and the importance of determining the form of this choice, mentioning the following four forms:

1. The teacher guides pupils in observing the object with the help of words, and they (the pupils) acquire knowledge about the appearance of the object themselves;

2. With the help of words (questions, notes, etc.), the teacher directs pupils to perceive and formalize the relationships in the "events (*the studied reality* - italics are ours)" based on the results of their visual observation and their existing knowledge, relationships that cannot be revealed through the perception process;

3. Pupils receive information about the appearance of the object from the teacher's words, and visual aids serve to confirm and clarify the teacher's verbal conclusions;

4. During the process of observing visual objects, the teacher himself provides pupils with information about the relationships between events that are not directly perceived by them, draws conclusions, and generalizes individual information. [16;116-117]

As seen, the variants of "reconciliation (integration) of word and visuality" presented by L.V. Zankov have been structured in accordance with the first two levels of education, and the stages of pupils' intellectual activity, specifically their analytical and heuristic types (logics), which we describe below, have not been followed: The structure of the analytical type of cognitive activity includes the following:

1. Understanding the difficulty and analyzing the problematic situation;

2. Identifying the main difficulty and formulating the problem;

3. Searching for a solution using a known solution algorithm or finding new analytical methods;

4. Solution and verification of correctness.

The structure of the heuristic type of cognitive activity differs fundamentally; at certain stages, it is similar to the analytical one, but it also has its own distinct features:1. Understanding the difficulty and analyzing the problematic situation; 2.Identifying the main difficulty and formulating the problem; 3. a) Formulating hypotheses and developing them (creating new algorithms) or b) making hypotheses through sudden guesses and finding an intuitive solution; 4.Verifying the correctness of the hypotheses by applying the obtained solution in practice. [15;119]

The ideas regarding the use of the "Word-Visualization Unity Resource" (its "potential carrier functions") in the implementation of education are not lim-

ited to L.V. Zankov's presentation. Numerous considerations on the possible use of this resource in various forms can be found in scientific literature. As evidence of our point, we can refer to Q.I. Shukina's consideration of the "polysemy" of the cognitive load of word-visual unity in the teaching process, L.V. Zankov, N.A. Menchinskaya, and F.I. Yakovlev's views on the three functions of visualization (visualization as a source of knowledge, visualization as an illustration tool for confirming deductive conclusions, and visualization as the basis and cognitive support for sensory perception), M.I. Maksutov's addition of the fourth function - "formulation of the teaching problem, the means of creating a problematic situation," and E.Q. Mingazov's thoughts on the role of word-visual unity in activating pupils' teaching-cognitive activities. [5; 226]

E.Q. Mingazov concluded that visualization has an important "potential carrier function" within the teaching resources complex, and he divided it into two types and eight categories. He classified five types under the "visual imagery" category: natural, volumetric, descriptive, graphic, and conventional. Three types are included in the "non-imagery" visualization category: diagrams, tables, and formulas. E.Q. Mingazov arranges all types of visualization in a sequence according to their degree of abstraction. The zero degree of abstraction is assigned to natural visualization, while the highest degree of abstraction is associated with formulas and equations. According to him, pupils' activation progresses along a transition line from the concrete to the abstract, from general representation to individualization, from non-moving to moving, and so on. This transition occurs gradually with increasing difficulty in pupils' cognitive activities. There can also be a reverse transition. For example, the ease of solving cognitive problems and the confirmation of deductive conclusions reveal this very transition. [13; 413-415] Here, the auxiliary role of tools is implied: they have been used as illustrative materials to facilitate the acquisition of knowledge. The flaw in the systematization presented by E.Q. Mingazov is that he did not correctly identify the logical foundations of systematization, nor did he focus on the *"interest ↔ potential ↔ action ↔ process's involvement in the desired development, educational, and pedagogical level"* management vector.

V.P. Strezikozin divides visual aids into two groups based on their role in the teaching process: object-imagery visual aids and symbolic visual aids. The first group of visual aids helps the teacher use pupils' sensory perception to form concepts and ideas. In the second case, visual aids are necessary to convey the complex, interdependent relationships of the objects being studied and their internal structure. He points out that since the reflection of reality in human consciousness is realized in the unity of the sensory and the rational, it may not be practical to universalize the role and place of a particular type of visualization in teaching. It is necessary to reconcile object-imagery and symbolic types of visualization in the teaching process, and in any type of visualization, isomorphism and simplicity should be combined. [17; 153-155] V.P.Strezikozin also did not address the essential parameters that should serve as the basis for determining and applying forms of teaching resources.

I.S. Yakimanskaya considers it appropriate to categorize visual aids used as teaching resources in schools into three types based on their content and function: 1) natural, material, 2) conventional and graphic representations, and 3) symbolic models. She also addresses the methodological issues related to the use of these visual aids in the process of knowledge acquisition. She emphasizes the necessity of selecting visual aids that align with the content of the knowledge, noting their significant role in the perception of teaching material. In her opinion, it is important to set sensory tasks for pupils at the moment of presenting visual material. The methods for working with visual aids activate perception, making it conscious and dynamic (without these methods, it is impossible to fully acquire knowledge). [18; 12-18] In I.S. Yakimanskaya's reflections, the theoretical and technological aspects of using visual aids as teaching resources have not been adequately clarified.

As it can be seen, in the presented examples, the considerations regarding the use of the "integration of visual aids with words" resource have not been presented in a systematic manner, and the necessary parameters for determining the forms of combining visual aids with words have not been shown. We consider it appropriate to include the following parameters in the list: the development direction of 21st-century Azerbaijani society and education; the "specificity function" (possibilities) in teaching; the expectation of dependencies corresponding to the methodological system of teaching; the focus on the management vector of teaching that leads to the desired level of development, education, and upbringing of the participant involved in the process ("interest↔potential↔action↔process"); the recognition of the teacher's activity as one of the project opportunities of the teaching process; the focus on the driving force of the realization of pupil possibilities; the reference to the characteristics of the teaching process when designing the movement of pupil possibilities; the acceptance of intellectual interest as a means for realizing pupil possibilities in teaching; the application of teaching methods as a form of intellectual movement toward new knowledge for pupils; the selection of processional movement forms of material corresponding to the pupil's zone of proximal development; the identification of directions of pupil possibilities after the problematic situation arises in the teaching process. In our subjective understanding, in order for the integration of visual aids with words to become a system aimed at regulating pupils' analytical and heuristic activities, the process (system) must be designed according to the presented parameters.

In order to fully realize the research objective set forth in the article, let us provide interpretations (scientific comments) of the above-presented parameters. This would positively influence the theoretical and technological merits of the research.

A teacher affirms their creativity when they have the capability to explore various actions. Clear pedagogical thinking emerges from their complex, uncertain ideas. In our opinion, referring to Lotfi Zadeh's idea,

which enables the modeling of human thoughts, finding methods in various forms, and implementing the decisions made, one can discuss the "specificity function." In the teaching process, determining what corresponds to the specificity functions essentially means uncovering the essence of this process.

The analysis of technologies that have found a certain degree of place in pedagogical practice shows that their structure includes the following elements: a conceptual basis for each pedagogical technology; the content of the teaching material; the organization, regulation, direction, and management character of the teaching process (or other means of education); the level of activity of the parties involved; the activity model, forms, and methods for pupils; the activity model, forms, and methods for the teacher; the evaluation of the results of the activity; the design of the process defined at the scientific-methodological level based on the system of goals and tools; the reliance on philosophical-methodological, pedagogical, psychological, social, and logical concepts; the adequacy of the content and the procedural aspect.

In our opinion, the success of any pedagogical technology should be evaluated based on the level of realization of pupils' potential and the achievement of new qualities. This is natural, as the transmission of human culture is based on the experience ofКонец формы

$$\begin{Bmatrix} interests \\ potential \end{Bmatrix} \rightarrow \left\{\left(\begin{matrix} activity \\ communication \end{matrix} \middle| action\right)\right\} \rightarrow \begin{Bmatrix} new\ quality \\ (personality) \end{Bmatrix}.$$

Here, it is worth highlighting the very relevant analysis by Professor Rovshan Mustafayev regarding the internal unity of potential, action, and personality. He rightly emphasizes that the concept of "potential" plays a special role in our thinking and is, to some extent, equal to our existence and daily life. Existence only becomes meaningful when it has the potential for action. Moreover, this is impossible without deep creative pursuits. Where there is potential, there is action. In turn, this creates a dialectical unity between particles and the whole. The idea that generates action is the vital being that shapes the new model of development. [10; 88]

When focusing on the dialectical relationship related to the teaching process (which is also true in the political context!), one cannot overlook the concept of "interest." It is undeniable that interest is always potential. It is interest that drives potential into action (Today, our world is also governed by interests!). Interest transforms through the inner world of the personality, and can gain value through its actions. The personality is always potential. Potential itself does not mean action. Without the idea that generates action, it is absurd to talk about new quality. By "idea," we refer to a thought that has reached a high degree of objectivity, completeness, and specificity, and is also practically directed towards implementation.

There are different types of potentials: general and individual, real (concrete) and formal (abstract). General potential reflects only the general aspects of objects and events, the preliminary conditions, and individual characteristics. General potential is conditioned by the laws of development of reality, while individual potential is conditioned by the existence of these general laws and the specific conditions of action. Each individual potential is unique. If a potential reflects the significant, lawful development trend of an object or event, and there is a necessary condition in reality for its realization, it is called real potential. Formal potential reflects an objective, insignificant development trend, and there are no necessary conditions in reality for its realization. Formal potential differs from impossibility because it is something that cannot be realized under any circumstances. It should be noted that a large number of formal potentials do not transform into reality. It is also worth emphasizing that, due to some circumstance, a fully real potential can be lost or objectively remain unrealized. In such cases, it turns into formal potential. There is undoubtedly a relative difference between formal and real potentials. Potential arises in the existing reality and is realized, materialized in the new reality. As latent trends that express various directions in the development of an object, potentials characterize reality in terms of its future. In dialectics, it is accepted that development is not just about expanding the collection of available potentials but is a process of the constant emergence of potentials within the framework of reality and their transformation into new reality. In social development, the realization of potentials depends largely on their will, consciousness, and activity. The process of realizing potentials, transforming them into reality, becomes possible through activity and communication. In the teaching process—under the guidance of the teacher—special conditions are required for the constant emergence of the potential of the chosen object within the framework of reality and its transformation into new reality as part of the pupil's education, development, and upbringing process. These conditions should be capable of accelerating this process. [6 ; 16-18]Начало формыКонец формы

In our opinion, the *"interest↔potential↔action↔the desired level of development, education, and upbringing of the party involved in the process"* management vector is determined in the teaching process. The "choice" factor plays a particularly important role in this process. The regulation of algorithmic and heuristic types of activity (as a system containing optimal relationships) is related to choice. In teaching, it is "potentials," not "probabilities," that align with the function of belonging.

It is known from psychology that perception is directed toward a specific goal. Under the influence of a teaching task, the content and nature of perception change. The optimality of this or that description can only be realized when the functions of the given description are identified based on a thorough analysis of the structure and content of knowledge. [12; 262-264]

We are of the opinion that the following aspects hold special importance among the main requirements for the application of visual aids and the integration of visuality with words in teaching resources, as identified in teaching practice: a) The teaching process should not be overloaded with visual aids (the process should occur in a situation where pupils face challenges within

their capacity, and the educational process should precede development, serving a developmental function); "undesirable overload" reduces pupils' independence and activity in understanding and mastering the teaching material. In other words, an excessive number of visual aids (even if their integration with words has become a unified form!) hinders the mastery of knowledge; b) Visual aids should not create external associations in pupils; c) There should be a clear purpose for the use of the integration of visuality and words; d) The integration of visuality and words should be applied in accordance with the logic of the teaching process, regulating the dialectic between empirical and theoretical knowledge; e) When using visual aids combined with words, the age of the pupils must be taken into account; "In lower grades, only pictorial visual aids accompanied by words can be used" is an incorrect statement. It is essential to familiarize children with understanding relationships and dependencies through the use of conditional visual descriptions, and this conclusion is supported by our accumulated experience in teaching and research.

In summary of what has been stated above and based on the analysis of the accumulated experience materials, we conclude that the integration of visual aids with words and the sequence of their application should direct pupils' activities towards creating a model of the studied material. The nature of solving cognitive problems in teaching, as well as the pupil's cognitive activity itself, largely depends on the application of the types of visual aids that integrate with words (which we consider to be an appropriate approach to include among the types of teaching resources). This includes ensuring the integration of pupils' analytical and heuristic activities in the teaching process, as well as regulating these activity types, which is largely conditioned by the integration of visuality and words. Therefore, by utilizing the following functions of the integration of visuality and words, it is possible to regulate pupils' analytical and heuristic activities and improve the conditions for ensuring their optimal relationships: 1) by using it as a means of obtaining empirical data; 2) by using it as a means of applying deductive conclusions; 3) by using it as a means of reaching an inductive conclusion, generalization, and systematization; 4) by using it as a means of creating the conditions for transitioning from restorative activity to heuristic activity; 5) by using it as a means of providing an algorithmic description of analytical activity; 6) by using it to improve the illustration support of heuristic activity and to focus on modeling.

Scientific novelty of the research: 1) It has been highlighted that in the field of pedagogical science, the issue of developing the theory of pupil-centered education in response to the challenges of the Fourth Industrial Revolution remains an unsolved problem. Among the issues directed at solving this, the determination of ways to regulate pupils' analytical and heuristic activities holds a special place; 2) Among the specific structural components of ways to regulate pupils' analytical and heuristic activities, the presence of teaching resources is emphasized, and the existence of different types of these resources, particularly the "integration of visuality and words as a resource type," has been proposed; 3) The essential parameters for determining the "integration of visuality and words" as a resource in a system form have been outlined; 4) The functions of the integration of visuality and words directed at regulating pupils' analytical and heuristic activities have been identified.

Practical significance of the research

The scientific novelty of the research holds practical importance for both individuals conducting research in the field of pedagogy and those engaged in practical pedagogical activities, as it provides clarity of purpose.

Conclusion

1. In the "methodical system of the teaching process," teaching resources conditioned by goals and content have a specific place among the components of the system, carry functions in dialectical unity with other components, and influence the system's effectiveness; 2. The integration of visuality and words as one of the teaching resources is appropriate and takes various forms, with essential parameters for its formation in systematized form; 3. Efficient use of the functions of the integration of visuality and words can positively impact improving the conditions for regulating pupils' analytical and heuristic activities.

References

1. Abbasov, A.N., Mammadzade, R.R., Mammadli, L.A. Pedagogy: Selections (Textbook for Higher Education Institutions). Baku, "Mutarjim", 2021, 608 p.

2. Ahmedov, B.A., Rzayev, A.Q. Lecture Notes on Pedagogy (Textbook). Baku, "Maarif", 1983, 352 p.

3. Alizade, E.E. Psychological Issues in Modern Azerbaijani Schools. Baku, "Pedagogy", 2004, 432 p.

4. Ibrahimov, F.N., Huseynzade, R.L. Pedagogy (Textbook). Vol. I, Baku, "Mutarjim", 2013, 708 p.

5. Ibrahimov, F.N. Essays on the Fundamentals of Optimal Ratios of Algorithmic and Heuristic Activities in Teaching (Monograph). Baku, "Mutarjim", 1998, 398 p.

