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Netherlands

November, 2025
№ 11

Amsterdam, Netherlands
6-7.11.2025

International
Scientific
Conference

European Research Materials

UDC 001.1
P 97

Publisher.agency: Proceedings of the 11th International Scientific Conference «European Research Materials» (November 6-7, 2025). Amsterdam, Netherlands, 2025. 315p

ISBN 978-5-9616-1274-5
DOI 10.5281/zenodo.17602699

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EXPLORING THE CONCEPT OF RESEARCH COMPETENCE: A COMPARATIVE ANALYSIS OF NATIONAL AND INTERNATIONAL PERSPECTIVES

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Abstract

Contemporary geopolitical challenges affecting the exchange of knowledge and advanced technologies have created a pressing need for Kazakhstan to intensively develop its national intellectual capital and accelerate the generation of new scientific knowledge. These processes underscore the relevance of studying the concept of *research competence* as a key phenomenon in the context of higher education and scientific development. The purpose of this article is to identify the main approaches to defining the essence of *research competence* in educational science through a theoretical analysis of the works of national and international scholars.

The study is grounded in the competency-based approach. The primary research methods include analysis and synthesis of national and international scholarly works focused on defining the essence of the concept of research competence.

Over the past two decades, several theoretical approaches have emerged in educational science to conceptualize research competence. These include the systemic, activity-based, value-activity, axiological, process-technological, competency-based, and synergetic approaches. In the international literature reviewed, research competence is predominantly viewed as a set of skills necessary for conducting scientific inquiry. Moreover, foreign scholars often associate the concept of research competence with research literacy, understood as a collection of competencies related to an individual's cognitive and intellectual activity.

The diversity of approaches to defining and conceptualizing research competence that has emerged in national and international scholarship over the past two decades enables a comprehensive examination of this phenomenon. As society continues to evolve—driven by trends in digitalization, technologization, and the development of networked cooperation among universities and other institutions—there is a growing need to reconsider the components of research competence. These developments highlight the relevance and necessity of further research aimed at identifying and substantiating the criteria and methodologies for developing research competence among students.

Keywords: competence, research competence, competence approach, research activity, innovation environment, education, international scientists, academic exchange

ИЗУЧЕНИЕ КОНЦЕПЦИИ ИССЛЕДОВАТЕЛЬСКОЙ КОМПЕТЕНТНОСТИ: СРАВНИТЕЛЬНЫЙ АНАЛИЗ НАЦИОНАЛЬНЫХ И МЕЖДУНАРОДНЫХ ПЕРСПЕКТИВ

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Аннотация

Современные геополитические вызовы, влияющие на обмен знаниями и передовыми технологиями, привели к тому, что Казахстан остро нуждается в интенсивном развитии своего национального интеллектуального капитала и ускорении генерации новых научных знаний. Эти процессы подчеркивают актуальность изучения концепции исследовательской компетентности как ключевого феномена в контексте высшего образования и развития науки. Целью данной статьи является выявление основных подходов к определению сущности исследовательской компетентности в науке об образовании на основе теоретического анализа работ отечественных и зарубежных ученых.

В основе исследования лежит компетентностный подход. Основные методы исследования включают анализ и обобщение национальных и международных научных работ, направленных на определение сущности понятия исследовательской компетентности.

За последние два десятилетия в педагогической науке появилось несколько теоретических подходов к концептуализации исследовательской компетентности. К ним относятся системный, деятельностный, ценностно-деятельностный, аксиологический, процессно-технологический, компетентностный и синергетический подходы. В рассмотренной международной литературе исследовательская компетентность преимущественно рассматривается как набор навыков, необходимых для проведения научных исследований. Более того, зарубежные ученые часто связывают понятие исследовательской компетентности с исследовательской грамотностью, понимаемой как совокупность компетенций, связанных с когнитивной и интеллектуальной деятельностью индивида.

Разнообразие подходов к определению и концептуализации исследовательской компетентности, возникших в национальной и международной науке за последние два десятилетия, позволяет всесторонне изучить этот феномен. По мере того как общество продолжает развиваться, движимое тенденциями цифровизации, технологизации и развития сетевого сотрудничества между университетами и другими учреждениями, растет потребность в пересмотре компонентов исследовательской компетентности. Эти разработки подчеркивают актуальность и необходимость дальнейших исследований, направленных на выявление и обоснование критериев и методик формирования исследовательской компетентности у студентов вузов.

Ключевые слова: компетентность, исследовательская компетентность, компетентностный подход, исследовательская деятельность, инновационная среда, образование, международные ученые, академический обмен.

ЗЕРТТЕУ ҚҰЗІРЕТТІЛІГІ МӘНІНЕ ҰЛТТЫҚ ЖӘНЕ ХАЛЫҚАРАЛЫҚ ПЕРСПЕКТИВАЛАР НЕГІЗІНДЕ САЛЫСТЫРМАЛЫ ТАЛДАУ

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Аңдатпа

Білім мен озық технологиялармен алмасуға әсер ететін қазіргі заманғы геосаяси сын-қатерлер Қазақстанның өзінің Ұлттық зияткерлік капиталын қарқынды дамытуға және жаңа ғылыми білімдерді қалыптастыруды жеделдетуге аса мұқтаж болуына әкелді. Бұл процестер жоғары білім мен ғылымды дамыту контекстіндегі негізгі құбылыс ретінде зерттеу құзыреттілігі тұжырымдамасын зерттеудің өзектілігін көрсетеді. Бұл мақаланың мақсаты отандық және шетелдік ғалымдардың жұмысын теориялық талдау негізінде білім беру ғылымындағы зерттеу құзыреттілігінің мәнін анықтаудың негізгі тәсілдерін анықтау болып табылады.

Зерттеудің негізінде құзыреттілік . Зерттеудің негізгі әдістері зерттеу құзыреттілігі ұғымының мәнін анықтауға бағытталған ұлттық және халықаралық ғылыми жұмыстарды талдау мен жалпылауды қамтиды.

Соңғы екі онжылдықта педагогика ғылымында зерттеу құзыреттілігін тұжырымдамалаудың бірнеше теориялық тәсілдері пайда болды. Оларға жүйелік, белсенділік, құндылық-белсенділік, аксиологиялық, процесс-технологиялық, құзыреттілік және синергетикалық тәсілдер жатады. Қарастырылған халықаралық әдебиеттерде зерттеу құзыреттілігі негізінен ғылыми зерттеулер жүргізу үшін қажетті дағдылар жиынтығы ретінде қарастырылады. Сонымен қатар, шетелдік ғалымдар көбінесе зерттеу құзыреттілігі ұғымын адамның танымдық және интеллектуалдық қызметімен байланысты құзыреттер жиынтығы ретінде түсінілетін зерттеу сауаттылығымен байланыстырады.

Соңғы екі онжылдықта ұлттық және халықаралық ғылымда пайда болған зерттеу құзыреттілігін анықтау мен тұжырымдамалаудың әр түрлі тәсілдері осы құбылысты жан-жақты зерттеуге мүмкіндік береді. Университеттер мен басқа мекемелер арасындағы цифрландыру, технологияландыру және желілік ынтымақтастықты дамыту тенденцияларына негізделген қоғам дамуын жалғастыра отырып, зерттеу құзыреттілігінің компоненттерін қайта қарау қажеттілігі артып келеді. Бұл әзірлемелер білім алушылардың зерттеу құзыреттілігін қалыптастыру критерийлері мен әдістемелерін анықтауға және негіздеуге бағытталған әрі қарайғы зерттеулердің өзектілігі мен қажеттілігін көрсетеді.

Түйін сөздер: құзіреттілік, зерттеу құзыреттілігі, құзыреттілік тәсілі, зерттеу қызметі, инновациялық орта, білім беру, халықаралық ғалымдар, академиялық алмасу.

Introduction. Currently, the field of pedagogy incorporates both well-established approaches to professional training—such as the systemic, learner-centered, and activity-based approaches—and relatively new ones that have only recently entered academic discourse, including the environmental, polyparadigmatic, and informational approaches. As Ibragimov notes, among the latter, the competence approach is of particular importance. Khimicheva emphasizes that this approach serves as a method of modeling educational outcomes and designating them as professional training standards. This shifts the focus from the content of education to its results, which are expressed in the form of competencies, according to Medvedev and Tatur [1,2,3].

The concept of the competency-based approach became firmly established in the national education system during the 1990s, when Kazakhstan began actively integrating into the European Higher Education Area. At the Berlin Conference in 2003, the Bologna Declaration was signed, and shortly thereafter, a national concept for the modernization of Kazakhstan's education was developed for the period up to 2010. Within this framework, the competency-based approach was identified as one of the foundational principles for educational reform.

Contemporary geopolitical challenges, which influence the international exchange of knowledge and innovative technologies, have intensified Kazakhstan's need to develop its national intellectual capital and accelerate the production of new scientific knowledge in order to achieve technological sovereignty. To ensure the country's innovative development, it is essential to enhance and expand the effectiveness of domestic research activities. In this context, the role of continuous professional education aimed at improving the level of research competence among young scholars is becoming increasingly significant. These factors underscore the relevance of research focused on exploring the essence and content of the concept of research competence.

The aim of this study is to identify the main approaches to defining the essence of the concept of research competence in educational science, based on a historical and pedagogical analysis of national and international literature on the subject.

Literature Review. To date, two fundamentally different approaches to interpreting the terms «competence» and «competency» can be identified in the academic literature. In the first approach, these terms are treated as synonymous or mutually complementary. In the second, they are clearly distinguished: competence is understood as a broad personal characteristic, while competencies are regarded as its structural components.

In Kazakhstan, numerous scholars have contributed to the study of the formation and development of research competencies in the field of pedagogy. Their work addresses issues related to the professional growth of educators, the preparation of future teachers, and the implementation of innovative teaching methods. Notable Kazakhstani researchers in this area include: Aitzhan Sydykov, a prominent scholar in pedagogy and psychology, whose research focuses on the methodology of pedagogical science and the development of teachers' professional competence, including their research skills; K.Zh. Kozhakhmetova, who specializes in the professional and pedagogical training of teachers and the development of research abilities among students of pedagogical universities; K.B. Zharikbayev, one of the founders of Kazakhstani pedagogical science, whose work is dedicated to the advancement of the national education system and the methodological preparation of educators; R.Zh. Nurtazina, who explores the professional development of teachers with a focus on innovative approaches to pedagogical practice and the enhancement of research competence; A.E. Abylkasymova, whose research addresses teacher training, the development of professional competencies, and the integration of modern technologies into the educational process; Sh.Kh. Taubaeva, an expert in the methodology of pedagogical science, known for her work on the formation of research culture among educators; and S.K. Kaliyeva, who focuses on developing research skills and competencies among students and early-career teachers.

These scholars have made a significant contribution to the development of pedagogical science in Kazakhstan, placing particular emphasis on research activities and the professional formation of educators. Their work remains highly relevant in the context of ongoing modernization of the national education system.

Kazakhstani scholars define the concept of competence as follows: Sh.T. Taubaeva describes it as an integrated personal attribute based on knowledge and experience acquired through learning and socialization, characterized by general abilities and readiness to act; B.A. Turghynbaeva emphasizes the application of acquired knowledge to solving real-life problems through practical activity; M.Zh. Zhadra views it as self-development, self-management, and problem-solving through the use of knowledge, flexibility, and skills; K.S. Kudaybergenova defines it as the authoritative resolution of specific issues; B.T. Kenzhebekov sees it as the ability to effectively solve problems and tasks arising in everyday situations; G.K. Aikynbayeva highlights the ability to apply acquired knowledge in changing conditions, to solve problems, and to acquire new knowledge that determines the structural quality of a learner's preparation; G.T. Nurgaliyeva defines it as the ability to carry out a specific activity; and M.A. Galymzhanova considers it a capacity that enables effective problem-solving in real-life situations [4,5,6,]. Some academic teachers note digital competence as the main feature of a future specialist that is associated with the requirements of the 21st century[7]. The development of researchers of intercultural communicative competence among states contributes to the advancement of general knowledge and progress [8]. In the modern era of information abundance, the development of research competence in higher education has become an important skill. Educational development and training programs in order to improve research competence provides valuable information for development [9].

In the field of pedagogy, Russian scholars have actively explored issues related to the development of research competence, particularly in the context of professional education, teacher training, and continuing professional development. Notable figures in this domain include: V.A. Slastenin, a prominent educational researcher who developed the theory of pedagogical activity and examined teachers' professional competencies, including their research component; Yu.K. Babansky, known for his theories on optimizing the educational process and for studying the formation of teachers' skills in evaluating teaching effectiveness; A.M. Novikov, who addressed methodological issues in pedagogical science with a focus on cultivating research culture and competencies among educators; N.V. Kuzmina, who investigated the professionalism of pedagogical practice, including its research-related aspects in teacher preparation; L.M. Mitina, who studied the professional development of teachers, including the advancement of their research and reflective capacities; I.A. Zimnyaya, who worked on the competency-based approach in education, including the development of research skills among learners; and E.V. Bondarevskaya, whose research addressed pedagogical axiology and the formation of professional and personal competencies, including those related to research activity [10,11].

These scholars are developing approaches that help educators incorporate research into their professional practice, make use of modern technologies, and adapt to emerging challenges in the educational landscape.

In pedagogical education, the study of students ' competencies occupies an important place in the educational paradigm [12].

L. Burgoyne, in her study, presents a list of skills assessed through a questionnaire developed at the University of Reading. This list includes oral and written communication skills; the ability to collect, process, and evaluate information; mathematical literacy; skills for both individual and group work; as well as project management, time management, problem-solving, and critical thinking. More specialized skills are also highlighted, such as research planning, scientific writing or reporting, and presenting research results [13].

Showman et al. emphasize a set of soft skills and personal traits, including organizational ability, critical thinking, communication skills, creativity, and persistence [14].

J. Best defines research competence as a combination of knowledge, skills, personal qualities, and values that facilitate successful scientific inquiry. These include critical and logical thinking, synthesis, prediction, familiarity with scientific methodologies, as well as interpersonal communication skills and the ability to make informed decisions [15].

Duangkamol and Oluwaseyi conceptualize research competence as a set of knowledge, skills, and personal aspirations. According to Oluwaseyi, it includes the ability to identify a research problem, develop conceptual research models, articulate the significance of the study, formulate objectives, and define tasks, among other components [16].

Based on an analysis of the literature over the past 20 years, K. Vieno also conceptualizes research competence as a set of skills and identifies seven core competencies applicable across all fields of scientific activity:

– Critical appraisal – the evaluation of information to determine its reliability and relevance;
– Information synthesis – the logical integration of information from various sources to draw conclusions;
– Decision making – identifying and implementing a specific plan of action;
– Problem solving – identifying the sources of difficulties and finding appropriate and effective solutions;
– Data collection – gathering information using structured methods aligned with research objectives;
– Data analysis – processing and systematizing data to identify trends and correlations for the purpose of drawing conclusions in accordance with research goals;
– Communication – exchanging information with others through written or oral means [17].

Secondly, the concept of research competence is often considered in conjunction with the notion of scientific or research literacy. Research literacy is viewed as a "latent variable" that influences the development of research competence; it encompasses a set of competencies related to thinking and intellectual activity. These competencies include the ability to formulate scientific problems and to use scientific facts to explain and justify various phenomena. According to T. Duangkamol, research literacy plays a significant role in shaping research competence. Developing research literacy requires a combination of instructional methods, proficiency in information technologies, and the teacher's personal example.

In 2007, R. Groth published a study focused on the assessment and development of research literacy among educators. The author defined this phenomenon as the ability to purposefully evaluate, comprehend, and process scientific information, as well as to apply research findings to problem-solving in specific contexts [18].

Groß O.J., Wolf R., Schladitz S., Wirtz M. consider research literature to be also considered a component of broader assessment literature, alongside information literature, statistical literature, and critical thinking [19].

The international studies that we have reviewed are mainly of an applied nature. The main purpose of such studies is to analyze the results of the assessment of the development of research skills. Arellano et al. uses surveys to study students' self-assessment of research competence [20] and Muthuswamy et al. they are distinguished by their value-based attitude to research activities [21].

Many scientists consider the components of research competence to remain a methodological problem due to difficulties in ensuring objectivity. Nevertheless, according to Sanders and other authors, they identify a combination of diagnostic tools, including assessment of assignments within specific academic courses as well as focus on standardized tests and interviews [22], as well as Schweizer et al. emphasize standardized tests and interviews [23].

Research methods and materials. The methodological foundation of this study is the competency-based approach, as developed by Sh.T. Taubaeva, G.K. Aikynbayeva, B.A. Turghynbayeva, B.T. Kenzhebekov, V.A. Adolf, I.A. Zimnyaya, G.I. Ibragimov, V.P. Medvedev, and others. The main research methods include analysis and synthesis of national and international scholarly works focused on the definition and conceptualization of research competence. The theoretical foundation of this article is based on the works of both Kazakhstani and foreign researchers who have explored various approaches to defining the essence of research competence. Theoretical and practical aspects of the concept and nature of competence in Kazakhstan have been examined by K.S. Kudaybergenova [4], A.A. Beysenbayeva [5], M.Zh. Zhadrina [6] among others. The topic has also been addressed in the works of A.S. Barvinok [10], J.W. Best [15], K. Vieno [17] and others.

In the course of the study, a survey "Formation of research competencies" was conducted at the Higher College of the S. Amanzholov East Kazakhstan University, which was attended by 1st-year students specializing in 01140100-«Pedagogy and methods of primary education», 01140600 – «Pedagogy and methods of teaching language and literature of basic secondary education» in the number of 51 students. 18 teachers also participated in our study. The main task of the diagnostic stage was their attitude to the formation of research competencies in the system of secondary technical and vocational education, taking into account the specialization of training and teaching.

Analysis and research results. We conducted an analysis of Russian and foreign literature, it was stated that there are different approaches to the definition and content of research competence, which has emerged in Russian science over the past 20 years, contributes to a comprehensive consideration of this phenomenon. Over the past 20 years, several approaches to understanding research competence have emerged . The results of the literature analysis for this period are presented in the table below.

Defining the essence of research competence in educational science: A theoretical analysis of national scholarly works from the past 20 Years

Approach	Essential Characteristics of Research Competence	Components of Research Competence
Systemic Approach	An integral part of general education and professional competence; a characteristic of a teacher that implies the ability to conduct research activities aimed at solving pedagogical problems and optimizing the educational process.	Personal component (value orientations, motivation, skills); operational component (methods of activity, technologies); communicative component
Activity-Based Approach	A set of abilities necessary for conducting research activities: adaptation to the conditions of multi-role research engagement; planning and implementation of research activities; the ability for personal and professional self-realization in the research process.	Problem component (problem formulation); semantic component (comprehension of the problem); value-based component (adequate assessment of the situation)

Value-Activity Approach	A personal characteristic developed through the practical implementation of research activities; a value-based attitude toward research and interest in its outcomes.	A combination of general cultural and professional competencies (in accordance with the specialist's field of study)
Competency-Based Approach	A personal characteristic that implies autonomy in acquiring knowledge, skills, and abilities. The development of research competence is seen as the result of shifting the semantic context of activity from functional to transformative.	Knowledge, skills, abilities, and methods of activity
Process-Technological Approach	The learner's acquisition of a set of research methods and techniques, as well as ways of conducting research activities in the course of cognitive engagement.	Motivation; value orientations of the researcher; methodological stance
Axiological Approach	A value-based attitude of the individual toward research activity and toward themselves as its subject; the presence of a well-formed, active research position, openness to new experiences, and readiness to transcend existing perceptions of self and the world.	The ability to study reality in its essential relationships and connections; the ability to generate new knowledge; the ability to conduct research activities; an active life position of the researcher; an intrapersonal value-based attitude toward research activity
Synergetic Approach	A set of knowledge, skills, abilities, and methods of activity that enable the learner to adopt a research-oriented stance toward the surrounding world; the researcher operates with both theoretical and empirical information to identify and resolve problem situations in their environment.	Cognitive component; motivational and needs-based component; activity component

An analysis of international studies conducted over the past 20 years has revealed several important trends in comparison with the works of national scholars.

In most cases, research competence is understood by international authors as a set of skills that enable individuals to conduct research in a specific field. These skills are typically developed through purposefully structured practical research activities. Scholars either propose a universal set of skills that constitute research competence or a set tailored to a specific discipline. Although some studies also refer to categories such as knowledge, values, or personal traits, the predominant emphasis across the reviewed literature remains on research-related skills.

The experimental part of this study was conducted at the Higher College of Sarsen Amanzholov East Kazakhstan university. Participants included 51 first-year students enrolled in the programs 01140100 – «Pedagogy and Methods of Primary Education» and 01140600 – «Pedagogy and Methods of Teaching Language and Literature» in Basic Secondary Education." In addition, 18 faculty members took part in the study. The main objective of the diagnostic stage was to assess participants' attitudes toward the development of research competence within the system of secondary technical and vocational education, taking into account their areas of specialization in teaching and learning. A questionnaire titled «Developing Research Competence» was administered. The analysis of questionnaire responses revealed that 41.5% agreed that the development of research competence has an intellectual and developmental nature and influences the quality of individuals' life activities. Another 33.1% believed that it fosters openness to new experiences and readiness to transcend existing self-perceptions. A total of 17.2% stated that research competence significantly aids students in their learning processes, while 8.2% associated its development with other opportunities (Figure 1).

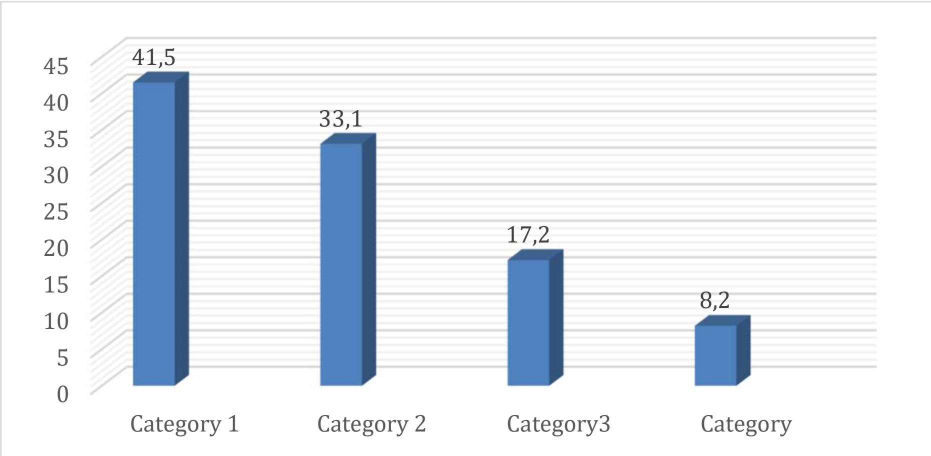

Figure 1 – Results of the Survey «Development of research competence» among first-year students

Among the instructors who participated in the survey, three groups were identified based on the extent to which they apply methods for developing research competence in their teaching practices: - those who apply such methods sporadically or randomly (approximately 15%); - those who are compelled to use research development methods and technologies due to curriculum or institutional requirements (approximately 75%); - and a group of innovative teachers who actively and purposefully implement such methods (approximately 10%).

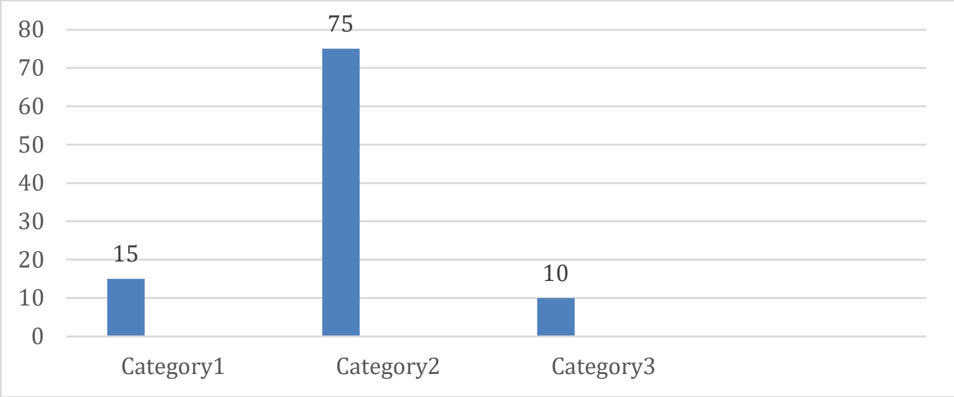

Figure 2 – Results of the sociological survey of instructors on the formation of research competence

Conclusion. The analysis of national and international literature demonstrates that the diversity of approaches to defining and conceptualizing research competence—emerging in Kazakhstani scholarship over the past 20 years has contributed to a comprehensive understanding of this phenomenon. Both domestic and foreign researchers examine research competence through the lens of systemic, activity-based, competency-based, process-technological, synergetic, axiological, and value-activity approaches. In light of societal development, ongoing digitalization, technologization, and the expansion of networked collaboration among universities and other institutions, there is an increasing need to revise the components and criteria that define research competence. These developments underscore the relevance and necessity of further research on this topic.

As the diagnostic stage of the study showed, the attitude towards the formation of research competencies in the system of secondary technical and vocational education: out of 51 students surveyed, only 41.2% agreed that the formation of research competence is intellectual and developmental. This indicator is low and requires comprehensive attention. The results of a survey among teachers using methods of forming research competencies in their lessons: - this group of innovative teachers made up only 10%. The results of the survey of students and teachers show a low level of attitude towards the formation of research competencies.

This determines the relevance and necessity of further research on the topic of the formation of scientific and research competence in secondary education.