6. Ibrahimov, F.N. The Teaching Process: Possibilities, Action, New Quality (Monograph). Baku, "Mutarjim", 2012, 84 p.

7. Kazimov, N.M., Hashimov, E.S. Pedagogy (Textbook). Baku, "Maarif", 1996, 416 p.

8. School Pedagogy (Edited by Q.I. Shukina) (Textbook). Baku, "Maarif", 1982, 403 p.

9. Mirzejanzade, A.Kh. Introduction to the Profession (Textbook for Oil and Gas Profile Higher Education Institutions). Baku, BSU Publishing, 1990, 368 p.

10. Mustafayev, R.F. Free Thought (Available Online). Baku, 2000.

11. General Education Curriculum for Grades I-IV. Baku, "Təhsil", 2008, 480 p.

12. General Psychology (Edited by Prof. A.V. Petrovsky). Baku, "Maarif", 1982, 495 p.

13. Feyziyev, C.A., Ibrahimov, F.N., Badiyev, S.R. Didactics (Textbook). Baku, "Mutarjim", 2011, 624 p.

14. Pashayev, E., Rustamov, F. Pedagogy (Textbook). Baku, "Nurlan", 2008, 464 p.

15. Makhmutov, M.I. Theory and Practice of Problem-Based Learning. Kazan, Tatarstan Book Publishing, 1972, 555 p.

16. Zankov, L.V. Didactics and Life. Moscow: "Prosveshchenie", 1968, 246 p.

17. Strezikozin, V.N. Current Issues of Primary Education. Moscow, "Prosveshchenie", 1976, 274 p.

18. Yakimanskaya, I.Ya. Visual Thinking and Its Role in Teaching. // "Soviet Pedagogy", 1968, No. 2.

ПРИМЕНЕНИЕ ОБЛАЧНЫХ ТЕХНОЛОГИЙ В ПОВЫШЕНИИ КАЧЕСТВА ОБРАЗОВАНИЯ

Курбанов З.М.
Доцент кафедры прикладной математики
Каршинского государственного университета,
г. Карши, Узбекистан
Туйчиева Ч.Р.
Магистрант Каршинского государственного университета

APPLICATION OF CLOUD TECHNOLOGIES IN IMPROVING THE QUALITY OF EDUCATION

Kurbanov Z.
Associate Professor of the Department of
Applied Mathematics Karshi State University,
Karshi, Uzbekistan
Tuychieva Ch.
Graduate student of Karshi State University
DOI: 10.5281/zenodo.15037229

Аннотация

В данной статье представлена информация об облачных технологиях. Представлены понятия и мнения о внедрении облачных технологий в нашу жизнь, их возможностях и преимуществах. Приведена базовая информация о роли облачных технологий в образовании. Подробная информация представлена об эффективном использовании облачных технологий для повышения качества образования, более широкого объяснения тем и более эффективной работы со студентами. В качестве примера приведены возможности Google Drive при объяснении темы. Подробно объяснены его основные услуги на конкретных примерах, а также дано описание. Кроме того, представлена подробная информация о внедрении облачных технологий в Республике Узбекистан, современных возможностях их использования, компаниях, которые предоставляют их использование, и определения, данные этими компаниями.

Abstract

This article provides information about cloud technologies. Concepts and opinions on the implementation of cloud technologies in our lives, their capabilities and advantages are presented. Basic information on the role of cloud technologies in education is provided. Detailed information is provided on the effective use of cloud technologies to improve the quality of education, a broader explanation of topics and more effective work with students. As an example, the capabilities of Google Drive are given when explaining a topic. Its main services are explained in detail using specific examples, and a description is given. In addition, detailed information is provided on the implementation of cloud technologies in the Republic of Uzbekistan, modern possibilities for their use, companies that provide their use, and the definitions given by these companies.

Ключевые слова: облачные технологии, Iaas, Paas, Saas, Uzcloud.uz, Uztelecom, Cloud.

Keywords: cloud technologies, Iaas, Paas, Saas, Uzcloud.uz, Uztelecom. Cloud.

ВВЕДЕНИЕ

Термин «в облаке» вошла в наш разговорный язык. Возможно, вы слышали, что правительство Соединенных Штатов инициировало «облачную инициативу» или что почти 75 процентов разработчиков в Microsoft в настоящее время работают над «облачными» продуктами, или что телефон или служба хранит свои данные в облаке. Таким образом, облако - это аморфная сущность, которая должна представлять будущее современных компьютеров[1, XXV].

Облачные технологии открывают возможности для создания новых социальных сервисов, объединяя пользователей через социальные платформы, которые строятся на основе нескольких облачных решений. Однако предугадать полный спектр возможностей, которые может предоставить облако, затруднительно. Оно развивается по сложному и динамичному пути, затрагивая множество аспектов повседневной жизни, что создает широкий простор для инноваций.

Для полноценного анализа облачных вычислений необходимо владеть соответствующей терминологией. Многие сокращения и термины, используемые в данной сфере, могут со временем изменяться или исчезать. Обычно облачные вычисления классифицируются на две основные категории:

1. **Модели развертывания** – относятся к способу организации и управлению облачной инфраструктурой.
2. **Модели предоставления сервисов** – включают различные типы облачных услуг, доступных пользователям. Подобное разграничение широко применяется в сфере облачных технологий.

Одним из главных недостатков облачных решений является внутренняя задержка, связанная с подключением к глобальной сети. Кроме того, облачные вычисления, как и сам интернет, функцио-

нируют без сохранения состояния. В распределенной системе обмен данными осуществляется в однонаправленном порядке. Все запросы, применяемые в HTTP (например, PUT, GET и другие), относятся к сервисным запросам, передаваемым поставщику облачных услуг [2,ст.56.].

Используя облачные технологии, мы можем быстро и легко найти нужную нам информацию. Мы можем отказаться от программ, установленных на наших компьютерах, и вместо этого свободно использовать облачные приложения. Социальные сети, созданные с использованием сервисов облачных технологий, могут запускать новые сервисы, объединяя пользователей. Это гарантирует, что новые возможности, а именно облачные технологии, очень быстро войдут в нашу жизнь.

Облачные технологии — модный современный термин, который обозначает предоставление определенных видов программных услуг с использованием серверного устройства через Интернет. Например, можно назвать хранение файлов, обработку файлов, анализ данных и т. д. [3].

Облачные технологии предоставляют множество удобств представителям всех отраслей.

В качестве примера попробуем остановиться на некоторых предоставляемых преимуществах, исходя из нашей сферы.

Одной из замечательных возможностей облачных технологий является возможность совместной работы нескольких сотрудников над одним документом одновременно. Каждый партнер отвечает за определенный отдел. Кроме того, у этих коллег появится возможность добавлять информацию к работе тех, за кого отвечают другие коллеги. Для этого вам необходимо создать документ и разместить его в облачном хранилище. Чтобы другие партнеры получили доступ к созданному документу, вам необходимо разрешить доступ к этому документу по электронной почте.Кроме того, преподаватель сможет видеть, в какой степени студенты выполняют поставленную задачу. По таким разделам учебной программы, как моделирование, обработка числовых данных в таблицах, построение диаграмм, может проводиться как индивидуальная, так и совместная практическая работа [4].

Используя данную технологию, можно проводить текущий и итоговый контроль, а также самоконтроль. Учитель может организовать проверочные работы, тесты, анкетирование учащихся и их родителей, используя специальные формы в документах.

МЕТОДОЛОГИЯ ИССЛЕДОВАНИЯ

Выше мы обсудили удобство использования облачных технологий для пользователей. Теперь поговорим о преимуществах использования облачных сервисов для учреждений.

В этом случае учреждения не тратят деньги на программное обеспечение, ИТ-специалистов. Им не нужно тратить время и деньги на антивирусную и антихакерскую безопасность. Все эти услуги оказывают сотрудники облачного сервиса. Хранение данных осуществляется облачным сервисом.

Software as a service IaaS — это означает, что пользователь может арендовать вычислительные ресурсы, на которых он может устанавливать любое программное обеспечение и программы. Провайдер управляет серверным и сетевым оборудованием. Настройки на уровне операционной системы и приложений выполняются самим пользователем.

Облачные технологии включают в себя ряд сервисов. Мы рассмотрим три основных.

Модель PaaS (Платформа как услуга). Здесь всем пользователям предоставляется готовая среда для разработки и развертывания программ.

Модель SaaS (Программное обеспечение как услуга). В этом случае все сервисы предоставляются позователям в готовом виде.

Модель IaaS (Инфраструктура как услуга.)В этом случае пользователь несет ответственность за все системы, включая серверы, операционные системы и другие компоненты.

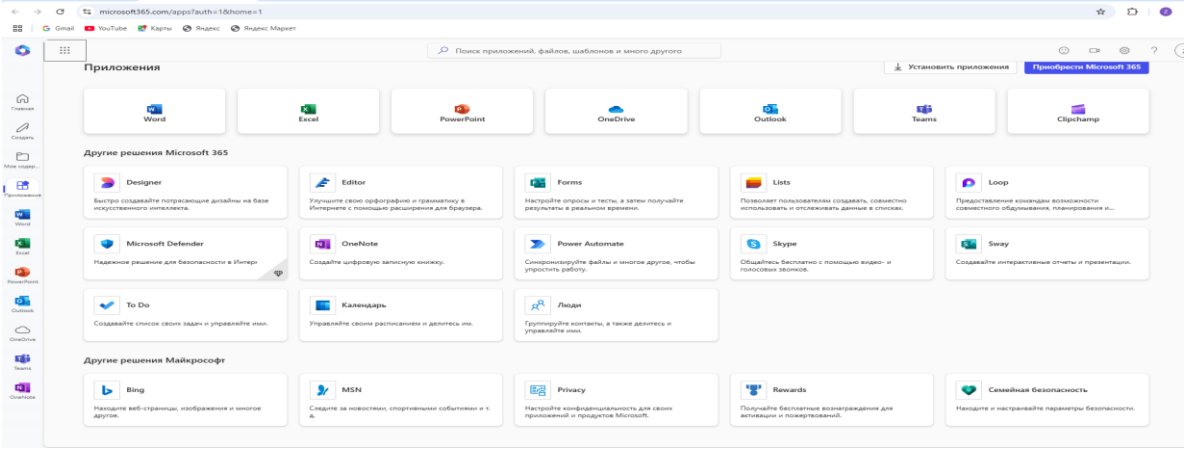
Использование Microsoft Облачные сервисы Microsoft имеет очень обширный портфель облачных вычислений под активное развитие. Усилия по расширению продуктов Microsoft и сторонние приложения в облаке сосредоточены вокруг добавления больше возможностей для существующих инструментов Microsoft. Подход Microsoft заключается в просмотре облачных приложений как программного обеспечения плюс сервиса. В этой модели облако другая платформа и приложения могут работать локально и получать доступ к облачным сервисам или работать полностью в облаке и быть доступным для браузеров, использующих стандартные протоколы сервис-ориентированной архитектуры. Microsoft называет их облачную операционную систему платформой WindowsAzure.Сам сервис indows zure является размещенной средой виртуальных машин включается фабрикой под названием Windows Azure App Fabric. Вы можете разместить своё приложение на zure и обеспечить его хранилищем, увеличивая его по мере необходимости. Служба Windows Azure является предложением «инфраструктура как услуга».

Работа с приложениями Microsoft 365 от Microsoft, поставщика облачных сервисов, позволяет пользователям работать онлайн из нескольких программ. Это подтверждает наши мысли о возможностях, преимуществах и удобстве облачных технологий, которые были изложены во введении к нашей статье (ТАБЛИЦА 1).

Ниже представлен общий вид окна приложений Microsoft 365. Помимо приложений Office, есть также такие решения, как Designer, OneNote, Sway, Lists, Loop. Вы также можете использовать Bing, который позволяет искать веб-страницы, изображения и другие действия, MSN, который позволяет получать все последние новости, продукты Microsoft и Privacy, который позволяет вам устанавливать конфиденциальность собственных приложений.

Таблица 1.

Список всех приложений Microsoft 365

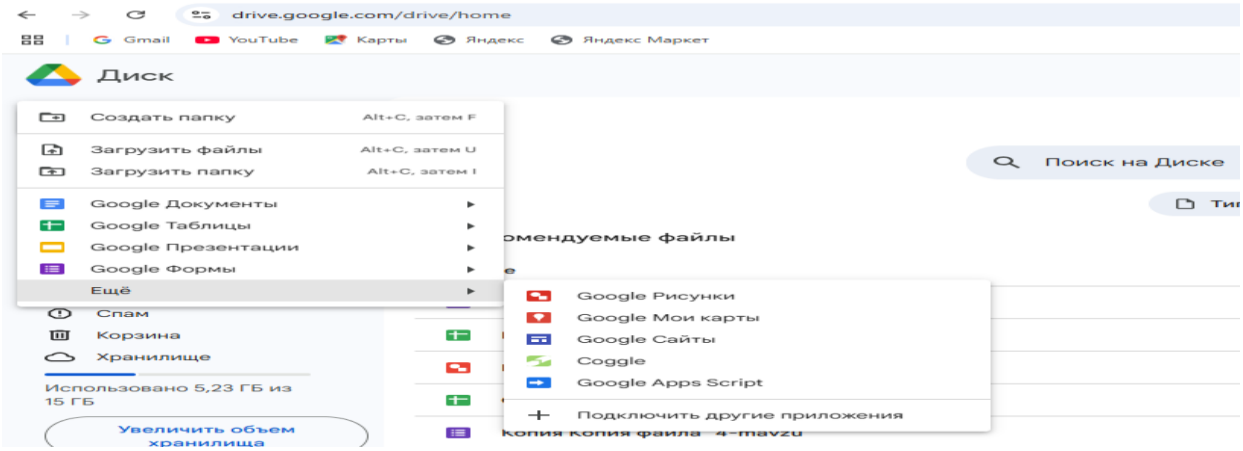


В отличие от приложений Microsoft 365 от Microsoft, Google также предлагает собственные приложения облачных сервисов, которые предлагают множество удобств для пользователя.

Google Drive также включает в себя ряд распространенных приложений. Ниже приведен общий обзор того, как выглядят эти приложения. (ТАБЛИЦА 2).

Таблица 2.