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Addressing Individual Learner Needs While Applying the Total Physical Response (TPR) Method in Vocabulary Revision

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Abstract
This study investigates how the Total Physical Response (TPR) method can be adapted to address individual learner needs during vocabulary revision in mixed-ability classrooms. TPR, developed by James Asher, integrates physical movement with language learning to enhance comprehension, reduce anxiety, and improve memory retention. A quantitative approach was used, collecting data from 60 participants, including university students and English language teachers in Kazakhstan, through a structured online questionnaire. The results indicate that TPR effectively promotes vocabulary retention, learner engagement, and motivation across varying proficiency levels. Teachers demonstrated slightly higher confidence in adapting TPR for mixed-ability classrooms compared to students, reflecting practical classroom experience. Challenges such as classroom space constraints and lesson preparation were noted, yet overall perceptions were positive. The findings suggest that TPR is an inclusive, adaptable, and low-stress method that can support differentiated vocabulary instruction. Recommendations include integrating TPR training into teacher education programs and providing adequate resources for effective implementation.
Key words: *Total Physical Response, vocabulary revision, mixed-ability classrooms, learner differentiation, language teaching, learner engagement, English education*

Literature Review

The Total Physical Response (TPR) method has been widely recognized as one of the most effective techniques for introducing and reinforcing vocabulary, particularly among young and beginner learners. According to Asher (1977), TPR reflects the natural language acquisition process, where understanding precedes production. Learners first respond to verbal commands with physical actions, and only later begin to produce the target language. This sequence reduces anxiety and promotes a low-stress learning atmosphere, a crucial factor for successful vocabulary retention.
Several researchers have explored the adaptability of TPR for mixed-ability classrooms. Larsen-Freeman (2000) emphasizes that TPR's strength lies in its multisensory engagement, which supports auditory, visual, and kinesthetic learners simultaneously. Because of this, students who may struggle with abstract or grammar-based lessons can still actively participate and demonstrate understanding through movement. Similarly, Cook (2008) argues that physical activity strengthens memory encoding, making vocabulary learning more meaningful and durable.
When addressing individual learner needs, differentiation within TPR can be achieved through varying levels of support, task complexity, and role assignments. Brown and Lee (2015) highlight that teachers can adjust commands and activities based on learners' proficiency levels—for example, by using simple verbs for beginners and multi-step commands for advanced students. In

addition, allowing students to take the role of the instructor encourages autonomy and critical thinking, giving more advanced learners opportunities to extend their linguistic range.

In Kazakhstan, Baigudanova and Kolomiyets (2025) studied the application of the TPR method in multilingual classrooms and concluded that it promotes engagement, motivation, and effective vocabulary retention. Their findings emphasized that integrating movement with visual aids and verbal practice helped students of different proficiency levels achieve better comprehension. This supports the view that TPR can be successfully adapted to the needs of diverse learners in Kazakhstani educational contexts.

In a study conducted by Şahin and Yıldırım (2018), TPR was implemented in a Turkish EFL context to teach and review vocabulary among mixed-ability learners. The results showed that both low- and high-proficiency students improved in vocabulary recall and engagement. The researchers noted that TPR helped bridge ability gaps by combining comprehension-based input with physical response, allowing weaker learners to follow peers and learn collaboratively.

Furthermore, the integration of technology and visuals into TPR activities has been shown to enhance inclusivity. According to Delyser (2020), using flashcards, digital games, or short video clips alongside physical actions can provide additional scaffolding for visual learners and students with slower auditory processing. These adaptations make TPR a versatile method that accommodates various learning preferences and needs.

Despite these benefits, challenges remain in large and diverse classrooms. Teachers often face time constraints and difficulty in maintaining classroom management during active sessions. As reported by Al-Ghamdi (2021), implementing TPR effectively requires careful planning, especially in heterogeneous groups where learners differ in motivation, energy, and attention levels. Despite these challenges, the literature consistently supports TPR as a method that promotes inclusivity, engagement, and long-term vocabulary retention when properly adapted to individual learner needs.

Introduction

The Total Physical Response (TPR) method, developed by James Asher in the 1970s, is a teaching approach that connects language learning with physical movement. It is based on the idea that memory is enhanced when learners respond to verbal input through physical actions. In this method, teachers give commands, and students demonstrate understanding by performing the corresponding actions. This technique mimics the natural way children learn their first language—through listening, observing, and responding—before they begin speaking. As a result, TPR helps reduce anxiety, encourages participation, and strengthens comprehension, especially during vocabulary learning.

In contemporary classrooms, teachers often face the challenge of addressing diverse learner needs within mixed-ability groups. Students differ in learning pace, attention span, and language proficiency, which can make uniform instruction ineffective. The TPR method offers flexibility because it involves multisensory engagement—listening, seeing, and moving—which appeals to different learning preferences. By combining physical activity with verbal commands, TPR allows students with varying abilities to grasp meaning through both auditory and kinesthetic channels. This dynamic and interactive nature of TPR creates a supportive learning environment where learners can participate without fear of making mistakes.

During vocabulary revision, TPR can be adapted to individual learner needs by modifying task complexity, group arrangements, and teacher guidance. For instance, advanced learners can be asked to create and lead commands, while beginners can focus on listening and responding physically. Visual aids and gestures can provide additional support for students who struggle with comprehension. Moreover, integrating pair and group work fosters collaboration and peer scaffolding, allowing students to learn from each other's strengths.

The adaptability of TPR makes it suitable for diverse classrooms, but its success depends on how teachers implement differentiation within the method. Understanding how TPR can be adjusted to serve individual learner differences is crucial for maximizing its potential in vocabulary teaching. By exploring these adaptations, educators can ensure that all learners—regardless of ability—benefit equally from vocabulary revision sessions that are both engaging and effective.

This study aims to explore how the TPR method can be modified to meet the diverse needs of learners during vocabulary revision in mixed-ability classrooms, ensuring active participation and comprehension for all students.The objectives of the study are as follows:

1.To define and analyze the theoretical foundations of the Total Physical Response (TPR) method in relation to addressing individual learner needs during vocabulary revision.

2.To investigate how teachers apply and adapt TPR activities in real classroom settings to accommodate learners with different levels of ability, confidence, and participation.

3.To evaluate the effectiveness of adapted TPR techniques in improving learners' participation, comprehension, and vocabulary retention, and to provide recommendations for classroom practice.

The study is guided by the following research question: How can the Total Physical Response (TPR) method be adapted to address individual learner needs during vocabulary revision in mixed-ability classrooms?

Materials and Methods

The data analysis in this research employed quantitative research. This quantitative research aimed to explore and explain how the use of the Total Physical Response (TPR) method helps in addressing individual learner needs during vocabulary revision in mixed-ability classrooms. Data were gathered through a structured online survey designed to capture the understanding and familiarity with TPR, its perceived effectiveness and adaptability for diverse learners, and the challenges faced in its classroom implementation.

The study targeted Kazakhstani university students and English language teachers who have experience learning or teaching English in classroom environments. These participants were capable of identifying which methods are most effective for vocabulary teaching and revision. Researchers conducted a survey among 60 participants, including both senior students (3rd and 4th year) of the Kazakh Ablai Khan University of International Relations and World Languages and school teachers who have already gained practical experience in the field (see Table 1).

The primary data collection instrument was an online survey administered via Google Forms (see Figure 1). The survey included Likert-scale, multiple-choice, and open-ended questions aimed to assess understanding and familiarity with TPR, its effectiveness in promoting vocabulary retention, and how it can be adapted to meet individual learner needs. Quantitative data were analyzed through the Excel program to identify the exact percentage of responses and summarize participants' opinions.

Table 1 presents the demographic characteristics of the participants, illustrating their age distribution, gender, role, and English proficiency levels.

Table 1
Statistical Information of Participants

Demographic Information of Participants	Categories	Percentage (%)
Age	18–24	60%
	25-30	30%
	30+	10%
Gender	Female	70%
	Male	30%
Role	Student	65%
	Teacher	30%
	Other	5%
English Proficiency	Beginner	15%
	Pre-Intermediate	25%
	Intermediate	35%
	Upper-Intermediate	20%
	Advanced	5%

Note. Demographic information of participants, including age, gender, role, and English proficiency level. Percentages are rounded to one decimal place.

The data were collected through a structured online questionnaire distributed via Google Forms. The instrument consisted of twenty questions divided into demographic, Likert-scale, and open-ended sections. The Likert-scale items measured participants' understanding and familiarity with the Total Physical Response (TPR) method, its perceived effectiveness in vocabulary revision, and its suitability for mixed-ability classrooms. The open-ended items sought to gather participants' reflections on challenges faced during TPR implementation and suggestions for improving inclusivity in classroom practice. All items were developed based on previous studies in communicative language teaching and TPR methodology (Asher, 1977; Larsen-Freeman, 2000; Brown & Lee, 2015; Al-Ghamdi, 2021). Before distribution, the questionnaire was reviewed by an experienced lecturer in English teaching methodology to ensure clarity, content validity, and alignment with the study's objectives.

Data collection was conducted over a one-week period. Each participant received a digital consent form embedded at the beginning of the survey, explaining the purpose of the study, voluntary participation, and guaranteed anonymity. Demographic information such as age, gender, and English proficiency was collected solely for analytical purposes and treated with complete confidentiality. Participants were informed that they could withdraw at any time before submission. All completed responses were automatically stored and securely organized in a Google database to maintain data integrity and confidentiality.

Quantitative data were analyzed using descriptive statistical methods, including frequency counts and percentages, to identify patterns in participants' responses regarding the effectiveness and adaptability of TPR. Open-ended responses were examined through content analysis, allowing for the identification of recurring themes such as motivation, engagement, and differentiation. This approach enabled the integration of numerical precision with qualitative insight, resulting in a comprehensive interpretation of how TPR supports vocabulary retention and addresses learner diversity.

Ethical research standards were fully observed. All procedures complied with general academic ethics, ensuring privacy, voluntary participation, and the protection of participants' data. The combination of statistical analysis and narrative interpretation provided a solid foundation for understanding how TPR can be effectively applied in Kazakhstani English classrooms to enhance vocabulary learning outcomes among diverse learners.

Results

To identify the role of the Total Physical Response (TPR) method in supporting vocabulary revision and addressing individual learner needs, the survey data from 60 participants were analyzed. The responses were grouped into three thematic categories: (1) participants' understanding and familiarity with TPR, (2) perceptions of its effectiveness and adaptability for mixed-ability classrooms, and (3) challenges faced in implementation. Quantitative data were expressed in percentages to illustrate general trends, while short qualitative remarks were considered for interpretation.

As shown in Table 2, the majority of respondents expressed positive views toward the TPR method. A majority of both students and teachers confirmed that TPR activities helped them retain vocabulary better, increased motivation, and reduced anxiety in language learning. Specifically, 85% of participants agreed or strongly agreed that physical actions strengthen memory, while 82% indicated that TPR makes vocabulary lessons more engaging and less stressful. Similarly, 78% of participants considered TPR suitable for mixed-ability classrooms because it allows both advanced and lower-level learners to participate actively at their own pace.

Table 2

Perceived Effectiveness of the TPR Method in Vocabulary Revision

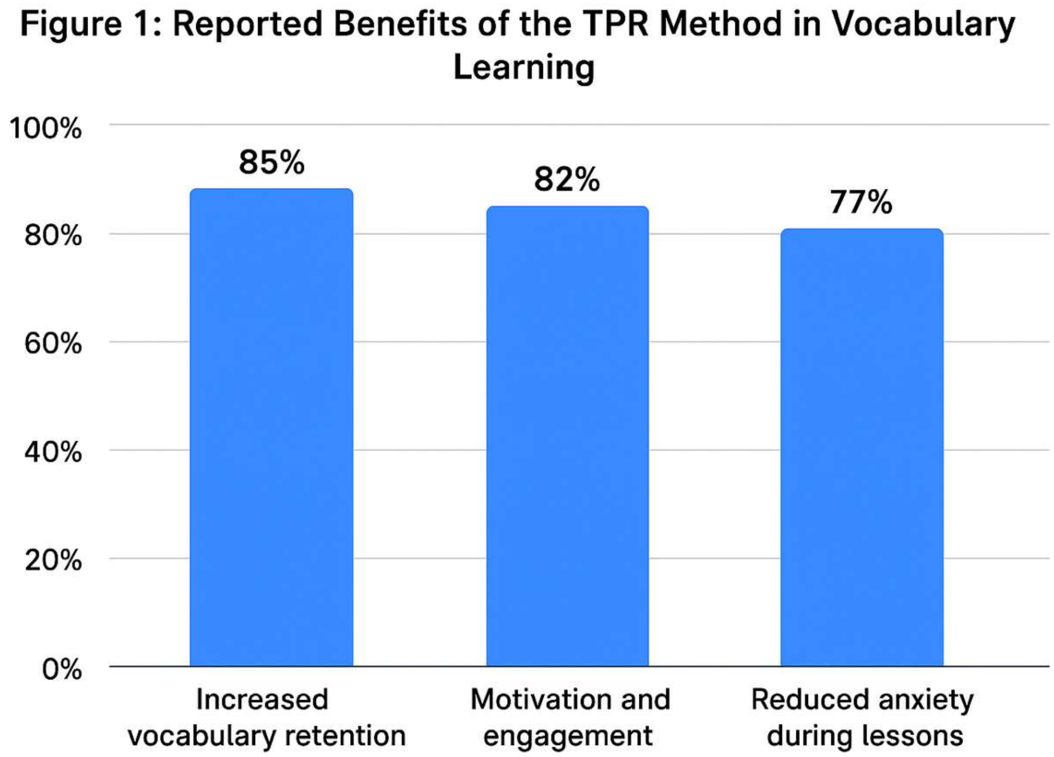
No.	Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Total (%)
1	TPR helps me remember new vocabulary better.	45	40	10	5	0	100
2	TPR activities reduce stress and increase classroom participation.	38	44	13	5	0	100
3	Gestures and physical movement make learning more effective.	50	35	10	5	0	100
4	TPR is suitable for students of different proficiency levels.	32	46	15	7	0	100
5	Assigning stronger students as “leaders” in TPR tasks supports weaker learners.	30	48	12	10	0	100

Note. Responses to Likert-scale statements evaluating perceptions of the Total Physical Response (TPR) method in vocabulary revision (1 = Strongly disagree, 5 = Strongly agree). Mean scores reflected overall positive attitudes toward TPR, with the highest agreement on memory improvement and learner engagement.

The mean scores for all five items ranged from M = 4.10 to M = 4.35, indicating a consistently positive orientation toward the use of TPR in vocabulary instruction. The highest-rated item (M = 4.35, SD = 0.58) showed strong agreement that TPR helps learners remember vocabulary more effectively through movement, confirming the method’s cognitive and kinesthetic advantages.

Overall, 85% of participants agreed that TPR enhances vocabulary retention, 82% believed it increases motivation and reduces anxiety, and 78% considered it suitable for mixed-ability classrooms. The greatest consensus was observed in responses emphasizing that TPR promotes inclusivity, allowing both stronger and weaker learners to participate actively through physical interaction and peer collaboration.

Figure 1: *Reported Benefits of the TPR Method in Vocabulary Learning*



Note. Reported benefits of the Total Physical Response (TPR) method in vocabulary learning as identified by respondents. Percentages represent the proportion of participants who selected each benefit. Data reflect increased vocabulary retention (85%), motivation and engagement (82%), and reduced anxiety during lessons (77%) as the most frequently mentioned outcomes.

These results suggest that while both teachers and students appreciate the interactive and learner-centered nature of TPR, they also recognize the importance of balancing physical activities with focused language practice. Participants emphasized that TPR helps learners of varying proficiency levels stay actively involved by allowing them to demonstrate understanding through movement before verbal production. This approach promotes inclusivity and supports differentiated instruction in mixed-ability classrooms.

Nevertheless, several respondents noted that implementing TPR effectively requires sufficient preparation time and clear classroom organization to maintain discipline and ensure meaningful participation. Overall, the findings indicate that TPR is valued not only for its effectiveness in vocabulary retention but also for its ability to create a positive, low-anxiety learning atmosphere that benefits diverse groups of learners.

Table 3 presents the comparative results between students and teachers. Although both groups shared positive perceptions of TPR, some differences emerged. Teachers (M = 4.38) showed slightly higher confidence in adapting TPR for mixed-ability classrooms compared to students (M = 4.15), who reported occasional challenges in following multi-step commands or maintaining focus during extended activities.

Table 3: *Comparison of Mean Scores by Participant Group*

Aspect	Students (n = 39)	Teachers (n = 21)	Difference
TPR helps in remembering new vocabulary	4.28	4.42	+0.14
TPR increases motivation and engagement	4.21	4.37	+0.16
TPR reduces stress and anxiety during lessons	4.17	4.33	+0.16
TPR supports participation of mixed-ability learners	4.09	4.36	+0.27
TPR is easy to adapt for classroom practice	3.95	4.25	+0.30

Note. Comparison of mean scores between university students (n = 39) and English language teachers (n = 21). Higher mean scores among teachers may reflect greater classroom experience and familiarity with instructional adaptation.

These findings indicate that teachers' practical classroom experience enhances their confidence in applying the Total Physical Response (TPR) method, whereas students—though generally positive—remain more theoretical in their understanding of how TPR supports learning. The overall differences between groups were moderate, reflecting a shared appreciation of TPR's effectiveness and inclusivity in vocabulary instruction.

Qualitative feedback provided additional insight into participants' experiences with TPR. Several recurring themes emerged:

(1) Active learning and engagement — TPR activities increase student participation and enjoyment;

(2) Inclusivity — weaker learners benefit from observing and imitating peers;

(3) Stress reduction — physical movement helps reduce anxiety and builds classroom rapport;

(4) Implementation challenges — teachers face time constraints and space limitations in applying TPR regularly.

Representative responses included:

These qualitative findings complement the quantitative data, showing that while both teachers and students value TPR for its motivational and kinesthetic qualities, effective implementation requires classroom management strategies and well-structured lesson planning. Overall, responses remained strongly positive, demonstrating that TPR is perceived as an engaging and inclusive approach to vocabulary learning across proficiency levels.

Discussion

The purpose of this study was to investigate how the Total Physical Response (TPR) method supports vocabulary learning and revision in mixed-ability classrooms and to analyze the perceptions of both students and teachers regarding its effectiveness. The findings demonstrated strong overall approval of TPR as a method that combines physical activity with linguistic comprehension, thereby creating an inclusive, low-stress, and highly engaging learning environment. This confirms the notion that movement-based learning aligns with natural language acquisition processes, where comprehension precedes production (Asher, 1977).

The high percentage of participants who agreed that TPR enhances vocabulary retention and reduces anxiety suggests that the method is particularly effective in fostering motivation and participation among learners of varying proficiency levels. Teachers, in particular, rated TPR slightly higher than students, likely due to their direct classroom experience and greater awareness of how movement aids memory and focus. These results align with Larsen-Freeman’s (2000) assertion that TPR effectively integrates multiple learning styles—auditory, visual, and kinesthetic—making it suitable for heterogeneous classrooms.

The data also reflect the psychological and social advantages of TPR. Respondents emphasized that physical activity reduces tension, increases confidence, and supports cooperative learning. These benefits are consistent with Brown and Lee (2015), who observed that interactive methods such as TPR promote meaningful communication and deeper cognitive engagement. The findings further reinforce Vygotsky’s (1978) social constructivist theory, suggesting that physical and social interaction stimulate both linguistic and cognitive development through active participation and peer modeling.

In the context of Kazakhstan’s educational landscape, these results carry particular significance. As communicative and student-centered methods continue to replace traditional grammar-focused instruction, TPR serves as a bridge between theory and practice by engaging learners of all levels in active, task-based participation. The positive feedback from both university students and teachers demonstrates readiness to adopt methodologies that emphasize inclusivity, collaboration, and learner autonomy—key goals in current language education reform initiatives.

Nevertheless, participants also identified several challenges in applying TPR consistently. Time constraints, limited classroom space, and the need for careful management during physical activities were among the most frequent concerns. Similar challenges were noted by Al-Ghamdi (2021), who emphasized that successful TPR implementation requires structured planning, teacher training, and resource availability. Despite these challenges, the majority of participants expressed willingness to use or continue using TPR, acknowledging its motivational and pedagogical value.

Overall, the study confirmed that TPR is not only an effective method for vocabulary retention but also a pedagogical tool that enhances learner engagement and inclusivity. By combining comprehension-based input with physical response, TPR supports both stronger and weaker students, allowing each to learn at their own pace while contributing to collective classroom energy.

Conclusion

This study aimed to explore the effectiveness of the Total Physical Response (TPR) method in improving vocabulary revision and addressing learner diversity in mixed-ability classrooms. The results revealed that both teachers and students perceive TPR as a highly effective and enjoyable method that promotes active learning, reduces anxiety, and increases motivation through the integration of movement and language comprehension.

Quantitative and qualitative findings confirmed that TPR enhances vocabulary retention by reinforcing words through physical action, which supports long-term memory. Participants also highlighted its inclusivity—allowing weaker students to follow visual and kinesthetic cues while stronger students gain opportunities to lead and model actions. These findings reinforce previous research (Asher, 1977; Larsen-Freeman, 2000; Şahin & Yıldırım, 2018) showing that TPR contributes to both cognitive and affective aspects of language learning.

At the same time, several practical challenges were identified, including limited classroom time, spatial constraints, and the need for classroom management strategies during physical tasks. To maximize the effectiveness of TPR, it is recommended that teacher education programs integrate practical training on movement-based instruction and differentiation strategies. Providing teachers with sufficient space, time, and materials will ensure smoother implementation and sustainability of the method.

The results of this study contribute to the growing body of evidence supporting communicative, student-centered approaches in language education in Kazakhstan. By encouraging active participation, collaboration, and positive emotional engagement, TPR stands out as a valuable and adaptable framework for vocabulary learning. In conclusion, the Total Physical Response method remains one of the most practical, inclusive, and scientifically grounded approaches for fostering vocabulary retention and motivation among mixed-ability learners.

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THE IMPACT OF DIGITAL LEARNING TOOLS ON ENGLISH LANGUAGE TEACHING IN KAZAKHSTAN

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Abstract
The study explores the impact of computer learning technology on English language teaching in Kazakhstan with emphasis on how it enhances teaching efficiency, student engagement, and overall learning outcome. Carried out under quantitative methodology among 50 respondents, the study explores the extent to which technology is utilized in classroom instruction and its impact on language learning experience. The study finds technology such as Zoom, Google Classroom, Quizlet, and Duolingo to be having a positive impact on motivation, cooperation, and autonomy among students. However, issues such as lack of infrastructure, lack of training among teachers, and unequal access to technology are still barriers to successful implementation. Institutional support and professional development are needed so that online education can become an effective and long-term part of English language instruction in Kazakhstan, the study states.
Keywords: *Teacher training, educational technology, English language teaching, EFL, Kazakhstan, digital learning tools, student engagement.*

Introduction

Education in the twenty-first century has been subject to the stress of rapid change with the universal utilization of digital technology. The use of online courses, mobile apps, and interactive multimedia programs has transformed learning and teaching processes. This technological advancement has played a specific role in the acquisition of foreign languages, where communication, practice, and exposure to authentic materials are the success factors. To this end, EFL teaching relies more heavily on computer learning technologies that support learner engagement, autonomy, and motivation. For Kazakhstan, under the policy of trilingual education where English is one of the major components, the effective use of technology in language instruction has become a national agenda responding to the agenda of education modernization and internationalization.Digital learning tools are a wide range of tools such as web platforms (Zoom, Google Classroom), interactive game-based tools (Kahoot, Quizlet), and mobile apps (Duolingo, Memrise) offering language skill learning for students within and beyond classrooms. The tools are potential real-time feedback tools, interactive learning tools, and tools for collaboration between students and teachers. Brown (2020) argues that technology allows students to learn actively and use language imaginatively in real-world contexts. In the same spirit, Dudeney and Hockly (2020) observe that digital literacies are becoming the classroom students' and teachers' key competence today. However, the integration of such technologies in Kazakhstan classrooms has been uneven. Even though some have managed to integrate digital learning environments, Post still grapple with limitations in infrastructure, teacher skills, and access to reliable internet connectivity.

The relevance of this research is further supported by national efforts to create innovation and digitalization in education. The Kazakhstan Ministry of Education has implemented many programs aimed at students' and teachers' digital literacy development as well as the growth of access to online educational materials. Nonetheless, despite these positive developments, there remain barriers to the integration of teachers' use of digital tools not only as ancillary resources but as an integral part of the learning process. The majority of teachers lack systematic education in using digital technologies as part of their teaching approach. It is because of this that it is pertinent to examine English teachers' perception, use, and evaluation of digital learning tools as an integrated part of their professional work in Kazakhstan.The aim of this study is to explore the impact of digital learning tools on English language teaching in Kazakhstan. Specifically, the study seeks to examine how the integration of digital technologies affects teaching effectiveness, student engagement, and learning outcomes in English as a Foreign Language (EFL) classrooms. Additionally, it aims to identify the main challenges and opportunities that teachers face when using digital learning tools in their instructional practices.To achieve this aim, the study sets out three specific objectives:

(1)To investigate how digital learning tools are used in English teaching in Kazakhstan.
(2)To identify teachers’ attitudes toward digital tools.
(3)To analyze challenges teachers face in integrating technology.The study seeks to answer the following research question:How does the use of digital learning tools impact teaching process and student engagement in English language classrooms in Kazakhstan?

Materials and methods

This research employed a quantitative method to explore the effect of computer-based learning materials on English Language Teaching (ELT) in Kazakhstan. The sample was comprised of 50 individuals — 25 English teachers and 25 students — from various Kazakhstani universities and language schools. A questionnaire with 25 Likert-scale items (Strongly Agree to Strongly Disagree) specifically designed for this purpose was given through Google Forms. The items were administered under five categories: understanding and application, perceived effectiveness, student participation, responsiveness to students' needs, and challenges of implementation. Ethical principles were followed strictly: all the participants provided informed consent, and they were assured of their anonymity. The data collection exercise was undertaken between October 10–October 26, 2025. Response was analyzed using descriptive statistics, examining percentage and frequency distributions.