Приложения Google Диска

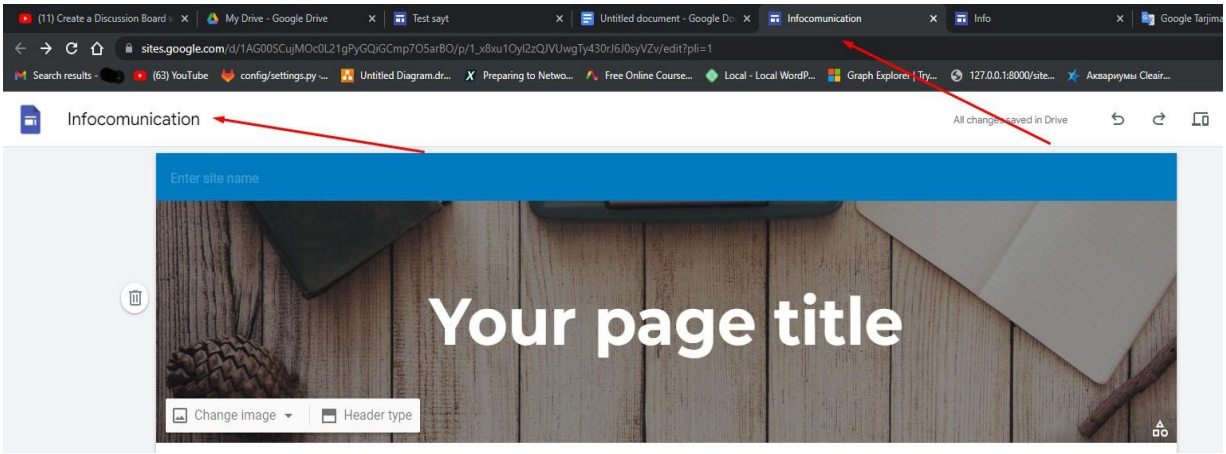


Давайте рассмотрим конкретный случай на основе вышеизложенной информации. Попробуем создать сайт с помощью приложения Google Sites.

Заходим на этот сайт https://drive.google.com через веб-браузер. В появившемся окне выполняем следующие действия. Просто редактируем наш сайт, как показано, чтобы написать «Infocomunication» в заголовке. (ТАБЛИЦА 3).

Таблица 3.

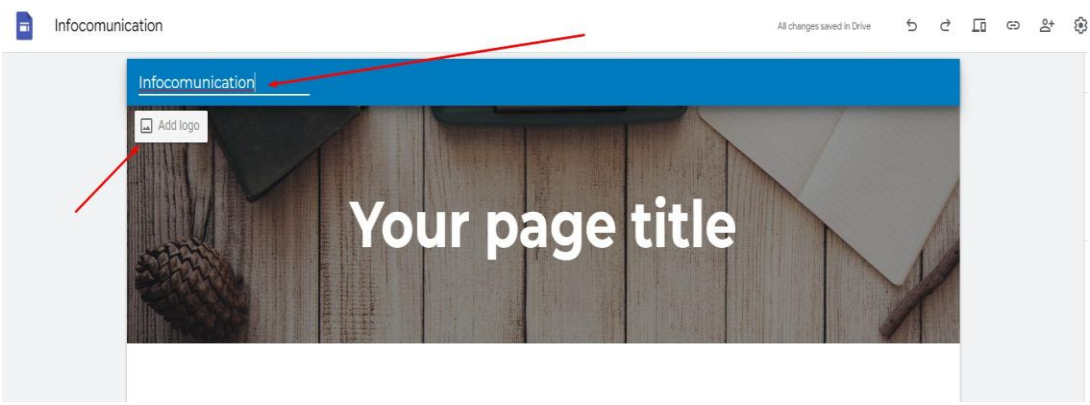
Напишите название сайта



Чтобы написать название сайта и загрузить на него логотип, выполните действия, указанные в (ТАБЛИЦА 4).

Таблица 4.

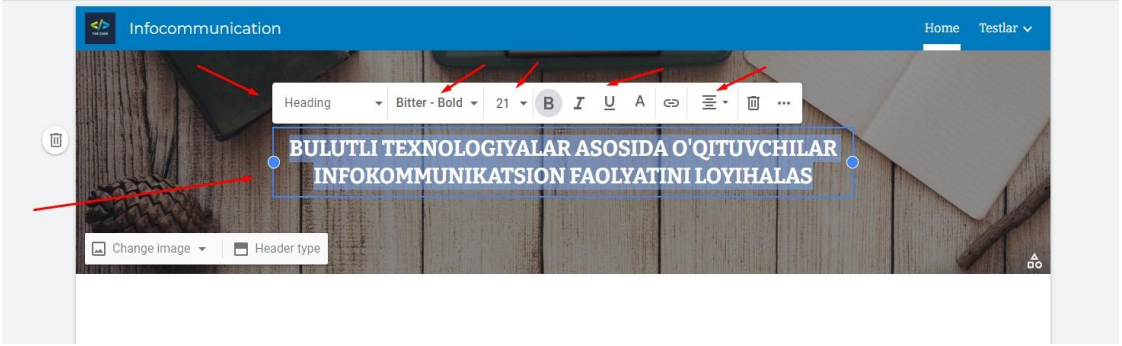
Загрузить логотип



Мы напишем текст для заголовка нашей главной страницы. Для этого просто щелкните по заголовку и напишите нужный вам текст. Если вы посмотрите выше текста, вы можете редактировать текст по своему усмотрению. Вы можете редактировать его так же, как вы редактируете тексты в Word. (ТАБЛИЦА 5)

Таблица 5.

Напишите текст для заголовка



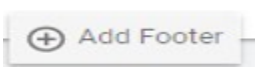
Мы также можем изменить изображение в покупателе. Мы можем загрузить изображение с нашего компьютера или из наших изображений на drive.google.com, в зависимости от нашего выбора.

Мы можем редактировать нашу страницу, используя поля Текст, Изображения, Встроить, Диск, Контент, показанные выше.

Мы вставим текст «Классификация облачных технологий» на нашу страницу через поле Текст, для этого мы нажмем на поле Текст и нам откроется место для ввода текста и впишем в него нужный текст. (ТАБЛИЦА 6)

Таблица 6.

Область ввода текста

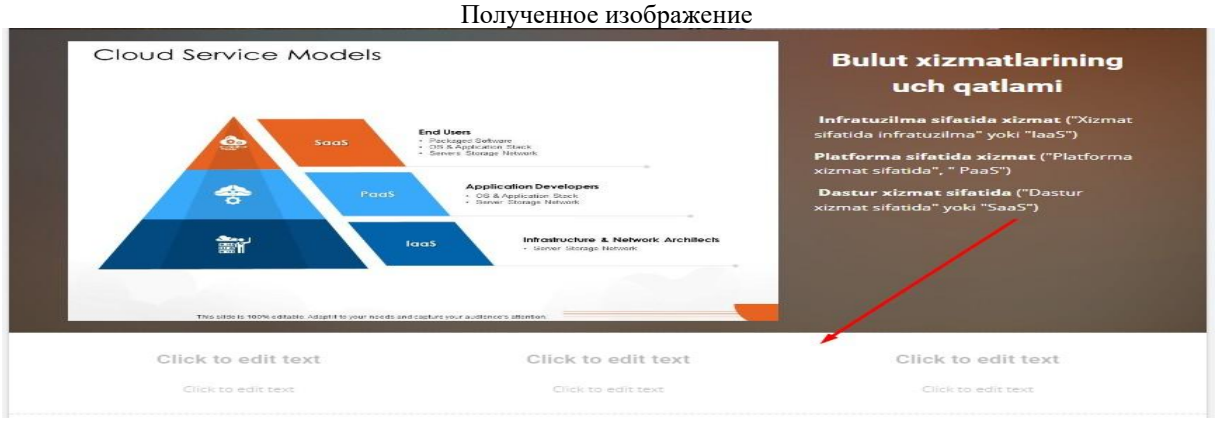


При нажатии на текст откроется новое окно. Здесь вводим нужный текст.

Добавляем информацию на страницу с помощью блока Контент.

Таблица 7.

Полученное изображение



РЕЗУЛЬТАТЫ И ОБСУЖДЕНИЕ

Выше мы попытались дать общее представление об облачных технологиях. Так какие же проблемы внедрения этой технологии в нашей стране, ее применения и эффективного использования ее преимуществ существуют сегодня?

Стратегия «Цифровой Узбекистан – 2030» рассматривает облачные сервисы как одно из основных направлений развития. Облачные технологии внедряются для централизованного управления и хранения данных государственными организациями.

Облачные сервисы являются относительно новой технологией в Узбекистане, и в последние годы, вместе с развитием ИТ-сектора, их применение увеличивается. Данная технология эффективно используется в государственном секторе, бизнесе, образовании, здравоохранении и других сферах.

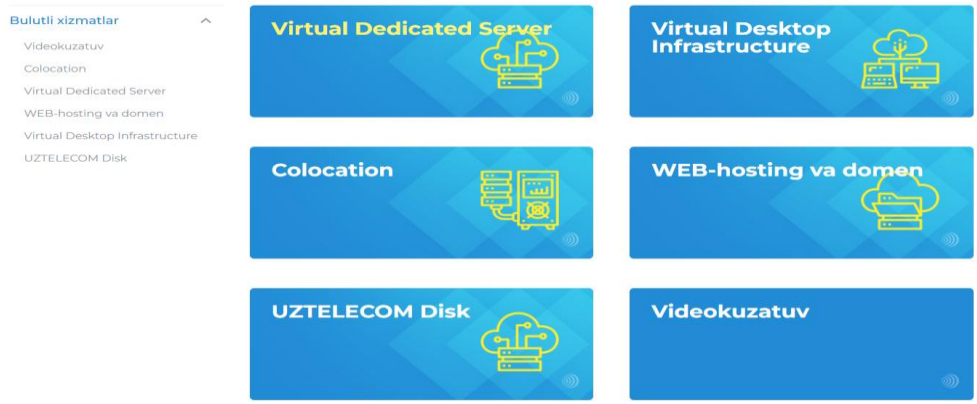
Расширяется покрытие телекоммуникационными услугами и сетью Интернет, что увеличивает возможности использования облачных сервисов. Создание государственных ИТ-парков и предоставление благоприятных условий для ИТ-компаний способствуют быстрому развитию облачных технологий.

Наряду с развитыми странами мира, Узбекистан также начал широко использовать облачные технологии во всех сферах. В качестве примера можно привести центр обработки данных UZCLOUD.UZ АК «Узбектелеком» в Узбекистане. Облачные технологии предлагают доступные и удобные технологические решения для малого и среднего бизнеса. Цифровая трансформация является одним из основных направлений экономической стратегии Узбекистана, а облачные технологии являются ее неотъемлемой частью. Облачные технологии создают благоприятные возможности для внедрения и развития системы «ЭЛЕКТРОННОЕ ПРАВИТЕЛЬСТВО». Облачные технологии позволяют обеспечить безопасное хранение больших объемов данных в системах государственного управления и удаленный доступ к ним.

Отрадно, что в нашей стране появляется все больше местных производителей, предоставляющих облачные сервисы. Познакомимся с облачными сервисами одного из них — UZTELECOM CLOUD.

Таблица 8.

Облачные сервисы UZTELECOM CLOUD.



В этом разделе мы познакомимся с определениями одного из облачных сервисов — Uztelecom.Disk.

Таблица 9.

Ежемесячный тарифный план Узтелеком.Диск

Oylik tarif rejalar:

TARIF REJASI	DISK MAYDONINING HAJMI (GB)	MOBIL TRAFIK (GB)	NARXI (SO'M)	HISOB-KITOB DAVRI, OY
Start	15	15	8 000	1
Ultra	40	40	12 000	1
Premium	100	100	18 000	1
Studio	1024 (1TB)	-	60 000	1
Studio Pro	2048 (2TB)	-	110 000	1
Studio Max	3072 (3TB)	-	150 000	1

Таблица 10.

Годовой план определения Узтелеком.Диск

Yillik tarif rejalar:

TARIF REJASI	DISK MAYDONINING HAJMI (GB)	MOBIL TRAFIK (GB)	NARXI (SO'M)	HISOB-KITOB DAVRI, OY
Start+	15	180	80 000	12
Ultra+	40	480	120 000	12
Premium+	100	1200	180 000	12
Studio+	1024 (1TB)	-	600 000	12
Studio Pro+	2048 (2TB)	-	1 100 000	12
Studio Max+	3072 (3TB)	-	1 500 000	12

Таким образом, в зависимости от Ваших требований и потребностей, Вы можете выбрать один из вышеуказанных тарифов.

ВЫВОДЫ И ПРЕДЛОЖЕНИЯ

Выводы:

1. **Доступность и удобство** – облачные технологии обеспечивают круглосуточный доступ к образовательным ресурсам, что повышает удобство обучения для студентов и преподавателей.
2. **Гибкость обучения** – облачные платформы позволяют внедрять смешанное обучение, дистанционные курсы и персонализированные образовательные траектории.
3. **Совместная работа и взаимодействие** – облачные сервисы способствуют развитию коллективной работы, обмену знаниями и эффективной коммуникации между учащимися и преподавателями.
4. **Экономическая эффективность** – использование облачных решений снижает затраты на инфраструктуру и техническое обслуживание образовательных учреждений.
5. **Обеспечение безопасности данных** – современные облачные технологии предоставляют надежные инструменты защиты информации, но требуют внимательного подхода к вопросам конфиденциальности и защиты персональных данных.
6. **Автоматизация образовательных процессов** – облачные технологии позволяют автоматизировать административные задачи, управление учебным процессом и оценку знаний.
7. **Инновационный потенциал** – облачные технологии способствуют внедрению передовых методов обучения, таких как искусственный интеллект, адаптивное обучение и виртуальная реальность.

Предложения:

1. **Развитие облачной инфраструктуры** – обеспечить образовательные учреждения необходимыми техническими ресурсами и стабильным интернет-соединением.
2. **Обучение педагогов** – организовать курсы повышения квалификации для преподавателей по использованию облачных технологий в образовательном процессе.
3. **Создание единой облачной платформы** – разработка национальной образовательной платформы для хранения, обмена и совместного использования учебных материалов.
4. **Обеспечение кибербезопасности** – внедрение строгих мер защиты данных и обучение пользователей основам цифровой безопасности.

5. **Расширение доступа к образовательным ресурсам** – интеграция облачных сервисов с библиотеками, базами данных и научными публикациями.

6. **Поощрение научных исследований** – поддержка исследований, ориентированных на интеграцию облачных технологий в систему образования, с особым вниманием к анализу больших данных и адаптации учебного процесса под индивидуальные потребности учащихся.

7. **Анализ и контроль результативности** – систематическая оценка воздействия облачных технологий на уровень образования, направленная на повышение эффективности их применения.

На основании вышеизложенной информации можно сделать вывод, что внедрение облачных технологий во все аспекты нашей жизни, особенно в образовательный процесс, является одним из перспективных нововведений в системе образования. Поскольку данная технология позволяет создавать сервисы, снижающие затраты на информационную инфраструктуру, а также повышающие качество образования, распространять и использовать их в образовательной среде.

Принимая во внимание вышеизложенные соображения, мы считаем целесообразным предоставить каждому пользователю, организации, высшему учебному заведению, а также его профессорско-преподавательскому составу и студентам информацию о возможностях и преимуществах облачных технологий, а также снабдить их необходимыми знаниями и навыками для эффективного использования их возможностей.

Внедрение облачных технологий в образовательный процесс способствует его модернизации, делает обучение более доступным, интерактивным и персонализированным, а также повышает общий уровень цифровой грамотности учащихся и преподавателей.

Список литературы

1. Sosinsky Barrie. Cloud Computing Bible. Copyright ©, 2011 by Wiley Publishing. Inc.. Indianapolis. Indiana.

2. Курбанов З.М. Облачные технологии: Обзор и применение. Вестник науки и образования. Российский научно-методический журнал. № 4 (58). Часть 1. 2019 г.