Table 1
Statistical Information of Participants

Age	18-24	25-30	30+	Total
%	70%	15%	15%	100 %

Figure 1
Screenshot of the Google survey used in this study

The following table presents data on how frequently both teachers and students utilize digital learning tools in English language classrooms across Kazakhstan. The results illustrate the general level of integration of technology into everyday teaching practices, showing which platforms are most commonly employed and how regularly they are used. This information provides insight into the prevalence of digital tools in EFL contexts and establishes a foundation for understanding teachers' and students' familiarity with such technologies.(Table 1)

Table 1
Understanding and Application of Digital Learning Tools

No	Statement	SA	A	N	D	SD	Total
1.	Digital tools improve lesson quality	30%	50%	12%	6%	2%	100%
2.	Teachers integrate technology effectively	25%	40%	20%	10%	5%	100%
3.	Digital learning aligns with curriculum goal	22%	48%	18%	8%	4%	100%

Results

The data collected from the survey revealed insightful information about the use, perception, and impact of digital learning tools on English Language Teaching in Kazakhstan. Most respondents expressed positive attitudes toward integrating technology into language instruction, though some challenges were identified. Below are the summarized results from each of the five categories, accompanied by tables and analytical commentary.The survey results indicate a vast majority of the participants—nearly 70%—agreeing or strongly agreeing that online teaching tools enhance the quality of English language instruction. This is an evidence of very high awareness of how technology can contribute to teaching and learning. Around 20% of the participants were neutral, which might be an evidence of confusion or lack of exposure to such tools. Interestingly, 10% disagreed possibly due to lack of exposure or training to digital tools. Teachers overall indicated that computer facilities make lesson presentation more interactive and flexible. Students similarly indicated that they enjoy learning through platforms like Kahoot and Quizlet. Both groups, however, admitted to not always using technology in a systematic way in lessons. The results affirm a clear positive attitude towards computer tools, but somewhat inconsistency in their use. This indicates that while teachers value technology, its practical use remains dependent on infrastructure and support. Generally, the findings confirm awareness is not always matched with systematic classroom practice.

Table 2 summarizes participants' perceptions of the pedagogical effectiveness of digital learning tools in enhancing different language skills—reading, writing, listening, and speaking. It highlights how both groups evaluate the contribution of digital resources to language acquisition and whether they believe these tools improve engagement, feedback, and learning outcomes.

Table 2

Perceived Effectiveness of Digital Tools

No	Statement	SA	A	N	D	SD	Total
1.	Digital platforms improve motivation	35%	40%	15%	8%	2%	100%
2.	Students learn faster with multimedia	28%	46%	16%	6%	4%	100%
3.	Digital tools help teachers manage time	25%	42%	18%	10%	5%	100%

*Note.*The table summarizes perceptions of how effective digital tools are in improving English teaching and learning outcomes. Nearly 75% of participants either strongly agreed or agreed that technology improves student comprehension and motivation. A smaller portion (10%) expressed disagreement, mostly citing unstable connectivity or lack of resources. The findings show that multimedia content—such as videos, games, and interactive exercises—facilitates greater understanding of linguistic concepts. However, the varying degrees of agreement suggest that effectiveness depends heavily on how teachers integrate these tools within their lesson plans and objectives.

Table 3 show to what extent interactive and game-based tools, such as Kahoot or Quizlet, stimulate learners' interest and create a more dynamic learning environment.

Table 3

Student Engagement and Motivation

No	Statement	SA	A	N	D	SD	Total
1.	Students participate more actively online	30%	44%	16%	6%	4%	100%
2.	Digital lessons increase collaboration	25%	50%	15%	8%	2%	100%
3.	Gamified tools make learning enjoyable	40%	42%	10%	6%	2%	100%

*Note.*This table demonstrates the influence of digital learning tools on students' motivation, attention, and participation. Over 80% of respondents indicated that digital environments enhance student engagement, especially when lessons include interactive and game-based components like Kahoot or Quizlet. About 10% disagreed, citing that digital distractions may sometimes hinder focus. Teachers reported that gamified lessons help sustain interest, while students valued immediate feedback and collaborative activities. Overall, the results confirm that technology contributes significantly to motivation, provided it is balanced with traditional communicative interaction.

Table 4 outlines the primary obstacles reported by participants when integrating digital tools into their teaching or learning routines.

Table 4

Adaptation to Students' Needs

No|	Statement	SA	A	N	D	SD	Total
1.	Digital tools allow personalization	26%	50%	14%	6%	4%	100%
2.	Teachers adjust materials using technological tools	22%	46%	20%	8%	4%	100%
3.	Students benefit from adaptive learning app	30%	44%	16%	6%	4%	100%

*Note.*This table highlights how digital tools accommodate individual learning preferences and support differentiation in English language teaching. Approximately 76% of participants agreed that technology enables personalization, such as adjusting task difficulty or providing individual feedback. However, 20% were neutral, suggesting uncertainty about how to adapt digital resources effectively.The final table reveal several key challenges in integrating digital learning tools into English language teaching. About 40% of teachers reported technical difficulties such as unstable internet connections and lack of updated equipment. Another 30% mentioned insufficient institutional support and limited time for digital lesson preparation. Meanwhile, 20% of respondents identified low digital literacy among teachers as a major obstacle. Interestingly, 10% believed that the problem lies not in access but in motivation to innovate. Teachers expressed that while they recognize the benefits of digital learning, the workload often discourages experimentation.

Table 5

Challenges and Institutional Support

No|	Statement	SA	A	N	D	SD	Total
1.	Lack of technical support limits usage	34%	40%	14%	8%	4%	100%
2.	Internet issues affect lesson quality	28%	46%	16%	6%	4%	100%
3.	More teacher training is needed	40%	42%	10%	6%	2%	100%

*Note.*This table outlines the main barriers teachers and students encounter when using digital tools and their perceptions of institutional support. The majority (over 80%) identified insufficient training and technical assistance as persistent issues.

Discussion

The purpose of the current study was to explore the influence that digital learning tools have on English language teaching in Kazakhstan, focusing on how technology impacts teaching effectiveness, student engagement, and learning outcomes. The discussion below provides an interpretation of the findings from the survey and connects those with the existing literature, methodological considerations, and implications for practice. In all, the survey results from 50 participants, both teachers and students alike, gave voices to how digital technologies are perceived and used in Kazakhstani EFL classrooms.The data collected indicated that digital learning tools have become an integral part of the process of English language teaching and learning in Kazakhstan. Most respondents reported using, on a regular basis, such digital platforms as Zoom, Google Classroom, and Quizlet; this would seem to imply that the integration of technology has passed the experimental stage and is now part of mainstream pedagogical practice. Teachers indicated that digital tools increase interactivity and allow different modes of instruction, while students pointed out their motivational effect and ease of access. This result aligns with the assertion made by Dudeney and Hockly (2020) that digital literacy has become an indispensable part of both teaching and learning processes in contemporary classrooms.The results also reveal that digital technologies have a positive impact on developing specific language skills. According to the respondents, listening and vocabulary acquisition were the skills most improved through digital tools. Indeed, authentic linguistic input can be garnered from multimedia content, like videos and podcasts, which help students improve their comprehension and pronunciation. Writing, however, was reported to be the least improved skill, because there is a lack of opportunities for individual feedback by the teacher in an online environment. This is also what Brown (2020) noted: digitally enhanced learning environments tend to be more favorably disposed toward receptive rather than productive skills.

The findings of this study show various similarities and differences when compared to prior studies. Previous studies by Alqahtani (2021) and Wang (2022) have identified the motivational advantages of game-based learning tools in EFL teaching. This study has also found that interactive tools such as Kahoot and Duolingo increase students' enthusiasm and participation considerably. However, at the same time, it has been highlighted that technology alone cannot help improve learning outcomes. The effective integration of technology depends very much on teachers' digital competence and pedagogical strategies-a challenge that has also been commonly reported from other developing educational settings by Rahman (2022).

Other recurrent problems included the lack of time for teachers to prepare digital materials and the absence of technical support from the educational institutions. These results reinforce the necessity of systemic solutions-digital literacy training programs, technical assistance centers, and further investment in infrastructure-that will make the introduction of digital education sustainable. If these barriers are not overcome, the effectiveness of digital learning tools will continue to be spotty, dependent on the initiative of individual teachers rather than on the commitment of institutions.

This study is not without its limitations, as with all empirical research. The fact that data are self-reported can introduce bias because the respondents reflect perceptions rather than directly observed behaviors. Only 50 participants were surveyed, from urban educational institutions, and thus cannot be representative even of rural or remote areas. A limitation of this research could be that it has mostly focused on English as a foreign language; further studies could be conducted to see how digital tools influence the learning of other foreign or regional languages in Kazakhstan. Longitudinal or experimental designs would add significant value to establishing causal conclusions related to the efficiency of digital learning tools.

Conclusion

The conclusion of the research clearly shows that digital learning tools have a revolutionary effect on the teaching process of the English language in Kazakhstan. All these tools are highly appreciated by most of the students and instructors as effective tools for developing communications skills, participation, and liveliness in learning. Implementation of online platforms such as Zoom, Google Classroom, Kahoot, and Duolingo has encouraged collaboration, independent learning, and innovation among the students. Instructors have reported that the virtual setting helps them diversify teaching and address various learning styles, which eventually result in more motivation and achievement.Nevertheless, the study also indicates that the successful integration of technology is based on several contextual factors. Problems such as finicky internet connections, outdated equipment, and lack of training for teachers remain to undermine the full capacity of digital education. A number of educators expressed the need for teacher education and school support programs for building their digital literacy as well as pedagogical skills. In the absence of proper guidance, the implementation of digital tools may be haphazard and limited to superficial interaction rather than deep effects of learning. Ongoing investment in teacher development and school infrastructure is thus imperative to ensure sustainable progress.

One of the most important findings is that learner autonomy and personalization—two of the principal strengths of digital learning—are still not realized in most English classrooms. Although teachers recognize the importance of adapting content to students' needs, they do not know the most effective way to effectively individualize online teaching. This means that teacher training must move beyond minimum technical competence to the pedagogical practices of integrating adaptive and student-controlled technologies.

In general, the current research confirms that digital technology is a permanent part of modern English language teaching in Kazakhstan with possibilities and problems. The results underscore the necessity of a strategic approach to digital integration, one that unites infrastructure, training, and pedagogical innovation. Policymakers and institutions should keep investing in digital literacy programs, availability of resources, and evidence-based teaching practices. Subsequent studies may look into the long-term impact of blended learning and how more recent technologies such as virtual reality and artificial intelligence may further shape English education in Kazakhstan.

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Generation Z: Peculiarities in Foreign Language Learning

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Аннотация
Бұл мақалада заманауи жастардың, яғни Z буынының шетел тілдерін меңгерудегі ерекшеліктері мен үрдістері талданады. Автор шетел тілдерін оқыту тарихына қысқаша шолу жасап, ежелгі дәуірлерден қазіргі заманға дейінгі эволюциясын сипаттайды. Қазіргі кезеңде технологиялардың, әсіресе жасанды интеллекттің дамуы білім беру саласына айтарлықтай әсер етуде. Z буынының негізгі сипаттары мультитапсырмалық қабілет, дербестікке ұмтылу, цифрлық сауаттылық және қысқа уақытқа назар аудару болып табылады. Мақалада жүргізілген шағын сауалнама нәтижелері көрсеткендей, студенттердің басым бөлігі оқу барысында ChatGPT және DeepSeek сияқты жасанды интеллект құралдарын белсенді пайдаланады. Бұл мәліметтер тіл үйрену тәсілдерінің едәуір өзгергенін және білім алушылардың жаңа технологияларға бейімделгенін дәлелдейді. Автордың пікірінше, қазіргі студенттер тілдің теориялық құрылымына қарағанда оның тәжірибелік және коммуникативтік жағына көбірек мән береді. Сонымен қатар, педагогтер де өз тәжірибесінде инновациялық әдістер мен цифрлық ресурстарды жиі қолдана бастады, бұл оқыту тиімділігін арттыруға ықпал етеді. Қорытынды бөлімде автор жасанды интеллекттің білім беру жүйесіне оң ықпалын мойындай отырып, оның адам ойлау қабілетіне және танымдық белсенділігіне ықтимал әсерін атап өтеді. Жалпы алғанда, мақала Z буынының шетел тілдерін меңгерудегі жаңа технологияларға икемділігін жан-жақты талдап, қазіргі заман білімінің даму бағыттарын айқындайды.

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Аннотация
В статье анализируются особенности и тенденции изучения иностранных языков представителями поколения Z. Автор делает краткий обзор истории преподавания иностранных языков, прослеживая изменения от древности до наших дней. В современную эпоху развитие технологий, особенно искусственного интеллекта, оказывает значительное влияние на систему образования. Основные характеристики поколения Z включают многозадачность, стремление к самостоятельности, цифровую грамотность и ограниченный период концентрации внимания. Результаты проведённого опроса показывают, что большинство студентов активно используют инструменты искусственного интеллекта, в частности ChatGPT и DeepSeek, для выполнения учебных заданий. Это подтверждает, что методы изучения языков претерпели серьёзные изменения, адаптируясь к цифровой среде. По мнению автора, современные обучающиеся отдают предпочтение практическому

применению языка как средству общения, а не его теоретическим аспектам. Учителя, следуя этим изменениям, начинают внедрять цифровые ресурсы и инновационные подходы в педагогическую практику, что способствует повышению эффективности обучения. В заключительной части автор признаёт позитивное влияние технологий на образовательный процесс, одновременно обращая внимание на потенциальные риски чрезмерной зависимости от них, которые могут ослабить самостоятельное мышление учащихся. В целом статья представляет всесторонний анализ адаптации поколения Z к цифровым условиям и трансформации процесса изучения иностранных языков в контексте современных образовательных тенденций.