3. Kurbanov Z.M. Important factors affecting modern Cloud technologies using in education. Journal of Contemporary Issues in Business and Government. 2021 г.. DOI: 10.47750/cibg.2021.27.02.1681. 1587-1594 с.

4. Курбанов З.М., Курбанова Р.З. Преимущества облачных технологий в высших учебных заведениях. Вестник КаршиГУ. 2(40). 2019 г.

5. Курбонов З.М. Использование возможностей Google Drive для совершенствования информационно-коммуникационной деятельности преподавателей. Вестник КаршиГУ. 2024 (1)

6. Аюпов Р.Х., Турсунов С.К. Цифровые технологии. Учебник. Ташкент: Издательство «Lesson Press», 2023г. 464 с.

7. Сабиржонов Р.А. и др. Перспективы развития современных цифровых технологий - монография. Ташкент: Издательство «Хилол Медиа», 2022. 202 с.

8. Pete Sharma. Using Technology In Language Teaching. Cambridge English. Topic: Technology and digital. 29.10.2021

9. Hayo Reinders. Using technology to support learning. Cambridge University Press & Assessment. 28.07.2022.

10. Senad Bećirović, Amna Brdarević-Čeljo, Haris Delić. The use of digital technology in foreign language learning | SpringerLink. 27.09.2021.

11. University of Illinois. Teaching with ChatGPT // Center for Innovation in Teaching & Learning. [2025]. URL: https://citl.illinois.edu/citl-101/instructional-spaces-technologies/teaching-with-technology/chatgpt (дата обращения: 18.02.2025).

12. Villasenor J. How ChatGPT Can Improve Education, Not Threaten It // SCIENTIFIC AMERICAN. 2023. Feb. 10. URL: https://www.scientificamerican.com/article/how-chatgpt-can-improve-education-not-threaten-it/ (дата обращения: 18.02.2025).

13. Northern Illinois University. ChatGPT and Education // Center for Innovative Teaching and Learning. [2025]. URL: https://www.niu.edu/citl/resources/guides/chatgpt-and-education.shtml (дат обращения: 18.02.2025).

14. Michaelsen A. Using ChatGPT for Language Learning // Ann Michaelsen. 2022. Dec. 29. URL: https://annmichaelsen.com/2022/12/29/using-chatgpt-for-language-learning/ (дата обращения: 18.02.2025).

15.Al-Maroof RAS, Al-Emran M. Students Accepting the Google Classroom: A Preliminary Study Using the PLS-SEM Approach // International Journal of New Learning Technologies (iJET). - 2018. - Т. 13. - № 06.-pp. 112-123.

16.Al-Adwan A. S., Al-Madadha A., Zvirzdinaite Z. Modeling students' readiness to adopt mobile learning in higher education: An empirical study //International Review of Research in Open and Distributed Learning. – 2018. – Т. 19. – No. 1.

17. Apostu A. et al. Study on advantages and disadvantages of Cloud Computing–the advantages of Telemetry Applications in the Cloud //Recent advances in applied computer science and digital services. – 2013. – Т. 2103.

18. Almadhoun, N., Dominic, P., & Abdulrahman, A.** (2021). *Security and Privacy Issues in Cloud-Based Education Systems*. Cloud Computing Journal, 13(1), 23-39.

19. Alshahrani, S., Ahmed, E., & Ward, R. (2018). The Impact of Cloud-Based Learning on Academic Performance. Journal of Educational Technology, 15(3), 112-126.

20. Murillo-Zamorano, L. R., Sánchez, J. Á. L., Godoy-Caballero, A. L., & Muñoz, C. B. Gamification and active learning in higher education: is it possible to match digital society, academia and students' interests? //International Journal of Educational Technology in Higher Education. – 2021. – Т. 18. – № 1. – pp. 1-27.

POLITICAL SCIENCES

GENDER QUOTAS IN POLITICS: ARE THEY EFFECTIVE IN PROMOTING ACTUAL GENDER EQUALITY?

Zamza T.
School of Law and Public Policy, Narxoz University
Professor Abdikadyrova Zh.
DOI: 10.5281/zenodo.15037231

Abstract

This study seeks to critically examine the effectiveness of gender quotas in politics, questioning whether they truly promote gender equality or serve more as symbolic gestures. My hypothesis proposes that while quotas indeed increase the presence of women in political roles, they do not necessarily drive deeper cultural or policy shifts within political systems. The research unfolds in two stages: a comparative analysis of gender quota policies across various countries to identify broader patterns and impacts, followed by a focused case study on Kazakhstan. By examining local data and public sentiment, the study investigates how quotas function within Kazakhstan's unique political landscape. The methodology combines quantitative analysis of representation trends pre- and post-quota, public survey of regular citizens of our country, alongside insights drawn from political discourse and media portrayals of female politicians.

This study offers a unique look at how gender quotas function across different cultures, with a close focus on Kazakhstan's specific context. By examining both international trends and local realities, this research aims to reveal how effective gender quotas actually are in advancing gender equality. Early findings suggest that, although quotas have increased the number of women in politics, they often don't address the deeper cultural and structural barriers that still limit women's roles. In exploring these challenges, this study doesn't just evaluate current methods – it also opens the door to potentially more effective strategies for creating lasting gender equity in politics.

This study aims to enhance our understanding of how to create a more inclusive political space. It emphasizes that government officials and policymakers should carefully consider the insights from this investigation into gender gaps and quotas before rolling out any reforms. With women making up more than half of Kazakhstan's population, the impacts of gender inequality are significant and far-reaching. By highlighting how current methods may fall short, this research advocates for a more comprehensive approach that goes beyond just meeting numerical targets. Instead, it calls for policies that genuinely address the underlying issues of gender inequality, fostering an environment where all voices are heard and represented in the political arena.

Keywords: gender quotas, gender equality, political representation, Kazakhstan, gender gaps, inclusive political space, policy reform, women's empowerment, structural barriers, intersectionality, political discourse, policy implications.

Introduction

In recent years, the conversation around gender equality in politics has gained momentum worldwide, with many governments introducing gender quotas as a primary tool to increase female representation in political institutions (Dahlerup, 2006). Gender quotas aim to bridge the gender gap by setting a minimum threshold for women's inclusion in political roles. Yet, as these policies become more widespread, the question arises: do gender quotas truly foster genuine inclusivity, or do they merely serve as symbolic gestures that leave underlying inequalities intact? This study investigates gender quotas within Kazakhstan's political context, aiming to reveal both their potential and limitations. Women constitute over half of Kazakhstan's population, yet they remain significantly underrepresented in decision-making roles (National Statistics Committee of the Republic of Kazakhstan, 2023). Kazakhstan's own gender quota laws have led to an increase in the number of women in politics, but it remains unclear whether this shift translates into substantive political influence or cultural acceptance. As such, exploring the effectiveness of these quotas is essential, not only to understand their immediate impacts but to see whether they create a foundation for meaningful equality and inclusivity.

This research centres on two main goals: first, to assess the effectiveness of gender quotas through both a cross-national comparison and a focused case study of Kazakhstan; and second, to explore public opinion on women in politics, using field research to gather insights into societal attitudes (Lovenduski, 2020). By combining quantitative analysis with qualitative perspectives from media, political discourse, and public opinion, this study seeks to provide a nuanced view of gender quotas. In particular, it will highlight how quotas can sometimes overlook the cultural and structural barriers that continue to hinder women's political empowerment, raising important questions for policymakers about how to make political reforms that lead to lasting, inclusive change (Franceschet, Krook, & Piscopo, 2012).

Literature Review: Theories and Existing Research on Gender Quotas

Theories on political representation emphasize the importance of having diverse voices in decision-making arenas – not simply for the sake of parity but to reflect the needs and aspirations of society at large. Descriptive representation theory argues that increasing the presence of women in politics naturally leads to policies that better serve women and other marginalized groups (Phillips, 1998). However, some scholars argue

that achieving gender balance through quotas alone may fail to translate into true influence, as these policies can remain surface-level without deeper structural change (Krook, 2009).

Critical mass theory suggests that there is a threshold at which the presence of women can begin to shift political dynamics – often cited as around 30% – whereby women can move from symbolic to substantive roles in decision-making (Dahlerup, 2006). Yet, following studies challenge this idea, showing that merely reaching this numerical threshold does not guarantee meaningful political change if the cultural and institutional barriers remain unaddressed (Franceschet & Piscopo, 2008). In some cases, as scholars like Dahlerup and Freidenvall (2022) have noted, gender quotas can even reinforce stereotypes, painting women politicians as "tokens" rather than leaders with autonomous political authority.

Kazakhstan's reality

Kazakhstan presents a unique case. Although gender quotas have been implemented, they often meet resistance within cultural norms that continue to perceive politics as a male domain. The complexities surrounding women's roles in Kazakhstani society mean that quotas alone may not suffice to challenge entrenched perceptions of women as secondary political actors (Khamzina, Z., 2020). In Kazakhstan's patriarchal context, the impacts of quotas are not only numerical but deeply intertwined with cultural narratives that shape how society views women in power. Here, we see the limitations of a policy meant to democratize representation – can it actually reach the roots of gender inequality when society itself might not yet be ready for this change? Further, research emphasizes the need to consider public perception when implementing gender quotas, as societal buy-in can determine a policy's success or failure. Studies on gender quotas in Latin America and Sub-Saharan Africa highlight that public opinion significantly influences the reception and effectiveness of such policies (Tripp, 2015; Bush, 2011). This perspective is relevant to Kazakhstan, where public acceptance could play a critical role in shaping whether gender quotas evolve into genuine pathways for inclusion or remain symbolic. As the literature reveals, while gender quotas can theoretically pave the way toward equitable political representation, their success hinges on factors beyond the legislative mandate. Kazakhstan's journey reflects the tension between institutional quotas and the cultural context in which they are implemented. This research aims to add to the discourse by investigating not only the structural impact of quotas but also the public's perception of women in politics – an aspect often overlooked yet critical in understanding whether quotas can truly drive inclusive reform.

Hypothesis and Research Questions

The journey of this study is a search for the truth behind the effectiveness of gender quotas. At its heart is the hypothesis that while gender quotas may successfully increase female representation in political roles, they may fall short of fostering the deeper cultural shift needed for true gender equality. The simple act of placing women in seats of power, though impactful in appearance, may not necessarily reshape the foundations of political dynamics or societal attitudes if underlying biases and structural barriers remain unchallenged. Guided by this hypothesis, the research will address the following central questions:

1. How effective are gender quotas in increasing both numerical and substantive representation of women in Kazakhstan's political landscape?
2. To what extent do gender quotas in Kazakhstan contribute to genuine political influence for women, or do they primarily fulfil symbolic roles?
3. What are the public perceptions and attitudes toward women in politics in Kazakhstan, and how do these views affect the acceptance and effectiveness of gender quotas?
4. How do cultural and institutional barriers impact the experience of women politicians in Kazakhstan, and how might these affect the long-term success of gender quotas?
5. What additional policies, if any, could complement gender quotas to create a more inclusive political environment in Kazakhstan?

These questions are not merely academic – they seek to pierce the veil of formality that often surrounds gender equality policies and to ask: Are we simply adding women to the system as it exists, or are we challenging the system to evolve alongside them? In the context of Kazakhstan, with its intricate cultural layers and unique political dynamics, the answers could redefine what it means to achieve true inclusivity in politics, laying the groundwork for reforms that extend beyond quotas and into the heart of societal structures.

Methodology. Questionnaire and Data Collection

In my scientific paper, I aimed to ground my analysis in both quantitative and qualitative data to deepen my understanding of gender-related perceptions within Kazakhstan's younger population. To achieve this, I designed and distributed a questionnaire among students at Narxoz University, seeking to capture diverse perspectives on gender quotas and their perceived effectiveness in politics. This approach provided a more intimate lens on the issue, revealing how future professionals view the topic beyond traditional or generalized surveys. I found that direct engagement with students allowed for more nuanced insights, especially as Narxoz students represent a range of socio-economic backgrounds and political awareness levels. In addition to the questionnaire, I conducted a comparative analysis to contextualize Kazakhstan's gender quota policies in a broader international framework. I examined countries with similar cultural and historical dynamics as well as contrasting cases where gender quotas have shown marked success, such as in parts of Europe, and places with more complex outcomes, such as Rwanda. This comparative approach highlighted how quotas interact with various cultural, economic, and political contexts, emphasizing that their success or failure is often contingent upon deeper social structures and local values. Together, these methods added layers of both local and global perspectives to my findings, providing a more comprehensive and critical evaluation of gender quotas and their impact.

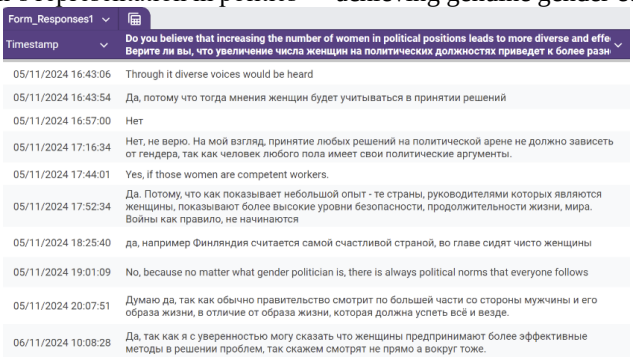
Field Research

Questionnaire

For the field research component, I conducted a questionnaire among my peers at Narxoz University. The questions were carefully designed to analyse general opinions in attitudes towards women in politics within the perspectives of the younger generation. The questionnaire included a total of 7 questions, aimed at exploring both general views on gender quotas and deeper perceptions of female leadership. Three of these questions followed a simple Yes/No/Other format to capture straightforward responses, while the remaining questions were open-ended, encouraging participants to express their thoughts in more detail. This approach allowed for a nuanced understanding of current attitudes and cultural tendencies among university students.

Pic.1. "Do you believe gender quotas in politics help achieve genuine gender equality?"

The results of the first question reveal that half of the respondents answered "no" regarding the effectiveness of gender quotas in achieving gender equality. This suggests that, in our society, there is a general scepticism toward policies that regulate representation for marginalized groups. Many respondents do not believe that increasing women's representation in politics necessarily leads to greater equality. Instead, there appears to be a widespread perception that simply ensuring women hold a certain number of seats does not address the deeper issues of gender inequality within society. This insight highlights a gap between symbolic representation and the more complex realities of achieving genuine gender equity.

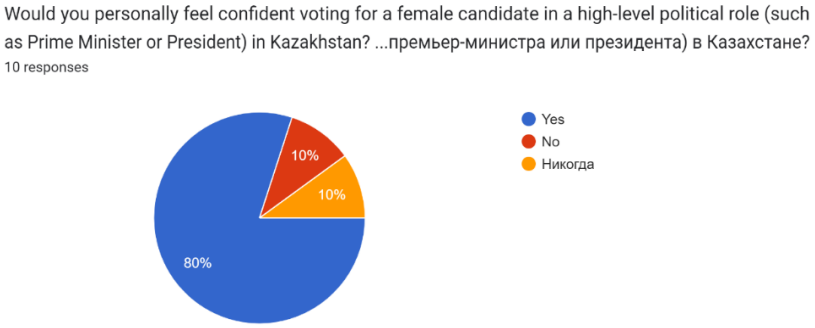


Form_Responses1

Timestamp	Do you believe that increasing the number of women in political positions leads to more diverse and effe… Верите ли вы, что увеличение числа женщин на политических должностях приведет к более разн…
05/11/2024 16:43:06	Through it diverse voices would be heard
05/11/2024 16:43:54	Да, потому что тогда мнения женщин будет учитываться в принятии решений
05/11/2024 16:57:00	Нет
05/11/2024 17:16:34	Нет, не верю. На мой взгляд, принятие любых решений на политической арене не должно зависеть от гендера, так как человек любого пола имеет свои политические аргументы.
05/11/2024 17:44:01	Yes, if those women are competent workers.
05/11/2024 17:52:34	Да. Потому, что как показывает небольшой опыт - те страны, руководителями которых являются женщины, показывают более высокие уровни безопасности, продолжительности жизни, мира. Войны как правило, не начинаются
05/11/2024 18:25:40	да, например Финляндия считается самой счастливой страной, во главе сидят чисто женщины
05/11/2024 19:01:09	No, because no matter what gender politician is, there is always political norms that everyone follows
05/11/2024 20:07:51	Думаю да, так как обычно правительство смотрит по большей части со стороны мужчины и его образа жизни, в отличие от образа жизни, которая должна успеть всё и везде.
06/11/2024 10:08:28	Да, так как я с уверенностью могу сказать что женщины предпринимают более эффективные методы в решении проблем, так скажем смотрят не прямо а вокруг тоже.

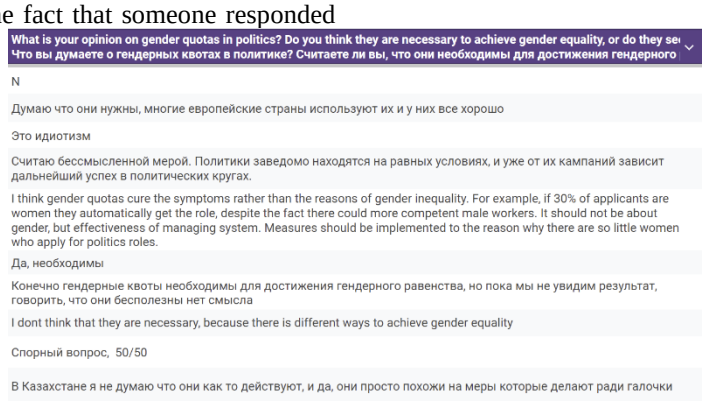
Pic.2. "Do you believe that increasing the number of women in political positions leads to more diverse and effective decision-making? Why or why not?"

The responses to the question reveal that support for diversity in leadership is evident, with some respondents valuing women's distinct perspectives as a way to enrich political decisions. This reflects a growing recognition among the younger generation that diverse voices can contribute positively to governance. However, there is a conditional acceptance based on competency, indicating that gender alone is not viewed as sufficient; there's an expectation for women in leadership to prove their qualifications, reflecting a possible societal emphasis on merit alongside representation. Some responses reveal doubt about the impact of gender alone on political outcomes, with a few participants arguing that political norms and systemic structures shape decisions more than the gender of those in power. This scepticism reflects a pragmatic outlook within Kazakh society, suggesting that while gender diversity is seen as valuable, it may not be enough to overcome deeper-rooted cultural and institutional barriers.



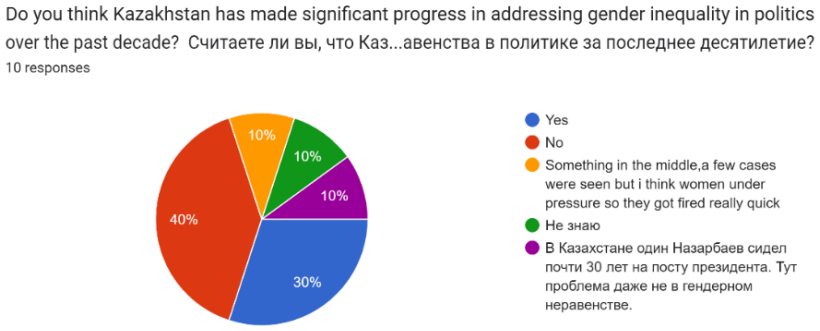
Pic.3. "Would you personally feel confident voting for a female candidate in a high-level political role (such as Prime Minister or President) in Kazakhstan?"

The results of this question reveal an encouraging level of support for female leadership in high-level political roles in Kazakhstan. A significant majority, 80%, responded confidently that they would vote for a female candidate, indicating a notable shift in public perception, especially among the younger generation. However, the presence of 20% who either responded "no" or, even more starkly, "never" (никогда) highlights lingering pockets of resistance. These responses likely stem from deep-seated societal views about gender roles that still influence opinions on women's place in political leadership. The fact that someone responded with "never" suggests an almost ideological rejection of female leadership, possibly tied to traditional views on gender that equate leadership with masculine traits. This may reflect a portion of society that views women as less suited to the perceived demands of high-level political roles, regardless of their qualifications or competencies. For policy-makers and advocates of gender equality, these results underscore the need for further education and engagement strategies to address these biases directly, particularly as Kazakhstan seeks to foster a more inclusive political landscape.



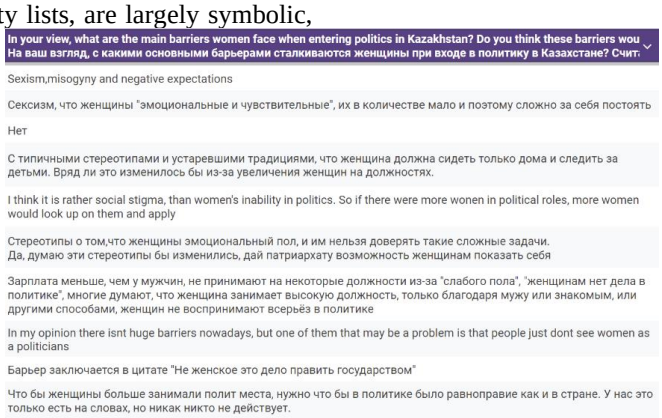
Pic.4. "What is your opinion on gender quotas in politics? Do you think they are necessary to achieve gender equality, or do they seem more like symbolic measures?"

The responses to this question reveal a divided view on gender quotas within Kazakh society. Some respondents support quotas, citing successful implementations in European countries or the necessity of quotas to achieve gender equality. This camp sees quotas as an essential tool – the one that still requires time to show tangible results in Kazakhstan. Others, however, view quotas with distrust or outright opposition. They argue that quotas may address symptoms rather than the underlying causes of gender inequality. This group suggests that the focus should be on removing the structural barriers that discourage women from entering politics rather than mandating representation. Some see quotas as meaningless gestures or "box-ticking" exercises, a sentiment that hints at a deeper frustration with superficial reforms that lack substance.



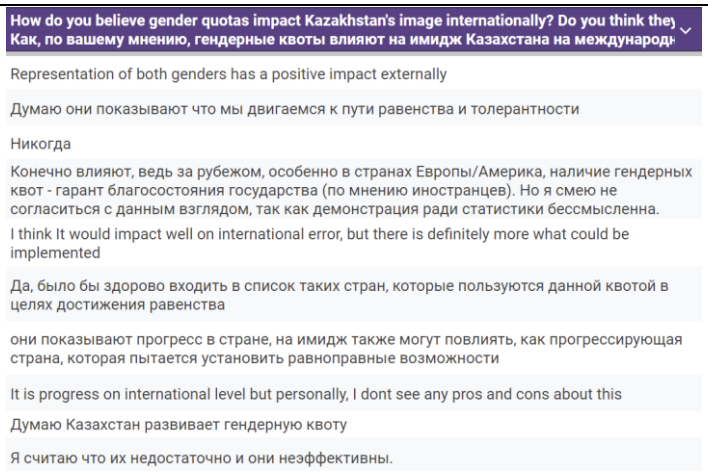
Pic.5. "Do you think Kazakhstan has made significant progress in addressing gender inequality in politics over the past decade?"

This chart reveals a strong suspicion among Kazakh respondents about the country's progress on gender equality in politics. With 40% indicating no significant progress, it reflects widespread disillusionment, likely rooted in the country's history of male-dominated, long-term leadership, such as Nazarbayev's nearly 30-year presidency. This scepticism could also stem from a perception that recent reforms, like the 30% gender quota in party lists, are largely symbolic, lacking real impact on women's empowerment in power structures. The 30% who view recent changes as progress may recognize the new quotas but might also see these reforms as initial steps rather than complete solutions. Other responses point to tokenism, where women are promoted but often lack lasting authority, highlighting a recurring issue in places where equality policies don't lead to broader social change.



Pic.6. "In your view, what are the main barriers women face when entering politics in Kazakhstan? Do you think these barriers would change if more women were in political roles?"

The predominant themes in the answers reveal that women in Kazakhstan still face significant barriers rooted in traditional stereotypes, societal expectations, and gendered biases. One prominent viewpoint expressed is that women are perceived as "emotional" or "sensitive," which positions them as less capable in the eyes of some in society, particularly in handling the rigors of politics. This stereotype reinforces the notion that emotionality is incompatible with the rationality demanded in governance, a deeply entrenched view in many patriarchal societies. Furthermore, the idea that "it's not a woman's business to run the state" indicates a long-standing belief in gender roles, where men are seen as the primary decision-makers and women as caregivers confined to domestic roles. Another critical issue is the perception that women's lower numbers in political positions make it harder for others to see them as legitimate leaders. This stigma around female participation in politics becomes a self-reinforcing cycle: fewer women in power positions discourage others from aspiring to similar roles, as they lack visible role models. This issue is exacerbated by stereotypes linking women's success to their husbands or influential connections rather than their own merit, further diminishing their perceived legitimacy. Additionally, some responses highlighted the structural inequalities women face in the workplace, such as unequal pay and limited access to higher-level positions, which perpetuate the idea that women are less suited for leadership. This is reinforced by another comment that suggests society sees women in high-ranking positions only as a result of nepotism or marital connections, not due to their individual competence.



Pic.7. "How do you believe gender quotas impact Kazakhstan's image internationally? Do you think they help to showcase progress, or could they be seen as insufficient?"

Some participants view quotas positively, suggesting they signal Kazakhstan's commitment to gender equality on the global stage. This aligns with the international perception that gender quotas can indicate a nation's progress towards social justice and tolerance, particularly in Western countries where quotas often accompany broader gender equality initiatives. However, a significant portion of the respondents express doubt about the effectiveness of quotas, arguing that quotas alone do not equate to genuine gender equality. One response even questions the necessity of implementing quotas for statistics' sake, highlighting a concern that quotas may merely serve as a superficial gesture rather than fostering real change. This sentiment reflects a broader criticism often seen in debates on quotas globally: the idea that focusing on representation might neglect deeper issues, such as cultural perceptions of gender roles and economic inequality that also influence women's opportunities (Krook & Norris, 2014).

Summary of the questionnaire.

The responses collectively depict a complex landscape regarding gender equality in Kazakhstan's political sphere. While a portion of respondents acknowledges some progress, the prevailing sentiment suggests that deeper societal changes are needed to dismantle the patriarchal norms that persistently hinder women. Gender quotas are seen as a double-edged sword: potentially beneficial for international perception but viewed domestically as insufficient or even disingenuous when not accompanied by substantive policy and cultural shifts.

Comparative Analysis of Gender Quotas and Representation: European and African Experiences

During the investigation I found that public sentiment in Kazakhstan leans towards rationalism regarding quotas, with many people viewing them as superficial tools rather than genuine drivers of gender equality. This public view aligns in part with international data, which shows that while quotas elevate the number of women in politics, they don't always lead to substantial social equality, particularly in societies with rigid gender norms and entrenched patriarchal structures.

In Europe, several countries serve as benchmarks in gender equality without necessarily enforcing strict quotas. Sweden and Norway, for instance, have achieved female representation rates of over 40% in national parliaments despite lacking legal mandates for quotas. This high level of female participation reflects a society-wide commitment to equality supported by robust policies across employment, education, and family welfare sectors, which together encourage a more inclusive approach to gender representation (European Commission, 2020). Countries like Belgium and Spain, which mandate a 50% gender quota, similarly demonstrate that quotas, when aligned with social values and supportive policies, can be effective. In Belgium, this has resulted in 47.7% of parliamentary seats being held by women, underscoring how legal structures and progressive values together drive equality (Inter-Parliamentary Union, 2021).

In Africa, Rwanda offers a unique case study. With a 30% gender quota mandated by law, Rwanda surpasses this threshold, with women holding an impressive 61% of parliamentary seats, the highest in the world. This achievement stems from post-genocide initiatives aimed at restructuring society and emphasizing gender inclusivity as a national rebuilding strategy. However, Rwanda's example also reveals the limitations of quotas: despite impressive representation in the politics, broader gender-based challenges in employment, education, and societal attitudes persist. Uganda and Kenya have similar quotas mandating around 30% female representation, yet these countries still struggle with deep-seated gender inequalities. For example, Uganda meets its political quota, but women's access to economic and educational opportunities remains restricted, reflecting how quotas in isolation may not fully address gender disparity (Tripp, 2015).

The contrast between these regions highlights how historical and socio-political factors influence the effectiveness of quotas. Europe's gender equality levels have been cultivated over decades through sustained policy efforts and economic motivation, with studies indicating a potential increase in the EU's GDP by up to 12% by 2050 if gender parity continues to progress (McKinsey Global Institute, 2015). Africa, on the other hand, grapples with the residual impacts of colonialism, economic instability, and patriarchal governance systems that persist in influencing societal structures.

These historical and economic barriers often prevent quotas from achieving their full potential in transforming gender relations across all areas of life (Tripp, 2015). This analysis suggests that while quotas play an essential role in improving numerical representation, their success in promoting genuine gender equality depends heavily on supporting policies and societal commitment to inclusive values. The findings align with Kazakh public opinion, revealing that quotas alone may not suffice to dismantle deep-seated inequalities; instead, a more comprehensive approach is required to ensure meaningful and lasting gender equity.

Quantitative Data Analysis — Impact of Quotas on Representation in Kazakhstan

Historical Comparison of Representation

In understanding the historical backdrop of gender equality in Kazakhstan, particularly in political contexts, one must look at the country's Soviet legacy. The Soviet Union promoted an image of egalitarianism, where women were encouraged – and often expected – to participate in the workforce and become "builders of socialism" This ideal was symbolized by figures like the female factory worker or collective farm labourer, who embodied the Soviet dream of a selfless, hard-working citizen contributing to the socialist state. Soviet propaganda celebrated female engineers, scientists, and pilots, projecting an image of progressivism and empowerment. However, the reality was more complicated. While women were present in various sectors of the workforce, actual positions of political influence remained predominantly male. The upper echelons of the Communist Party, which wielded real decision-making power, were heavily male-dominated. By the 1980s, Soviet policies had enabled women to hold around 51% of the workforce positions across the USSR, including Kazakhstan (Lapidus, 1978). Women's representation in these structures was largely symbolic, with their inclusion serving as a display of the USSR's supposed gender equality rather than a reflection of genuine influence. Most women held positions that, though integral to society, were structurally subordinate and rarely involved high-level policy or political decision-making.