"Education is not the learning of facts, but the training of the mind to think."

— *Albert Einstein*

Learning foreign languages was always actual topic for people starting from ancient times, as the major requirement to learn languages was connected with trade and religious aspect of the lives of countrymen. Theocracy*, or the supreme rule of the religious authorities over population affected people to learn holy manuscripts, like Bible, and to follow the strict faith-based traditions, one of which was learning Latin as the language of the Saints as the center located in Vatican, Rome. Moreover, medieval period also needed language learning for trades, as it was the dawn of the international trade between the East and West, or in simple words, terrestrial trade by the Great Silk Road* started from the Celestial Empire of China*, and ending in the coasts of Southern and Eastern Europe, connecting two sides of the Earth. Nevertheless, nowadays language learning is needed for several reasons and in this article, we will analyze the reasons and modern strategies of learning process among youth.

At the moment, the rapidly changing world makes everything effortless and challenging at the same time. Every year, there are hundreds of new forms of work emerging, in parallel with old-fashioned jobs disappearing. This has a great effect in learning too, mostly at schools and universities. Generation Z*, or in simple words, modern teenagers and younger part of the society are the first ones experiencing the new learning methods at educational organizations. Language learning is also facing big changes, shifting from primitive methods to cutting-edge ones, therefore learning is becoming more interesting. Now, let's take a look at general skills and features of "Generation Z":

Multitaskers	Big part of this generation is able to handle several digital activities at once, for example, studying while chatting or watching videos simultaneously
Individualists	They value self-expression and creativity
Digital natives	Most of them grew up in a world surrounded by rising technologies
Short attention span	Prefer quick, visual but dynamic content (like TikTok, Youtube shorts)
Financial careful	Seek stability as they witness several economic growths and stagnations
Diverse and inclusive	Tolerant and aware of variety in choice, culture and identity (gender, etc.)
Collaborative online	Use digital platforms to work together and share ideas
Socially aware	Thanks to brief information share they are aware of news and world problems like pollution or climate change

As it is seen in table above, major features of this generation are connected with digital technologies, in addition, this process of development is going faster than ever, as investigations and improvements in these fields accelerate further advancements. Therefore, we may state that the education is evolving and deepening its roots with innovative technologies. The lifestyle of youth itself is connected with smart technologies.

To prove these features and understand how teenagers learn foreign languages, we conducted mini-scale analysis through a survey among the representatives of Generation Z. There is the results of our survey:

- The number of males and females was almost equal;
- All the respondents said that they use AI (mostly ChatGPT*, some use Deepseek*);
- More than 80% of them use AI for study (task performance, etc.)
- Most of participants study at universities in Almaty (Abai University and Ablai Khan University);
- 13 respondents do the SIW tasks and other exercises only with the help of ChatGPT;
- Major part of them were born between 2003-2005, that shows that students were at the last study year;

The survey results show that most teenagers rely on the help of AI in daily routines and while studying and performing exercises. Moreover, some individuals believe that artificial intelligence has the potential to reorganize the educational system by giving more opportunities for developing the learning process and student engagement. Besides, Generation Z prefers practical use of language as a means of communication rather than theoretical foundations. This means that they need language to speak with others and ignore the rules or are not interested to recognize the reason why some linguistic terms are needed. This aspect leads to the next peculiarity which is connected with widespread use of digital tools in language learning process. Older generation used dictionaries and it was a bit problematic to take it everywhere to translate unknown words during the communication. Nowadays, everything is required is a mobile phone, that is both practical and affordable for everyone. ChatGPT is even recognized as more useful for learning a foreign language than specialized apps like DuoLingo*.

The features of teenagers are affecting the educators, as teachers start to use AI and digital sources at schools. In the past, the only things to use were the board and chalk. With the enhancement of technologies, there are more types of tools appearing right now. These means help teachers to save time and concentrate mostly on the content of the educational program and creating the curriculum more effectively.

However, despite these remarkable innovations, there remains a noticeable gap between the abilities of digital learners and the preparedness of the educational institutions. Many schools and universities still rely on traditional methods of teaching that do not fully correspond to the expectations and needs of Generation Z students. Teachers often find themselves balancing between classical pedagogical approaches and newly emerging digital ones. For instance, grammar translation or direct methods are being gradually replaced or supplemented by task-based learning (TBL), Content and Language Integrated Learning (CLIL), and project-based learning (PBL), all of which encourage creativity and collaboration through the use of technology. Yet, many teachers admit that the rapid development of AI outpaces their training, making it difficult to integrate tools like ChatGPT effectively into lesson plans.

Another aspect worth mentioning is motivation. Generation Z learners are usually motivated by immediate results and interactive content. They appreciate feedback that is fast, clear, and visual. This explains the popularity of platforms such as Kahoot, Quizizz, or Memrise, where game-like experiences stimulate engagement. In contrast to previous generations who relied on rote memorization, modern learners prefer short but meaningful learning moments—

microlearning—through reels, memes, or bite-sized videos. Language educators must therefore design lessons that align with this rhythm, using multimedia materials that appeal to visual and auditory senses.

Moreover, the social dimension of foreign language learning has changed dramatically. Today's learners practice speaking not only in classrooms but also online—through Discord servers, Reddit communities, or language exchange apps such as Tandem and HelloTalk. These digital spaces encourage authentic communication with native speakers, often without the psychological pressure of real-life interaction. This informal learning environment supports the communicative competence and self-confidence of learners. However, it also exposes them to uncontrolled content and slang, which may affect their accuracy or use of standard grammar forms.

The psychological aspect of AI usage in learning is another essential issue. While artificial intelligence can personalize education, provide instant corrections, and track progress, it may also decrease learners' ability to think critically and solve problems independently. Overreliance on AI-generated translations or grammar corrections reduces the need for cognitive effort. This might result in so-called "passive learning", when students receive ready answers without engaging deeply in the process. In addition, some scholars highlight that constant exposure to screens and notifications may cause digital fatigue and concentration problems. Thus, a balanced approach is required to ensure that technologies assist rather than replace human thinking.

Teachers, in turn, are also adapting to new realities. Modern educators act not only as information providers but as mentors and facilitators, guiding students through the digital space. Professional development programs increasingly include digital literacy training, helping teachers to evaluate the credibility of online resources, create interactive lessons, and use AI ethically. Many educational institutions have already started implementing blended learning models that combine face-to-face interaction with online platforms. This hybrid format allows flexibility and supports individualized learning paths for each student.

Another important consideration is the intercultural dimension of language education. Generation Z grows up in a multicultural and interconnected world where tolerance, diversity, and inclusivity are not abstract concepts but everyday realities. Learning a foreign language is not only about mastering grammar or vocabulary—it is also about understanding different cultural perspectives. Technologies play a vital role in this process: virtual exchanges, international online projects, and video conferences allow learners to meet peers from other countries without leaving their classrooms. This global approach enhances empathy and prepares students for international cooperation in the future workplace.

Still, the ethical and social concerns related to AI cannot be ignored. The questions of data privacy, plagiarism, and authenticity of student work are becoming increasingly relevant. Many students admit using AI for completing assignments, which raises debates about academic honesty. Educators must therefore focus on developing digital ethics—teaching students not only how to use AI effectively, but also how to use it responsibly. Establishing clear guidelines on AI-assisted learning and encouraging self-reflection can help prevent misuse and promote academic integrity.

Finally, to make the learning process more efficient for Generation Z, a few pedagogical recommendations can be suggested. Firstly, teachers should integrate AI tools as supportive resources rather than main sources of knowledge. Secondly, lessons should include project work and problem-solving tasks that promote creativity and critical thinking. Thirdly, students should be encouraged to balance online and offline learning, maintaining real communication with peers and teachers. And lastly, institutions must invest in teacher training programs that focus on digital pedagogy and ethical AI use.

In conclusion, the educational landscape is undergoing a major transformation driven by the technological revolution and the rise of Generation Z learners. Their digital mindset, creative potential, and global awareness open new opportunities for rethinking traditional teaching practices. However, innovation should always go hand in hand with responsibility. The challenge of the modern era is not only to provide access to technologies, but also to cultivate thoughtful, independent, and ethical users of them. The future of language learning depends on our ability to integrate human intelligence and artificial intelligence harmoniously—preserving the value of thinking, communication, and curiosity that define true education.

To sum up, teaching and learning process is facing great shifts, moving from common methods to more tech-relied ways of studying. Thanks to the access to brand-new AI tools, internet plays a role of the tutor, teacher and personal adviser, solving several educational problems for us. Nevertheless, there is some concerns about the role of AI in our lives. Doubtless, digital world serves us in any field of human life, but how does it affect our mental and cognitive senses, is an issue. Regular use of them creates an overreliance and people stop thinking automatically, giving this privilege to the "online-brain". Learning may also face some consequences as it is responsible work to teach others.

Word list:
Theocracy – type of government based on an authority of the religion (Vatican, Iran);
Great Silk Road – the trade path of caravans between China and Europe (on the land)
Celestial Empire of China – older name of PRC
Generation Z – generation born between the end of 1990s and till 2010-2012
ChatGPT – generative pre-trained transformer, AI chatbot created by OpenAI
DeepSeek – another chatbot, developed by a Chinese company
DuoLingo – language learning app, that teacher about 30+ languages at any level

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KSZTAŁCENIE UMIEJĘTNOŚCI CZYTANIA UCZNIÓW SZKÓŁ PODSTAWOWYCH

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Streszczenie W artykule podjęto problematykę kształtowania umiejętności czytania u młodszego ucznia. Podano definicje kluczowych pojęć. Wskazano główne sposoby rozwijania umiejętności czytania uczniów szkół podstawowych. Słowa kluczowe: proces edukacyjny; nauczyciel; umiejętność czytania; młodszy uczeń; tekst.

Kształcenie czytelnicze to umiejętność czytania, rozumienia, interpretowania, analizowania i wykorzystywania tekstów pisanych w celu rozwiązywania problemów edukacyjnych i praktycznych, osiągania celów, poszerzania wiedzy i możliwości oraz angażowania się w komunikację. Wielu badaczy definiuje umiejętność czytania jako zdolność jednostki do rozumienia tekstów pisanych różnego typu, o różnych strukturach formalnych, co łączy tę definicję z szerszym kontekstem – wykorzystaniem kompetencji czytelniczych do osiągania własnych celów, rozwijania wiedzy i możliwości aktywnego uczestnictwa w życiu społeczeństwa [1].

W strukturze umiejętności czytania Smetannikova N.N. identyfikuje elementy osobiste, poznawcze i proaktywne. Zdaniem autorki umiejętność czytania jako szczególna forma edukacji osobistej odzwierciedla system kompetencji kluczowych nabywanych przez dziecko w trakcie nauki czytania w szkole podstawowej [2].

Analiza struktury i treści umiejętności czytania pokazuje, że kategoria ta w kontekście badań nad edukacją uczniów szkół podstawowych ma swoją własną charakterystykę. Ważne jest rozwijanie umiejętności czytania jako złożonej, wieloskładnikowej edukacji osobistej na poziomie interdyscyplinarnym z wykorzystaniem materiału różnego rodzaju tekstów: artystycznego, naukowego, edukacyjnego i edukacyjnego.

Kształcenie piśmiennego czytelnika, który potrafi czytać i analizować dużą ilość informacji, jest problemem globalnym. Badania PISA potwierdziły to eksperymentalnie.

Nauczanie korzystania z czytania jako środka uczenia się jest ważnym zadaniem, ponieważ praca z materiałami edukacyjnymi wymaga opanowania nie tylko technicznej strony umiejętności czytania, ale także strony merytorycznej, czyli rozumienia tekstów różniących się formą, strukturą i logiką. Wysiłki nauczycieli szkół podstawowych powinny mieć na celu nie tylko rozwijanie umiejętności czytania jako warunku niezbędnego do pełnoprawnej aktywności czytelniczej, ale także kształtowanie i rozwój umiejętności młodszych uczniów. To właśnie umiejętność czytania zapewni uczniowi szkoły podstawowej możliwość samodzielnego zdobywania nowej wiedzy, a w przyszłości stworzy podstawy do samodzielnej nauki i samokształcenia na kolejnych poziomach edukacji. Za podstawową umiejętność czytania i pisania uczniów szkół podstawowych uważa się umiejętność czytania – jest to umiejętność rozumienia i wykorzystywania tekstów pisanych, analizowania ich i studiowania w celu rozwiązania problemów życiowych. Informacje, które czytelnik otrzymuje z tekstu, powinny poszerzyć jego wiedzę i możliwości życiowe.

Praktyczne zalecenia metodyków i nauczycieli szkół podstawowych dotyczące podnoszenia poziomu umiejętności czytania w ramach programu edukacyjnego opierają się na fakcie, że koncepcja umiejętności czytania jest ściśle powiązana z koncepcją umiejętności czytania. Jednocześnie nie mówimy o technice czytania, ale o umiejętności czytania przez ucznia szkoły podstawowej w celu zdobycia nowej wiedzy, która pomaga w życiu praktycznym i dalszej edukacji [2].