This contradictory Soviet legacy left Kazakh women with a dual burden. They were expected to fulfil the Soviet ideal of a "worker and pioneer," contributing economically and socially, while simultaneously upholding traditional roles as mothers, wives, and caregivers. The Soviet state encouraged women's education and employment yet retained deeply entrenched expectations that women should prioritize family and household duties, leading to what some scholars call "double burden" or "double shift" (Silova, I., 2004). This framework imposed significant challenges, as women juggled the socialist vision of work outside the home with the culturally ingrained expectations of family life, often with limited structural support.

Trends and Growth Rates in Female Representation

In recent years, trends in female political representation in Kazakhstan have shown gradual progress, yet growth rates have been relatively slow, and women remain underrepresented in political leadership roles. The last three parliamentary elections reveal both the advancements and the ongoing challenges faced by women in Kazakhstan's political landscape.

In the 2016 elections for the Mazhilis, Kazakhstan's lower chamber, female representation was only about 27%, despite some party efforts to promote women (OECD, 2017). AMANAT, one of Kazakhstan's prominent political parties, had a limited number of female candidates in this election. However, following the 2021 elections, AMANAT increased its proportion of female members, reflecting a general shift toward greater gender inclusivity. Women won 29 seats in the Mazhilis, accounting for about 27.1% of the total representation—a modest improvement but still far from parity (Inter-Parliamentary Union, 2021). While quotas have aimed to encourage higher participation, cultural and political barriers remain significant. The most recent 2023 election saw another small increase in female representation. Official statistics indicate that women held 30% of the seats in the Mazhilis post-election (The Astana Times. 2023). Although this represented progress, it fell short of the 50% equality goal and underscored persistent challenges for achieving balanced representation.

In AMANAT's own structure, women's roles have grown, yet they are still far from equitable. In 2023, women made up approximately 35% of AMANAT's active members, a noticeable rise from previous years but reflective of gradual rather than transformative change (AMANAT Party Statistics, 2023). This percentage aligns with national trends in female representation but also reveals systemic limits, as many women within AMANAT and other parties occupy lower or mid-level roles, with fewer in executive or leadership positions.

Challenges and Limitations of Quantitative Metrics

In concluding this section, we discuss the limitations inherent in relying solely on quantitative data to measure quotas' impact. Numbers may indicate representation, but they do not capture qualitative factors like political influence or acceptance. For instance, while quotas increase women's presence, they may not grant women real power or influence, particularly if their roles remain symbolic or constrained by societal expectations. We argue that a comprehensive assessment of quotas' effectiveness must consider both quantitative growth and qualitative empowerment.

Qualitative Analysis — Media and Political Discourse on Women Politicians

This chapter provides a qualitative perspective, analysing how media portrayals and public discourse shape and often limit the impact of quotas on women in politics. Here, we investigate whether Kazakhstan's gender quotas have influenced societal narratives about women leaders, using content analysis and comparative case studies.

Public and Private Lives of Female Politicians

The lives of female politicians, compared to their male counterparts, are often subjected to an intense level of scrutiny that encompasses both their public roles and private lives. These dynamics reveals how societal expectations about women's roles intersect with

the responsibilities of public office, thereby framing female politicians through a lens that is as much personal as it is professional. Public discourse often revolves around a female politician's family choices, appearance, or emotional responses, while men in similar positions typically experience greater privacy and focus on their professional achievements alone. This double standard not only impacts women's public images but also pressures them into conforming to conventional gender expectations, often at the expense of their political credibility and authority.

Many female politicians have spoken out about the burdens of balancing public and private personas. Kamala Harris, the first female Vice President of the United States, has frequently faced scrutiny regarding her family background and personal relationships, with media outlets delving into her identity as a stepmother, a wife, and a woman of mixed heritage, elements rarely emphasized in male politicians' coverage (Goldstein, A. 2020). This focus on her personal identity frames her accomplishments within a narrative that subtly questions her legitimacy in a male-dominated field, suggesting that her role is still unconventional or novel because she is a woman.

This phenomenon is not unique to the United States. Female leaders globally face similar scrutiny. Jacinda Ardern, the former Prime Minister of New Zealand, experienced extensive public attention on her pregnancy and decision to give birth while in office. Media outlets worldwide covered her maternity leave with an almost invasive fascination, debating her ability to handle both motherhood and political leadership. Reflecting on this experience, Ardern expressed that "it is hard not to sometimes feel judged for how we choose to balance both roles" (Roy, E. A. 2018). In contrast, male politicians who become fathers rarely face similar questioning, an indicator of how gender expectations continue to shape perceptions of political capability and personal responsibility.

Societal Pressures and Gendered Expectations.

The phenomenon of gendered scrutiny aligns with research on societal expectations placed on women in leadership. As Burnet (2011) highlights, female politicians are often evaluated based on both their adherence to traditional gender norms and their effectiveness as leaders. This dual expectation can create an unmanageable standard, where women are criticized for being either "too feminine" or "too detached," forcing them to perform a delicate balancing act that their male peers generally avoid.

The implicit demand for women to be "both tough and tender" in leadership is something noted by Hillary Clinton, who has commented on the challenge of being perceived as "strong enough to lead" without being seen as "unfeminine" (Clinton, 2014). Clinton's career exemplifies the challenge of these dual standards: her every emotion, choice, and family connection has been subject to extreme scrutiny, creating an environment where her political positions were often overshadowed by personal narratives that questioned her femininity and resilience. This relentless focus on female politicians' personal lives not only limits their freedom to define themselves professionally but also reinforces societal narratives that position politics as an innately male domain.

The Cost of Visibility

This intense public scrutiny can lead female politicians to carefully curate their personal lives in order to meet societal expectations, which often implies conforming to traditional notions of womanhood. For example, female politicians in Kazakhstan and other conservative societies frequently report facing pressures to emphasize their roles as mothers and wives to be perceived as relatable or acceptable to their constituents (Tolen, 2019). This enforced visibility constrains their agency, often reducing complex political careers to caricatures that serve social expectations. The need to publicly reconcile political roles with domestic identities can discourage potential female leaders from entering politics, fearing they will be judged by standards irrelevant to their competence.

In addition, this relentless focus on their personal lives can lead to burnout and deter female politicians from seeking higher office. In one study, Norwegian parliamentarian Anette Trettebergstuen, openly queer, shared that the incessant media spotlight on her personal relationships took a significant emotional toll, making her wonder if "public office was worth the intrusion" (Dørum, K. (Ed.). 2019). Trettebergstuen's experience mirrors those of many women in politics, who are forced to reconcile their commitment to public service with the psychological burden of being publicly analysed in ways that extend well beyond their professional lives.

The reality of being a woman

The disproportionate focus on female politicians' private lives undermines their autonomy and shapes public perceptions of their capabilities. While male politicians are largely assessed on their policies and professional accomplishments, female politicians must negotiate societal expectations of femininity alongside their political identities. This bias creates a barrier to genuine gender equality in political representation, as women are forced to address personal matters that men are typically exempt from discussing. For true parity to be realized, media and public discourse must shift from enforcing gendered scrutiny to respecting the professional achievements of all politicians, regardless of gender.

Discussion. Symbolic Representation vs. Substantive Inclusion

This study examines the effectiveness of gender quotas within the Kazakhstani political landscape, questioning whether such quotas achieve substantive gender equality or remain largely symbolic. At the heart of this inquiry is a fundamental tension observed in various quota studies: while quotas visibly increase the number of women in politics, their impact on genuine political inclusion is often ambiguous, challenging the assumption that representation alone leads to meaningful influence (Dahlerup, 2006; Tripp & Kang, 2008).

On one hand, gender quotas serve as a significant mechanism to address visible gender imbalances in political representation, acting as a necessary first step towards equalizing opportunities in male-dominated

fields. They provide a scaffold for women's entry into spaces historically barred by cultural and institutional barriers, especially in post-Soviet states where such structures are deeply ingrained (Krook, 2016). An essential component of this study was assessing whether Kazakhstan's quotas extend beyond numeric goals to provide substantive political power for women, moving from mere representation to meaningful participation. While quotas facilitate women's entry into political institutions, survey responses suggest that this entry does not automatically equate to a voice in decision-making. Many respondents reported viewing women in leadership as politically constrained by a culture that continues to value male leadership and view female politicians as overly emotional or unfit for authoritative roles. This public perception aligns with Krook's (2016) and Tripp's (2008) findings, which demonstrate that quotas alone cannot dismantle patriarchal structures or address deep-seated beliefs about women's roles**.** Consequently, for women in Kazakhstan, quotas may provide political access, but they rarely result in true equality or an ability to shape policy substantively.

This leads us to the concept of symbolic representation versus substantive inclusion. Symbolic representation is often achieved by quotas through increased numbers of women in office; however, without broader support structures, this representation may lack substantive influence. In Kazakhstan, women in politics frequently face dismissive attitudes, a result of long-standing cultural expectations and patriarchal norms, which label women as unfit for leadership (Krook & O'Brien, 2012). This symbolic inclusion does not necessarily lead to policies that reflect women's interests or challenge institutional gender biases, underscoring the limitations of quotas in fostering true inclusivity.

Moreover, gender quotas tend to fulfill a largely symbolic role in appeasing international expectations. By meeting certain representation thresholds, Kazakhstan enhances its global image and attracts foreign investments as a progressive nation, yet this international approval does not translate into domestic acceptance or deeper social change. Krook (2016) and Pustovit (2019) note similar patterns in other countries, where quotas serve as external validations rather than internalized commitments to gender equality. The respondents' mixed attitudes towards quotas in this study highlight a distrust in quotas' standalone ability to enact genuine reform, indicating that quotas can only be effective in a broader context of changing social norms. For gender quotas to move beyond symbolic representation, there must be a commitment to policies that enable *substantive inclusion*. This would involve initiatives that go beyond numeric increases, such as leadership development programs for women, media reforms that portray women in positions of power with respect, and education programs challenging entrenched gender biases (Tripp & Kang, 2008). Addressing these cultural and institutional barriers is essential to fostering an environment in which women politicians are not only present but empowered to contribute meaningfully to decision-making processes.

Ultimately, while gender quotas are a powerful tool for increasing women's visibility in politics, their capacity to effectuate substantive inclusion remains limited without concurrent cultural shifts and supportive policies. Kazakhstan's experience underscores that quotas alone cannot dismantle the barriers women face in politics; a broader strategy that includes social and institutional change is crucial for fostering an environment where gender equality can thrive.

Policy Recommendations: Toward Inclusive Political Reforms

As we arrive at the heart of this study, the question of what to do next rings clear: What must we, as a society, implement to not only increase women's participation in politics but to fundamentally transform our institutions into inclusive, equitable spaces? This chapter is a call to action, a roadmap that presses for reforms that go beyond quotas to tackle the underlying biases that hinder gender equality. While quotas may act as a stepping stone, our analysis reveals that quotas alone cannot suffice. Deep–seated societal norms, outdated policies, and systemic structures are what truly impede progress. In light of these findings, we propose three critical, detailed recommendations for policies that can foster an inclusive political environment, guiding Kazakhstan — and perhaps other nations — toward genuine gender equity in politics.

Comprehensive Gender Sensitivity Training in Political Institutions

Gender sensitivity training may sound like a small, perhaps superficial step in the grand scheme of policy reform. However, its potential impact is profound, going to the heart of the institutional culture that perpetuates biases against women. In many political spaces worldwide, women still encounter environments that are at best dismissive and, at worst, hostile to female leadership. According to the United Nations Development Programme (UNDP), gender– sensitive governance training has had transformative impacts in countries like Rwanda and Sweden, where both female and male leaders undergo structured education to recognize and address their biases (UNDP, 2021). These trainings promote empathy, understanding, and behavioural change, creating institutions where women can thrive rather than merely survive.

In Kazakhstan, implementing gender sensitivity training within Parliament and local government councils could lead to monumental changes. Imagine a space where women are not just present because quotas say they must be, but where they are respected and supported as equal contributors to the nation's vision. Training that encourages male and female politicians alike to recognize the impact of unconscious biases could break down stereotypes that undermine female politicians. It would allow women to be recognized as decision– makers, strategists, and visionaries on their own terms. This shift can only be achieved when training is mandatory and continuous, with oversight mechanisms to ensure genuine engagement rather than token participation. Ultimately, this reform is about establishing the kind of environment where true gender equality can flourish.

Enhanced Mentorship and Support Programs for Emerging Women Leaders

Often overlooked, mentorship plays a pivotal role in a woman's journey through the political landscape. In many male– dominated political institutions, aspiring female leaders face significant challenges in finding mentors who understand and support their ambitions. Research shows that mentorship programs for women in politics, such as those implemented in Nordic countries, substantially increase women's success rates in elections and improve their retention in political roles (Nordic Co-operation, 2020). Through these programs, young women gain insights from seasoned leaders, who offer guidance, advice, and crucial support networks, empowering them to navigate and overcome obstacles unique to female politicians.

Imagine the power of a mentorship program in Kazakhstan, connecting young women at the start of their political careers with trailblazing female leaders who have already broken ground. Such a network would help nurture ambition and confidence, enabling women to learn strategies for campaigning, public speaking, and policy negotiation. Further, a program that brings together both mentors and mentees across regions and political parties could foster unity, building alliances that transcend political divisions and promote gender inclusivity. In this way, mentorship programs become more than just professional development tools; they cultivate communities that sustain women in leadership. For these initiatives to be successful, however, they require state backing, consistent funding, and institutionalized recognition as an essential part of political development. These programs will serve as lifelines, allowing aspiring female politicians to feel less alone and more empowered, knowing they belong in leadership.

Media Accountability for Equitable Representation of Female Politicians

One of the more insidious barriers to gender equality in politics lies within the media, where coverage of female politicians frequently leans toward the personal rather than the professional. This phenomenon limits women's political legitimacy, trapping them in a narrative that often defines them through their gender rather than their policy positions. Studies from the Geena Davis Institute on Gender in Media reveal that women politicians are 27% more likely to have their personal lives discussed in media coverage, which can overshadow their policy work and political ambitions (Geena Davis Institute, 2019). This skewed portrayal not only affects public perceptions but also impacts women's sense of agency and self– worth within their political roles. For women in Kazakhstan, encountering a press that focuses on their appearance or family status rather than their legislative work can be discouraging, framing their role in politics as a superficial endeavour rather than a platform for impactful change. Thus, a critical policy reform must be the establishment of media accountability guidelines that emphasize equitable and professional coverage of all politicians, regardless of gender. Implementing such guidelines in Kazakhstan would require collaboration between government bodies, media organizations, and independent watchdogs to ensure that female politicians are represented fairly. By advocating for standards that highlight political accomplishments and policy expertise rather than gendered narratives, Kazakhstan can take a significant step toward dismantling stereotypes. This reform would hold journalists accountable, requiring that women's roles in policy debates, legislative achievements, and leadership contributions are given the same weight and respect as those of their male counterparts. When media narratives align with the principles of equality, public perceptions will shift, paving the way for a society that values female politicians for their intellect, vision, and courage.