Zalecenia dotyczące rozwijania umiejętności czytania uczniów szkół podstawowych:
1. Wykonuj notatki fragmentów z tekstu, streszczając przeczytane treści.
2. Przeanalizuj słowo, stosując zasadę (angl.) cinquain.
3. Poćwicz na dowolnym tekście narracyjnym.
4. Ułóż serię pytań do dziecka na temat tekstu.
5. Twórz ćwiczenia do nowych materiałów.
6. Przeprowadź burzę mózgów.
7. Przeanalizuj wizerunek bohatera.
8. Przygotuj własny quiz na podstawie tematów, których się uczysz.
9. Poproś dziecko, aby napisało własną bajkę lub wiersz.

Zatem kształtowanie umiejętności czytania u uczniów szkół gimnazjalnych definiuje się jako jeden z podstawowych elementów celów edukacji i wychowania. Dlatego też działalność pedagogiczna każdego nauczyciela powinna mieć na celu rozwijanie umiejętności czytania uczniów.

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Using Project-Based Learning to Improve Intercultural Communicative Competence

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Abstract
In today's globalized society, intercultural communicative competence (ICC) is essential, involving more than just language proficiency but also understanding and respecting cultural differences, recognizing personal biases, and adapting communication strategies to diverse cultural contexts. This article explores how Project-Based Learning (PBL), a student-centered pedagogical approach, can enhance ICC among learners. By integrating PBL into educational settings, students engage in real-world, meaningful projects that promote cultural awareness, collaboration, authentic language use, and critical reflection. Practical examples, such as cultural exchange projects and community-based initiatives, illustrate the effective implementation of PBL to foster ICC. Strategies and best practices for incorporating PBL into the curriculum, facilitating intercultural interactions, and assessing ICC are discussed, along with challenges and solutions for diverse classroom settings. Ultimately, PBL serves as a powerful tool to prepare students for intercultural interactions in personal and professional spheres, equipping them with the skills and attitudes necessary for effective communication in an interconnected world.
Keywords: *Intercultural Communicative Competence (ICC), Project-Based Learning (PBL), Cultural Awareness, Student-Centered Learning, Collaboration*

Introduction

In today's globalized society, the ability to communicate effectively across cultures-intercultural communicative competence (ICC) – is crucial. ICC is more than just language proficiency; it involves understanding and respecting cultural differences, being aware of one's own cultural biases, and adapting communication strategies to diverse cultural contexts. This article explores how Project-Based Learning (PBL), a student-centered pedagogical approach, can be used to enhance ICC among learners. By integrating PBL into educational settings, students can develop practical skills and gain valuable experiences that prepare them for intercultural interactions in both personal and professional spheres.

The Concept of Project-Based Learning

Project-Based Learning (PBL) is an instructional method where students learn by actively engaging in real-world and personally meaningful projects. Unlike traditional teaching methods that often rely on passive learning and memorization, PBL encourages students to explore, ask questions, and apply their knowledge to solve problems. Key characteristics of PBL include:

- *Student-Centered Learning:* Students take an active role in their learning process, making decisions about their projects and taking responsibility for their outcomes.
- *Inquiry and Exploration:* PBL involves asking questions, conducting research, and exploring various solutions to real-world problems.
- *Collaboration:* Students often work in groups, developing teamwork and communication skills.
- *Real-World Relevance:* Projects are connected to real-world issues and challenges, making learning more meaningful and applicable.

- *Reflection:* Students reflect on their learning experiences, assessing their progress and understanding.

How PBL Enhances ICC

1. Real-World Contexts
PBL projects provide students with opportunities to engage in real-world issues that often involve diverse cultural perspectives. For example, a project on global environmental sustainability might require students to research and compare how different cultures approach conservation efforts. Through these projects, students gain insights into various cultural practices and values, enhancing their cultural awareness and sensitivity.

2. Collaborative Learning
PBL emphasizes collaboration, often requiring students to work in diverse groups. These interactions are essential for developing ICC, as they allow students to practice and refine their intercultural communication skills. In multicultural classrooms, students learn to navigate cultural differences, manage conflicts, and build relationships across cultural boundaries. Group projects can also involve international partners, further exposing students to different communication styles and cultural norms.

3. Authentic Language Use
Effective communication is a key component of ICC, and PBL provides numerous opportunities for students to use language in authentic contexts. Projects that involve communication with native speakers, such as interviews, surveys, or collaborative tasks, help students develop practical language skills. For example, a project on cultural festivals might involve interviewing community members or creating bilingual materials, allowing students to practice language use in real-life scenarios.

4. Reflection and Critical Thinking
Reflection is a critical element of PBL, encouraging students to think deeply about their learning experiences. Reflective activities, such as journals, discussions, and self-assessments, help students examine their cultural assumptions and biases. This self-awareness is crucial for developing ICC, as it allows students to understand their own cultural identity and how it influences their interactions with others. Critical thinking skills are also honed as students analyze cultural differences and develop strategies for effective communication.

Practical Examples of PBL for ICC

1. Cultural Exchange Projects
Virtual exchange projects with peers from other countries provide valuable opportunities for intercultural communication. These projects can involve joint research on cultural topics, language exchange sessions, and collaborative presentations. For instance, students might work together on a project about traditional music, sharing their findings through virtual meetings and multimedia presentations. Such interactions help students practice intercultural communication in a meaningful context, developing both language skills and cultural understanding.

2. Community-Based Projects
Involving students in community projects that address local cultural issues provides hands-on experience with cultural diversity. For example, a project to support refugee or immigrant

communities can help students understand the challenges and perspectives of different cultural groups. Activities might include organizing cultural events, creating educational materials, or volunteering with local organizations. Through these projects, students develop empathy and a deeper understanding of cultural diversity.

3. Global Classroom Collaborations
Partnering with schools in other countries for joint projects exposes students to different educational approaches and cultural perspectives. These collaborations can involve joint research projects, video conferences, and cultural exchange activities. For example, a project on global health issues might involve students from different countries researching and comparing healthcare practices, then sharing their findings through virtual presentations. Such collaborations provide rich opportunities for intercultural learning and communication.

Implementing PBL to Enhance ICC: Strategies and Best Practices

1. Curriculum Integration
Integrating PBL into the curriculum requires careful planning and alignment with educational goals. Educators should identify key learning objectives related to ICC and design projects that address these goals. For example, a language arts curriculum might include a project on international literature, where students read and analyze works from different cultures, then create multimedia presentations or write comparative essays.

2. Facilitating Intercultural Interactions
To enhance ICC, PBL projects should involve direct interactions with people from different cultures. This can be achieved through virtual exchanges, community partnerships, or collaborative projects with international schools. Educators should provide guidance and support to help students navigate cultural differences and develop effective communication strategies.

3. Encouraging Reflective Practices
Reflection is a critical component of PBL and ICC development. Educators should incorporate reflective activities, such as journals, discussions, and self-assessments, into their projects. These activities help students examine their cultural assumptions, evaluate their communication strategies, and identify areas for improvement. For example, after completing a project on cultural heritage, students might write reflective essays discussing what they learned about their own and others' cultures.

4. Assessing Intercultural Competence
Assessing ICC can be challenging, as it involves both cognitive and affective dimensions. Educators should use a variety of assessment methods, including self-assessments, peer evaluations, and performance-based assessments. Rubrics that measure specific ICC skills, such as cultural awareness, empathy, and adaptability, can provide valuable feedback and guide student learning. For example, a rubric for a project on intercultural communication might assess students' ability to recognize and respect cultural differences, use appropriate communication strategies, and reflect on their learning experiences.

5. Providing Support and Resources
Effective PBL requires adequate support and resources. Educators should provide students with access to research materials, technological tools, and expert guidance. Collaborations with cultural organizations, community groups, and international partners can also enhance the learning

experience. For example, a project on global citizenship might involve partnerships with local NGOs, guest speakers from diverse backgrounds, and virtual exchanges with schools in other countries.

10 Steps of Project-Based Learning

Project-Based Learning (PBL) is a dynamic classroom approach that encourages students to explore real-world problems and challenges through extended inquiry and hands-on projects. Here are ten detailed steps to effectively implement PBL:

1. Identify Learning Goals and Standards
Begin by identifying the learning objectives and standards that the project will address. These should align with curriculum requirements and educational standards.

Implementation:
- Review curriculum standards and outcomes for the subject area.
- Define specific knowledge, skills, and competencies students should acquire.
- Consider incorporating skills such as critical thinking, collaboration, and problem-solving.

Example: For a project on environmental sustainability, learning goals might include understanding ecological principles, analyzing human impact on ecosystems, and developing communication skills through presentations.

2. Choose a Real-World Problem or Question
Select a driving question or real-world problem that is relevant, engaging, and challenging for students. This question should guide the entire project and provide a focus for inquiry.

Implementation:
- Brainstorm potential topics that are meaningful and interesting to students.
- Ensure the problem is complex enough to require extended investigation and multiple perspectives.
- Formulate an open-ended driving question that cannot be answered with a simple yes or no.

Example: "How can our community reduce plastic waste and its impact on the environment?"

3. Plan the Project and Timeline
Description: Develop a detailed project plan and timeline, outlining the key milestones, tasks, and deadlines. This helps manage the project and ensures students stay on track.

Implementation:
- Break the project into manageable phases or steps.
- Set clear milestones and checkpoints to monitor progress.
- Allocate time for research, collaboration, production, and reflection.

Example: Create a timeline with stages such as research and data collection (Weeks 1-2), analysis and solution development (Weeks 3-4), and presentation preparation (Weeks 5-6).

4. Design the Entry Event
Create an engaging entry event to introduce the project and spark students' interest. This could be a guest speaker, a video, a field trip, or a simulation.

Implementation:
- Plan an activity that introduces the real-world context and significance of the project.
- Use multimedia, hands-on activities, or expert talks to captivate students.
- Pose the driving question and discuss its relevance to their lives and community.

Example: Show a documentary on ocean plastic pollution and invite a local environmental activist to discuss the issue.

5. Form Student Teams and Define Roles
Organize students into teams to promote collaboration and peer learning. Clearly define roles and responsibilities within each team.

Implementation:
- Group students based on diverse skills, interests, and strengths.
- Assign or let students choose specific roles, such as project manager, researcher, data analyst, and presenter.
- Ensure roles are rotated or shared to give each student a chance to develop different skills.

Example: In a team working on reducing plastic waste, one student might lead research on recycling methods, another on community outreach, and another on creating educational materials.

6. Conduct Research and Inquiry
Guide students as they research the problem, gather information, and explore various solutions. Encourage them to use multiple sources and methods.

Implementation:
- Teach research skills, including how to find reliable sources, evaluate information, and cite references.
- Provide access to resources such as libraries, databases, and experts.
- Encourage diverse methods such as surveys, interviews, field visits, and experiments.

Example: Students might conduct surveys on plastic use in their school, interview recycling experts, and visit a local recycling facility.

7. Develop and Propose Solutions
Have students analyze their findings and develop potential solutions to the driving question. Encourage creativity and critical thinking.

Implementation:
- Facilitate brainstorming sessions and encourage students to think creatively.
- Guide students in evaluating the feasibility and impact of their proposed solutions.
- Use tools like mind maps, prototypes, and models to help visualize ideas.

Example: Students might propose solutions like implementing a school-wide recycling program, creating educational campaigns, or developing a plastic-free initiative.

8. Create a Public Product
Students create a final product that demonstrates their learning and solutions. This product should be shared with an audience beyond the classroom.

Implementation:
- Decide on the format of the final product, such as reports, presentations, videos, or websites.
- Ensure the product is polished and professional, reflecting the effort and learning involved.
- Provide guidance and support on technical skills needed for the final product.

Example: Students create a multimedia presentation and a website detailing their findings and proposed solutions to reduce plastic waste.

9. Present and Share the Project
Arrange for students to present their projects to an authentic audience. This could include classmates, teachers, parents, community members, or experts in the field.

Implementation:
- Organize a presentation event, such as a project fair, community meeting, or online webinar.
- Teach presentation skills and provide opportunities for practice and feedback.
- Encourage students to engage with their audience through Q&A sessions and discussions.

Example: Host a community event where students present their projects, share their website, and discuss their solutions with attendees.

10. Reflect and Assess
Reflection and assessment are critical components of PBL. Have students reflect on their learning process, the challenges they faced, and the skills they developed. Conduct assessments to evaluate their performance.

Implementation:
- Use reflection activities such as journals, group discussions, and self-assessments.
- Assess the project using rubrics that measure both the process and the final product.
- Provide feedback that highlights strengths and areas for improvement.

Example: Students write reflective essays on their project experiences and participate in a group discussion to share insights. Teachers use a rubric to evaluate their presentations, research, and collaboration.

By following these detailed steps, educators can effectively implement Project-Based Learning to enhance students' intercultural communicative competence and other essential skills.