These recommendations – gender sensitivity training, robust mentorship programs, and media accountability – are not merely policy changes; they represent a transformative vision for Kazakhstan's future. Each proposal is a step toward reshaping political institutions into spaces that welcome and uplift women, breaking down the barriers that hold them back. By adopting these reforms, Kazakhstan has the opportunity to become a leader in the region for gender equality, setting a powerful example for other nations to follow. Real change, however, will only emerge if these reforms are implemented with commitment and urgency, backed by genuine political will. In pursuit of a world where women are equal players in the political realm, we must advocate, empower, and hold ourselves accountable to building a more inclusive future.

Conclusion: Reflections and Future Research Directions

Reflecting on the findings in this study, it is evident that gender quotas have a complex, multifaceted impact on the political landscape in Kazakhstan. Quotas, while instrumental in increasing female representation, do not alone resolve the deeper, systemic issues surrounding gender inequality in political life. This study uncovered a critical divide between the quantitative gains made through quotas and the persistent cultural and social barriers that limit women's influence in political spheres. With each chapter's analysis—from the historical trends in female representation to the nuanced perspectives of students at Narxoz University—one conclusion resonates: quotas are just the beginning of a journey toward true inclusivity. For Kazakhstan, where political and social traditions often converge to challenge gender parity, the path forward requires policies that go beyond quotas, embracing broader cultural and structural reforms that genuinely support women's empowerment.

This study underscores that quotas serve primarily as a catalyst, a way to open doors that were previously closed to women. However, they cannot fully eradicate the gendered expectations and biases that remain ingrained in public perceptions and political institutions. As discussed, media portrayals of women as secondary to their male counterparts or primarily defined by their personal lives significantly hinder the quota's effectiveness (Geena Davis Institute, 2019). Similarly, the Narxoz University survey revealed that young citizens harbour mixed feelings about the effectiveness of quotas, with many seeing them as a symbolic rather than substantive step toward gender equality. These findings

highlight a dissonance between policy intent and public perception, suggesting that any future reforms must address not only numerical representation but also societal attitudes and institutional cultures.

Future Research Directions

To build upon the foundation laid by this study, future research should explore several key areas that remain underexamined yet crucial to advancing women's roles in politics. First, a long– term study on the career trajectories of female politicians in Kazakhstan could yield invaluable insights into the real, lived impact of quotas over time. This approach would allow for a deeper understanding of whether quotas support lasting political careers or if they merely offer temporary visibility without genuine influence. Exploring this area may require comprehensive datasets on career length, progression, and the political impact of quota– elected women to determine if quotas correlate with sustained political success or are followed by a decline in participation once quotas are achieved (Beaman et al., 2009).

Second, future studies should incorporate comparative analyses with nations that have implemented more robust, culturally attuned policies to complement quotas. Countries like Rwanda, where a unique blend of quotas and extensive social reforms has fostered one of the highest levels of female representation globally, offer valuable models. By comparing Kazakhstan's journey with nations that have embedded gender equality into broader societal reforms, researchers can identify strategies that resonate within similar socio– political contexts (Tripp, 2015). Kazakhstan's journey could benefit from insights into how different nations combine quotas with systemic reforms in education, media portrayal, and political mentorship, creating a cultural shift alongside policy.

Finally, there is an urgent need for qualitative research focusing on the personal experiences of female politicians in Kazakhstan. Through in– depth interviews and case studies, researchers could capture the complex dynamics of women navigating political spaces in a country where traditional norms and modern aspirations often clash. The voices of these women—highlighting their achievements, struggles, and perceptions of the quota system—would provide a deeply personal perspective that quantitative data alone cannot offer. As Kamala Harris stated upon her historic election as Vice President of the United States, women "may be the first, but we will not be the last," signalling a legacy that each woman in politics is building for those who come after (Powers, 2020). Kazakhstan's female politicians similarly embody resilience and ambition, and their stories would enrich our understanding of the subtleties and challenges inherent in political life for women.

Concluding Thoughts

As we conclude, it is clear that while gender quotas are a critical step, they are merely a piece of a larger puzzle that must be completed for true gender equality. For Kazakhstan to evolve into a nation that not only counts women in politics but counts on them as leaders, future policies must be comprehensive, addressing institutional biases, cultural perceptions, and structural barriers. This study is a call for continued research, for policies shaped by both evidence and empathy, and for a Kazakhstan that is ready to embrace a future where gender equality is not an aspiration but a lived reality.

References

1. Lovenduski, J. (2020). The political representation of women: a feminist institutionalist perspective. In *Research Handbook on Political Representation* (pp. 210– 221). Edward Elgar Publishing.

2. Dahlerup, D. (2013). *Women, quotas and politics*. Routledge.

3. Franceschet, S., Krook, M. L., & Piscopo, J. M. (2012). *The Impact of Gender Quotas*. Oxford University Press.

4. Krook, M. L. (2010). *Quotas for women in politics: Gender and candidate selection reform worldwide*. Oxford University Press.

5. National Statistics Committee of the Republic of Kazakhstan. (2023). *Statistical yearbook of Kazakhstan*.

6. Khamzina, Z., Buribayev, Y., Yermukanov, Y., & Alshurazova, A. (2020). Is it possible to achieve gender equality in Kazakhstan: Focus on employment and social protection. *International Journal of Discrimination and the Law*, *20*(1), 5– 20.

7. Bush, S. S. (2011). International politics and the spread of quotas for women in legislatures. *International Organization*, *65*(1), 103– 137.

8. Dahlerup, D., & Freidenvall, L. (2022). Gender quotas in politics. In *Routledge Handbook of Election Law* (pp. 174– 186). Routledge.

9. Franceschet, S., & Piscopo, J. M. (2008). Gender quotas and women's substantive representation: Lessons from Argentina. *Politics & Gender*, *4*(3), 393– 425.

10. Phillips, A. (1998). *The politics of presence*. OUP Oxford.

11. European Commission. (2020). *Union of Equality: Gender Equality Strategy 2020– 2025*.

12. McKinsey Global Institute. (2015). *The power of parity: How advancing women's equality can add $12 trillion to global growth*.

13. Tripp, A. M. (2015). *Women and power in post– conflict Africa*. Cambridge University Press.

14. Inter– Parliamentary Union. (2021). *Women in national parliaments*.

15. IDEA. (2024*). Gender quotas database*. International Institute for Democracy and Electoral Assistance.

16. Krook, M. L., & Norris, P. (2014). Beyond quotas: Strategies to promote gender equality in elected office. *Political Studies*, *62*(1), 2– 20.

17. Hughes, M. M., Paxton, P., & Krook, M. L. (2017). Gender quotas for legislatures and corporate boards. *Annual Review of Sociology*, *43*(1), 331– 352.

18. UN Women. *Gender quotas and other measures to promote women's political participation.*

19. Questionnaire "Gender quotas in politics" from Talipbay K. Zamza

20. Silova, I., & Magno, C. (2004). *Gender equity unmasked: democracy, gender, and education in Central/Southeastern Europe and the Former Soviet Union.* Comparative Education Review, 48(4), 417– 442.

21. Lapidus, G. W. (1978). *Women in Soviet Society: Equality, Development, and Social Change*. University of California Press.

22. AMANAT Party Statistics. (2023). *Annual membership report.*

23. The Astana Times. (2023, March 19). *Six parties elected to parliament, according to final results of Central Election Commission*. The Astana Times.

24. Inter– Parliamentary Union. (2021). Women in national parliaments. World Bank Database.

25. OECD. (2017). *Gender equality in public life: Kazakhstan*.

26. Burnet, J. E. (2011). *Women have found respect: Gender quotas, symbolic representation, and female empowerment in Rwanda*. Politics & Gender, 7(3), 303– 334.

27. Roy, E. A. (2018, January 26). *Jacinda Ardern baby mania: New Zealand 'besotted' with pregnant prime minister*. The Guardian.

28. Clinton, H. R. (2014). *Hard Choices*. Simon & Schuster.

29. Goldstein, A. (2020, October 9). *Kamala Harris is confronted by both racism and sexism in her run for vice president*. The New York Times.

30. Dørum, K. (Ed.). (2019). *Nordic gender equality policy in a Europeanisation perspective*. Routledge.

31. Geena Davis Institute on Gender in Media. (2019). *Gender Bias in Media Coverage of Female Politicians.*

32. Nordic Co–operation. (2020). *Mentorship and women in politics*.

33. United Nations Development Programme. (2021*). Gender equality in public administration*.

34. Beaman, L., Duflo, E., Pande, R., & Topalova, P. (2009). *Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India*. Science, 335(6068), 582– 586. doi:10.1126/science.1212382

35. Geena Davis Institute on Gender in Media. (2019). *Gender Bias in Media Coverage of Female Politicians*.

36. Powers, M. (2020). *Kamala Harris: The First, But Not the Last.* Vogue.

TECHNICAL SCIENCES

IMPROVED DEFORMATION AND INCREASED HARDNESS IN AUTOMOTIVE ALLOY WITH THE ADDITION OF BISMUTH

Vera-Serna P.
Polytechnic University of Tecámac
García-Domínguez G.
Technological University of Tecámac
Braulio-Sánchez M.
National Technological Institute of Mexico/TSI South of Guanajuato
Hernandez-Alonso Josue R.
Polytechnic University of Tecámac
DOI: 10.5281/zenodo.15037239

Abstract
This work developed a study on the modifications in aluminum alloy as such a development to apply to car body commercial of sedan vehicle, the results showed superior results in hardness, a integration of material in the alloy, a displacement on the peaks of profile obtained by X-Ray Diffraction and increased the displacement to be subjected the specimen to load in tensile test. Its knowledge can be used to develop of different news proposal of alloys in specific cases to use the capacity of deformation. The results showed values increased in the same direction than others works published in literature.
Keywords: Automotive alloys**;** Addition of bismuth**;** Aluminum alloy**;** Mechanical Strength**;** Hardness in alloys.

1.0 INTRODUCTION

In recent years in automotive industry different material used in car body and space industries has been of increasing interest in various directions such as cost, energy saving, weight loss and strength. [Hirsch 1997]. Other interest has been developed strict legal requirements for environmental protection and increased crashworthiness [Tisza 2018]. Today there are different materials used in the automotive manufacture as conventional HSSs and AHSSs, composites in specific carbon fiber reinforced plastics or CFRP, advanced materials and alloys in aluminum series, magnesium, titanium. The new materials in automotive industry too are required to meet the fuel economy in terms of pollution emissions per kilometer drive and get a better performance in the characteristics of vehicles, one advantage is the average on fuel economy is also challenging every year, for example in the United States of America was reported by Wen Zhang, Jun Xu (2022). In this direction the lightweight composite materials are an emerging technology that had gathered much interest from the space and automotive industries (Siengchin, 2023). The results in less weight are oriented to get as 2025 goal of average CO2 emissions to 89 g/km, reduced by about 40% compared with the last decade and the applications are extensively diverse in components such as dashboard, bumper, engine, transmission system, body shell, wheel, suspension system, brake, steering system, battery, seat, gearbox and accessories(Zhang y Xu, 2022). In automotive industry the addition of materials to develop new systems light and energy absorber are sectioned to new proposal in body car, it is necessary in the automotive market to offer advantages over other products in automotive market (Wang & Weiler, 2022). Is disponible a vision shows by Phaedra Martin (2025). She wrote that there are intense changes in the automotive industry, it will be in the next few years, oriented to be known more broadly as "*the mobility industry–the next generation of products and services*" with transportation combined with new advantages in materials, digital sciences, and business models such as ride-sharing and shared ownership. The research improvement that products and services.

Materials such as aluminum and magnesium in alloys still in the context of their utilization in the metallurgical and automotive industry, it studies carried out in the literature help to solve the problem of reducing the weight of automotive devices and structures to reduce fuel consumption through the use of aluminum-magnesium alloys (Hao et al, 2023), while in the manufacture industry are use alloys with sufficient strength for stability and durability, good formability for stretching, joining like welding, high corrosion resistance and recyclability, there are series as 5xxx, 2xxx, 6xxx using Cu, Mg, Si and Zn in different series (Hirsch, 1997) (Zhang & Xu, 2022),

Studies on addition of materials in alloys are identified in diverse literature on recent years (Kılınç et al., 2023) (Hassan et al., 2020). The development of solder alloys still having interest on the research field, so the properties of an alloy significantly influence its utility and lifespan (Shenggang, 2023), there are materials added to alloys to get different mechanical properties and the addition of elements has demonstrated a certain composition, the progress of corrosion poses potential risks to personal safety degree of improvement in alloy properties, indicating the positive effect of elements such as Bi on the mechanical properties, the literature shows that studies have shown that the addition of Bi to alloy affects the electrochemical performance of the alloy to a certain extent, with limited research in this area, a particular research of alloys with different Bi contents (x = 0, 3, 6, 9, 12, 15 wt%) were prepared by Shenggang et al., getting decreased properties in some cases while in others cases the corrosion resistance increased, the studies are limited to alloys with Sn and Cu.

Really the alloys used in body car are limited in their ability to make themselves known, it develop interest to try to identify the elements of alloys and explore the addition of bismuth, the commercials alloys with the mentioned material is not widely identified in the literature, it is a good possibility to the evaluation to commercial alloy used in vehicle to get the analysis of the results. We studied an alloy used in sedan vehicle, it was evaluated and compared with other alloy addition of bismuth oxide to show the results obtained.

2.0 MATERIALS AND METHODS

The materials used in alloy were obtained from door post in a compact commercial sedan vehicle. The addition of bismuth oxide particles from Sigma-Aldrich, with a purity of 99%, was carried out at a rate of 4% by weight. A Bruker D8 Advance X-ray diffractometer with 1.6 kW and Cu radiation (λ= 0.14051 Å) was used for structural characterization. The measurement was evaluated over a range of 15 to 80 degrees with a step size of 0.02º. A LynxEye XE detector was used. Hardness was measured on a Mitutoyo Wizhard using a 15N scale. The photography from surface was obtained with a Scanning Electronic Microscope JOEL model JSM- 6000 in high vacuum with 10 kV. The deformation and mechanic strength measurements were obtained from Marxtext machine model ETM-100 with capacity in 100KN and velocity at 0.5 millimeter/minutes. Muffle furnace used was Felisa FE 340.

The procedure followed was to prepare samples, the first one was evaluated the original material after applying heat treatment below the melting temperature of aluminum, while in the second case bismuth oxide was added, the same heat treatment was applied as in the first case and then the samples were evaluated. The standard applied to sample was the ASTM E8/E8M, it standard shows the dimensions of the sample, the distances to fix the gage.

Table 1

Identification of samples

Identification	Sample
A0	Original part aluminum alloy
A1	Alloy modified with bismuth

3.0 RESULTS

The alloys were evaluated with specimens in accordance with standard E8/E8M. The specimens A0 and A1 were subjected to heat treatment in different time, in order to compare the results under the same conditions. The figure 1 shows the specimen inside of muffle furnace.

Figure 1. Specimen in muffle.

Within the results obtained after adding bismuth oxide it is possible to observe in the X-Ray Diffraction profile the phases present derived from the incorporation of bismuth, which is possible to appreciate in the phases identified in the profile A1 in figure 2, where the response profile at angles 32.2°,45.2° and 45.4° could be corresponds to the phases of Bi_6MoO_{12} (PDF00-0036-0116) and 32° and 32.5° in $Bi_{0.9}Al_{0.2}Fe_{0.9}O_3$ (PDF 01-081-8320), with the indexation it is possible to observe the integration of bismuth in the alloy structures and with this are attributed the changes in the properties.

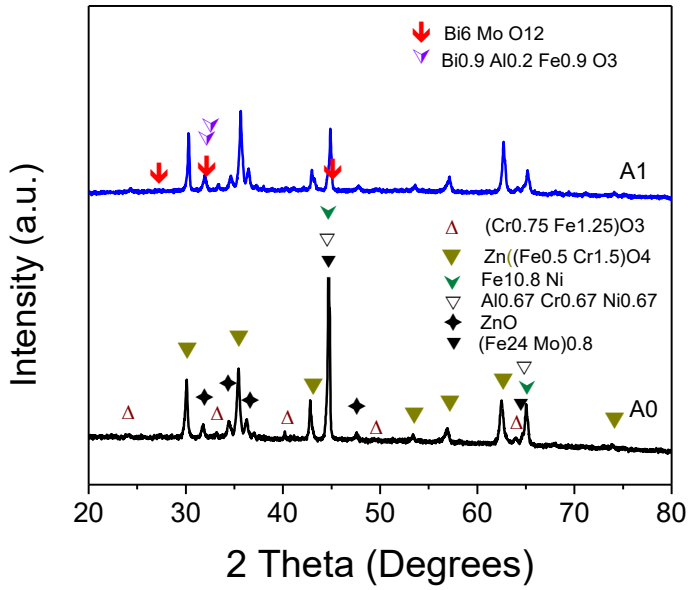


Figure 3 Profiles from alloys A0 and A1.

In figure 3 the profiles are compared more closed, and the bismuth generate displacements on the peaks and were identified peaks of bismuth compounds (PDF 05-001-0353).

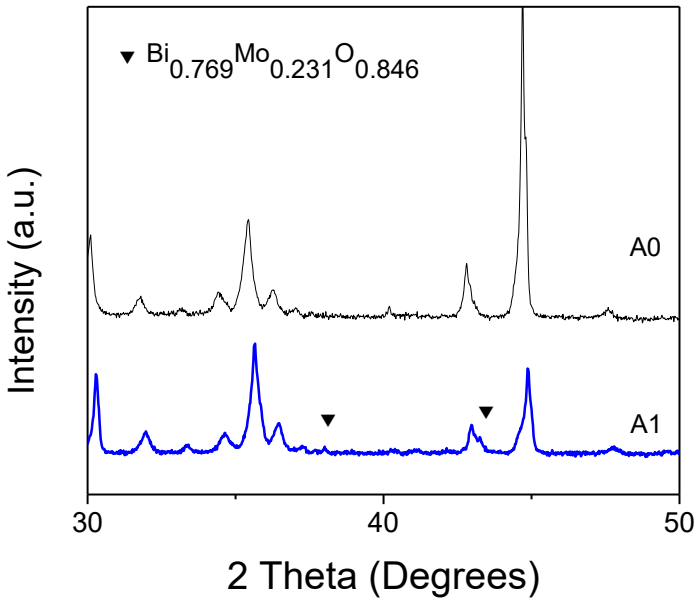


Figure 3. Displacement of peaks in profile of XRD

After to structural characterization with X-Ray Diffraction, the specimens were subjected to the same treatment conditions and were evaluated with respect to hardness under room temperature conditions, with the results shown in Table 2, the addition of bismuth increased the hardness by 32.25%.

Table 2.

Hardness

Sample	Hardness (Scale 15N)
A0	15.5
A1	20.5

A technique used was the scanning electron microscopy in which it was possible to observe the modifications on the surface of the sample, situation originated by the thermal treatment and the addition of bismuth oxide on the sample A1, in figure 4 is an image clear on surface of specimen A0, while in figure 5 a layer was observed which is congruent with the results

of X-ray diffraction with the present a surface with particles.

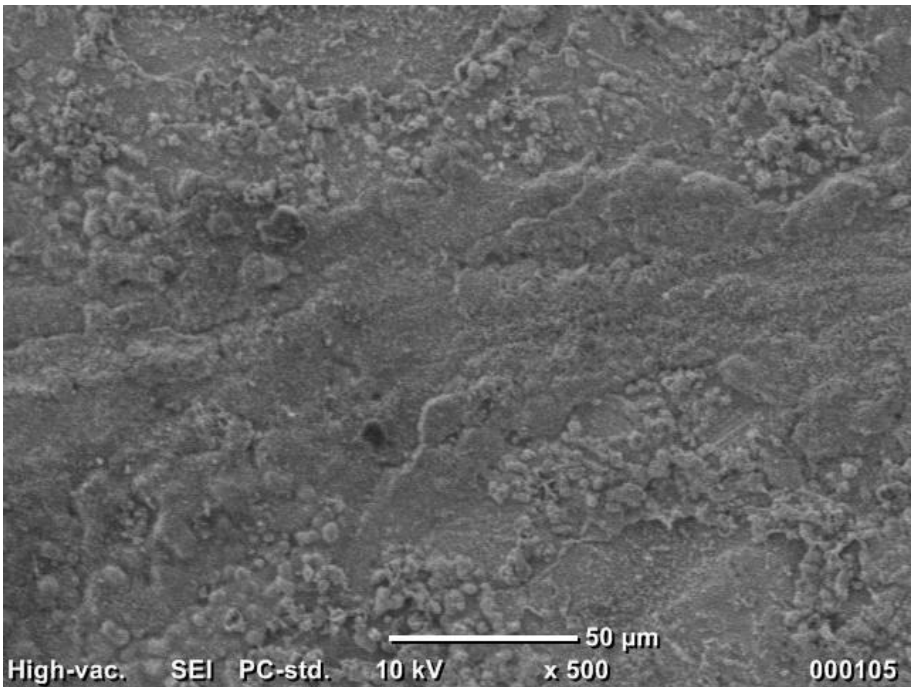


Figure 4. Surface from alloy A0

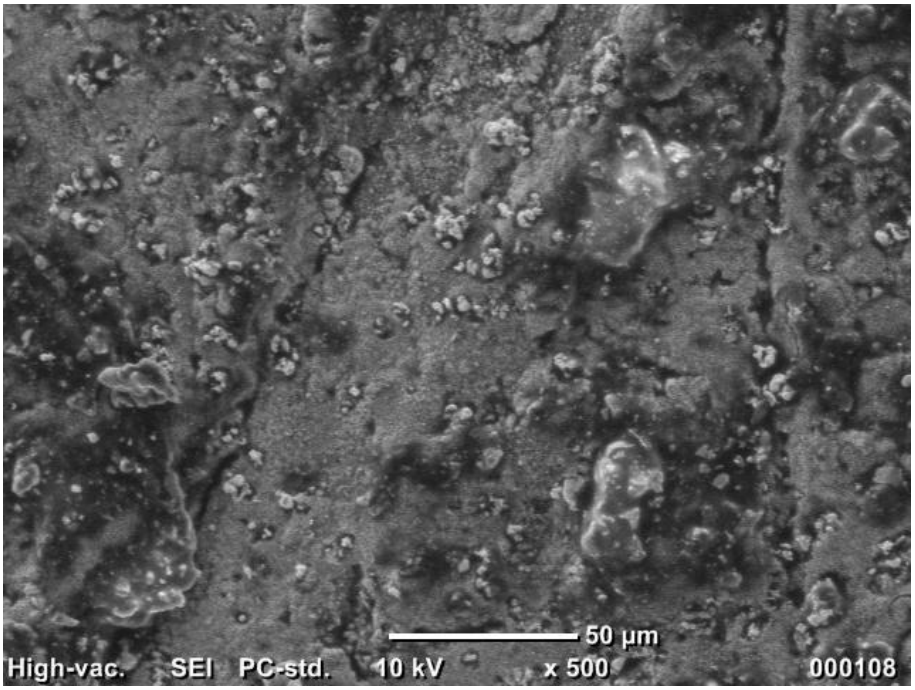


Figure 5 Surface from alloy A1

Regarding the mechanical strength of the specimens when subjected to a tensile test under ASTM E8/8M standards, their stress-strain graphs were obtained. Figure 6 shows the graph corresponding to specimen A0 and the results of specimen A1. Displacements in the deformation may be related to the change of crystal structure that may be generating point defects.

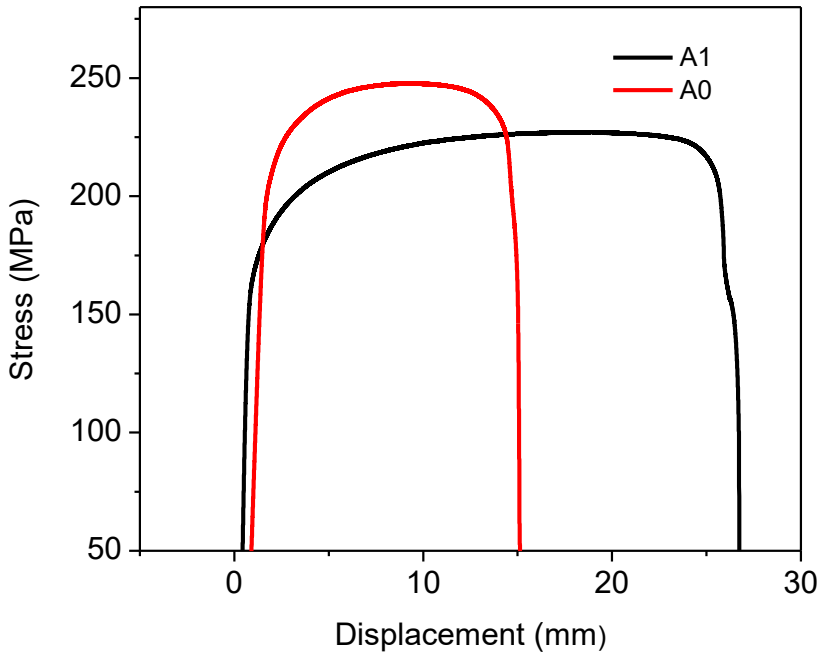


Figure 6. Mechanical strength in alloys

The modifications in alloy with addition of bismuth are in accordance with the study developed by Medine Kılınç et al. (2023), the hardness increased, new phases were identified. Obviously, the composition of alloy was different but generate new phases by the addition of the material with the results obtained by TEM and SEM. In other case in alloy of aluminum with addition of bismuth in 4% in weight was founded a very significant improvement beyond the 10.0% elongation observed from the control specimen, the value is lower than the results obtained in the present work but the results are in the same direction (Ugochukwu et al., 2024). The displacement observed in the

CONCLUSIONS

The addition of bismuth in alloy let identify the changes on the properties in the material. In the case of applications to automotive car body the mechanical resistance decrease, but the displacement increases in considerable value, it could help to use energy in deformation got values on 32% over the results obtained in original specimen, the profiles of X-Ray Diffraction showed the new phases with bismuth alloy in accordance with the 4% in weight, while the photographs from Scanning Electronic Microscope allow identify the material added and the modifications in surface.

References

1. Hao, Z., Ju, Y., & Chen, L. (2023). The use of aluminium and magnesium alloys in automotive lightweight technologies. *Journal of Mechanical Science and Technology*, *37*(9), 4615-4622. https://doi.org/10.1007/s12206-023-0712-2

2. Hassan, M. A., Mamat, O. B., & Mehdi, M. (2020). Review: Influence of alloy addition and spinel coatings on Cr-based metallic interconnects of solid oxide fuel cells. *International Journal of Hydrogen Energy*, *45*(46), 25191-252

3. Hirsch, J. (1997). Aluminium Alloys for Automotive Application. Materials Science Forum, 242, 33–50. https://doi.org/10.4028/www.scientific.net/msf.242.33

4. Kılınç, M., Elen, L., Ahlatcı, H., Sun, Y., Türen, Y., & Acarer, M. (2023). Investigation of A New Type of Aluminum–Magnesium Alloy with Bismuth Additions Subjected to Thermomechanical Heat Treatment. *International Journal of Metalcasting*, *18*(1), 649-666. https://doi.org/10.1007/s40962-023-01059-w

5. Luo, A. A. (2021). Recent advances in light metals and manufacturing for automotive applications. *CIM Journal*, *12*(3), 79-87. https://doi.org/10.1080/19236026.2021.1947088

6. Martin, P. (s. f.). The Future of the Automotive Industry. *GE Vernova*. https://www.gevernova.com/software/blog/the-future-of-the-automotive-industry.

7. Shenggang, Z., Yi, Z., Jihao, D., Anyu, Y., & Yong, C. (2023). Study on the preparation and properties of Sn–0.7Cu–xBi alloy. *RSC Advances*, *13*(50), 35161-35171. https://doi.org/10.1039/d3ra06742d

8. Siengchin, S. (2023). A review on lightweight materials for defense applications: Present and future developments. *Defence Technology*, *24*, 1-17. https://doi.org/10.1016/j.dt.2023.02.025

9. Tisza, M., & Lukács, Z. (2018). High strength aluminum alloys in car manufacturing. IOP Conference Series Materials Science and Engineering, 418, 012033. https://doi.org/10.1088/1757-899x/418/1/012033

10. Ugochukwu U. Anyafulu, Chilee M. Ekwedigwe, Chidume N. Nwambu, Eugene E. Nnuka (2024). Effect of Bismuth and Lead on the Mechanical Properties of Aluminium-4%Copper Alloy, *UNIZIK*

Journal of Engineering and Applied Sciences 3(2), 691-698.

11. Wang, G. G., & Weiler, J. (2022). Recent developments in high-pressure die-cast magnesium alloys for automotive and future applications. *Journal of Magnesium and Alloys*, *11*(1), 78-87. https://doi.org/10.1016/j.jma.2022.10.00109. https://doi.org/10.1016/j.ijhydene.2020.06.234

12. Zhang, W., & Xu, J. (2022). Advanced lightweight materials for Automobiles: A review. *Materials & Design*, *221*, 110994, https://doi.org/10.1016/j.matdes.2022.110994

POLISH JOURNAL OF SCIENCE
№84 (2025)
VOL. 1

ISSN 3353-2389

Polish journal of science:

- has been founded by a council of scientists, with the aim of helping the knowledge and scientific achievements to contribute to the world.
- articles published in the journal are placed additionally within the journal in international indexes and libraries.
- is a free access to the electronic archive of the journal, as well as to published articles.
- before publication, the articles pass through a rigorous selection and peer review, in order to preserve the scientific foundation of information.

1000 copies
POLISH JOURNAL OF SCIENCE
Wojciecha Górskiego 9, Warszawa, Poland, 00-033
email: editor@poljs.com
site: http://www.poljs.com