Challenges and Solutions in Implementing PBL for ICC

1. Managing Diverse Classrooms
Diverse classrooms present both opportunities and challenges for PBL. Educators must be mindful of cultural differences and create an inclusive learning environment that respects and values

diversity. This involves setting clear expectations for respectful behavior, fostering open communication, and addressing any cultural misunderstandings that arise. For example, in a multicultural classroom, educators might establish ground rules for group discussions, provide training on intercultural communication, and facilitate activities that promote cultural awareness and sensitivity.

2. Ensuring Equitable Participation

PBL relies on active student participation, but not all students may feel equally comfortable or confident contributing to group projects. Educators should provide support and encouragement to ensure equitable participation. This might involve assigning specific roles based on students' strengths and interests, providing scaffolding and guidance, and creating opportunities for individual contributions. For example, in a project on cultural festivals, students might take on different roles such as researchers, writers, designers, or presenters, ensuring that everyone has a meaningful part to play.

3. Addressing Language Barriers

Language barriers can pose significant challenges in PBL, especially in multicultural classrooms. Educators should provide language support, such as bilingual resources, language partners, and scaffolding techniques, to help students overcome these barriers. Additionally, projects should be designed to accommodate varying language proficiency levels, allowing students to contribute in ways that align with their skills. For example, a project on international cuisine might involve creating bilingual recipe books, conducting interviews in students' native languages, and presenting findings through visual and multimedia formats.

4. Balancing Academic Rigor and Cultural Sensitivity

PBL projects must balance academic rigor with cultural sensitivity. Educators should ensure that projects are challenging and intellectually stimulating, while also being respectful and inclusive of diverse cultural perspectives. This involves carefully selecting project topics, designing culturally relevant activities, and providing guidance on ethical research practices. For example, a project on indigenous cultures might involve studying traditional practices, interviewing community members, and creating respectful representations of cultural heritage.

Conclusion

Project-Based Learning is a powerful tool for enhancing Intercultural Communicative Competence. By engaging students in meaningful, real-world projects, PBL helps them develop the skills and attitudes necessary for effective intercultural communication. It fosters cultural awareness, empathy, and adaptability, preparing students to navigate and thrive in an increasingly interconnected world. Integrating PBL into the curriculum and providing support and resources can create enriching learning experiences that not only enhance academic skills but also build the intercultural competence essential for global citizenship. Through careful planning, reflection, and collaboration, educators can use PBL to empower students to become effective and empathetic communicators in a diverse and complex world.

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Управление развитием педагогического коллектива в условиях инновационных изменений

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Аннотация:
В статье рассматриваются актуальные вопросы управления развитием педагогического коллектива в контексте современных инновационных преобразований в системе образования. Автор анализирует ключевые вызовы, с которыми сталкиваются руководители образовательных организаций, и предлагает комплексный подход к управлению, включающий диагностику профессиональных дефицитов, создание мотивационной среды, организацию непрерывного обучения и формирование корпоративной культуры, ориентированной на сотрудничество и рост. Особое внимание уделяется практическим инструментам и методам, способствующим эффективной адаптации педагогов к изменениям и раскрытию их инновационного потенциала.

Ключевые слова: управление развитием, педагогический коллектив, инновационные изменения, профессиональное развитие, образовательная организация, мотивация, корпоративная культура, цифровизация.

Введение

В последние годы Казахстан активно внедряет инновационные изменения в образовательную систему. Эти изменения касаются не только образовательных программ, но и подходов к управлению педагогическим коллективом. В условиях глобализации и стремительного развития технологий управление развитием педагогического коллектива становится ключевым элементом успешной реализации реформ.

Современная система образования находится в состоянии постоянной трансформации, обусловленной процессами цифровизации, внедрением новых образовательных стандартов РК, возрастанием требований к качеству образовательных услуг и необходимостью формирования у обучающихся навыков XXI века. Эти инновационные изменения носят не эпизодический, а системный характер, предъявляя принципиально новые требования к профессиональным компетенциям педагога.

Управление развитием педагогического коллектива в условиях инновационных изменений является важной задачей для образовательных учреждений Казахстана. Эффективные стратегии, направленные на профессиональное развитие и поддержку учителей, способны значительно повысить качество образования и подготовить учащихся к вызовам современного мира.
Внедрение инновационных подходов поможет создать атмосферу, способствующую творчеству и сотрудничеству, что, в свою очередь, будет способствовать успеху не только педагогов, но и обучающихся.

В этих условиях ключевым фактором успешности образовательной организации становится не только наличие современной материально-технической базы, но и готовность педагогического коллектива к принятию и реализации новшеств. Следовательно, центральной задачей управленца (директора, завуча) становится эффективное управление развитием кадрового потенциала. Это управление выходит за рамки традиционного повышения квалификации и превращается в стратегический процесс, направленный на формирование самообучающегося, гибкого и мотивированного коллектива, способного к совместному поиску и внедрению инноваций.

1. Вызовы инновационной среды для педагогического коллектива

Прежде чем выстраивать систему управления развитием, необходимо четко идентифицировать основные барьеры и вызовы, с которыми сталкиваются педагоги:

1. Психологическое сопротивление новому: Инновации часто вызывают страх перед неизвестностью, опасение увеличивающейся нагрузки, непонимание практической ценности изменений. Консерватизм, присущий образовательной сфере, может стать серьезным препятствием.
2. Цифровой разрыв и технологическая неуверенность: Стремительная цифровизация требует уверенного владения цифровыми инструментами (интерактивное оборудование, онлайн-сервисы). Педагоги старших поколений могут испытывать дискомфорт и неуверенность, что приводит к их профессиональной дезориентации.
3. Дефицит новых профессиональных компетенций: Требуется не только передача знаний, но и умение проектировать индивидуальные образовательные траектории, формировать навыки (soft skills) у учащихся, работать в команде, использовать проектные и исследовательские методы.
4. Эмоциональное выгорание: Постоянные изменения, растущая отчетность и многозадачность на фоне высокой ответственности ведут к хроническому стрессу и синдрому эмоционального выгорания, что блокирует всякую готовность к развитию.

Эффективная система управления развитием должна быть направлена на преодоление этих вызовов.

2. Стратегические направления управления развитием педагогического коллектива

Управление развитием в инновационных условиях должно носить системный и многоуровневый характер. Можно выделить несколько ключевых направлений.

2.1. Диагностика и оценка потребностей в развитии

Развитие не может быть эффективным, если оно навязано «сверху» без учета реальной ситуации. Необходима регулярная диагностика:

Анализ профессиональных дефицитов: анкетирование, собеседование, наблюдение уроков выявить, какие именно компетенции (методические, цифровые, коммуникативные) требуют развития у конкретных педагогов и у коллектива в целом.

Оценка уровня готовности к инновациям: Использование специализированных опросников для определения типа реакции педагогов на изменения (новаторы, ранние последователи, раннее большинство, позднее большинство, отстающие). Это позволяет дифференцировать подход.

Мониторинг уровня мотивации и эмоционального состояния: Регулярное изучение индекса удовлетворенности, выявление признаков выгорания для своевременной профилактики.

2.2. Создание мотивационной среды
Принуждение к инновациям неэффективно. Задача руководителя — создать среду, где развитие становится внутренней потребностью педагога.
Связь инноваций с профессиональными целями: Четкое разъяснение, как новые методы или технологии помогут педагогу решить его ежедневные задачи, облегчат труд, повысят эффективность и признание учащихся.
Система материального и нематериального стимулирования: Введение грантов за инновационные проекты, возможность участия в значимых конференциях, публичное признание заслуг («Педагог месяца», доска почета), карьерные лифты (наставник, методист, руководитель проектной группы).
Поддержка инициативы: Создание условий, при которых педагоги чувствуют себя не исполнителями, а соавторами изменений. Внедрение практик «бережливого производства», где любые рацпредложения по улучшению процессов рассматриваются и поощряются.

2.3. Организация непрерывного и практико-ориентированного обучения
Классические курсы повышения квалификации часто оторваны от реальной практики. Необходимы новые форматы:
Внутрикорпоративное обучение (Talent Development): Создание системы наставничества, где продвинутые педагоги (новаторы) курируют менее опытных коллег. Организация внутренних мастер-классов, педагогических мастерских, воркшопов по обмену опытом.
Проектная деятельность: Наиболее эффективный метод обучения — работа над реальным проектом (например, разработка междисциплинарного модуля, создание цифрового образовательного ресурса). Это позволяет сразу апробировать новые знания на практике.
Создание профессиональных обучающихся сообществ: Формирование групп педагогов по интересам (например, «Цифровые инструменты в гуманитарных науках», «Проектная деятельность в начальной школе»), которые регулярно встречаются для совместного анализа практик, решения проблем и обучения друг у друга.
Стажировки и нетворкинг: Организация обмена опытом с другими передовыми образовательными организациями.

2.4. Формирование инновационной корпоративной культуры
Развитие — это не только обучение, но и среда, которая его поддерживает.
Культура сотрудничества вместо конкуренции: Поощрение командной работы, открытого обмена идеями и материалами. Разрушение изоляции между кафедрами и предметными областями.
Культура ошибки: Создание атмосферы, где ошибка в процессе внедрения новшества воспринимается не как провал, а как ценный опыт для обучения и корректировки действий. Это снижает страх и encourages experimentation.
Открытая коммуникация: Регулярное информирование коллектива о целях изменений, их этапах и промежуточных результатах. Прозрачность управленческих решений снижает уровень тревожности и слухов.

3. Роль руководителя в процессе управления развитием
В условиях инноваций роль руководителя трансформируется из администратора в лидера-наставника:
1. Visionary (Стратег): Четко формулирует и транслирует видение будущего организации, вдохновляя коллектив на движение к общей цели.

2. Facilitator (Организатор): Создает организационные структуры и процессы, поддерживающие развитие (проектные группы, систему наставничества).
3. Resource Provider (Обеспечивающий ресурсами): Гарантирует предоставление необходимых ресурсов: временных (на освоение нового), материальных (техника, ПО), информационных (доступ к курсам, литературе) и кадровых (привлечение внешних экспертов).
4. Supporter (Поддерживающий): Оказывает непрерывную поддержку, признает достижения, помогает преодолевать трудности, создает атмосферу психологической безопасности.

Заключение

Управление развитием педагогического коллектива в эпоху инноваций — это сложный, многогранный и непрерывный процесс. Он не может быть сведен к разовым мероприятиям. Его успех напрямую зависит от способности руководителя перейти от административного контроля к лидерству, ориентированному на человека и его потенциал.

Эффективная модель управления развитием основывается на глубокой диагностике, выстраивании персональных образовательных траекторий для педагогов, создании мощной мотивационной и поддерживающей среды, а также формировании культуры сотрудничества и постоянного обучения внутри коллектива. Инвестиции в развитие человеческого капитала являются самыми продуктивными, так как именно подготовленный, мотивированный и сплоченный педагогический коллектив становится главным драйвером и гарантом успешной реализации любых инновационных изменений в образовательной организации.

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Постановка и основа дирижёрского аппарата на начальном этапе обучения

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Дирижирование - это система жестов, с помощью которых дирижѐр может передать художественный, творческий замысел композитора. Единое целое составляет в дирижере – артистизм и музыкальность.

Дирижерский аппарат – это комплекс слуховых, эмоциональных, двигательных способностей, необходимых для взаимодействия с исполнителями в процессе управления.

Проблема постановки дирижерского аппарата – это, прежде всего, проблема мышечной свободы.

Мышечная свобода – это активное действие, требующее большего усилия, чем напряжение мышц. То есть аппарат дирижера не должен быть в напряжении. В первую очередь нужно исключить физические и психологические помехи, тормозящие развитие. Свободы аппарата невозможно достигнуть в практике дирижирования, когда внимание направлено на выполнение художественно-исполнительских задач исполняемого произведения. Поэтому в начальной стадии обучения их лучше развивать специальными упражнениями, целью которых является устранение всевозможных двигательных зажатостей.

В дирижерской практике используются различные упражнения, чтобы раскрепостить постановку дирижерского аппарата. При выполнении упражнения главным должно быть мышечно-слуховое и зрительное ощущения. В процессе работы над дирижерским аппаратом нужно необходимо учитывать индивидуальные особенности студента.
Специальные упражнения, направленные на правильную постановку дирижерского аппарата и предупреждения возможных недостатков (сутулость, согнутое положение корпуса и др.).

Упражнения для постановки дирижёрского аппарата:

1. Студент встаёт спиной к косяку двери, как можно плотнее. В таком положении у шейного позвонка и поясничной части образуется просвет в 1-2 сантиметра. Грудь при этом несколько приподнята, плечи разворачиваются, осанка приобретает естественное положение. Голова держится прямо, руки свободно висят. В корпусе не должно ощущаться напряжение.

2. Исходное положение тоже, что и в упражнении 1, только без опоры о косяк (опираясь на ноги.) Ноги расставлены на ширину стопы, одна нога выдвинута вперёд. Начинаем переносить центр тяжести с одной ноги на другую, как бы слегка покачиваясь. Таким образом, убирается мышечное напряжение в ногах.

3. Освобождение мышц шеи – плавные повороты и наклоны головы.

4. Освобождаются мышцы шеи и плечевого пояса – плечи свободно поднимаются и опускаются, приподнять плечи, отвести их назад и свободно опустить; круговые движения плечами вперёд и назад (повторить несколько раз). Эти упражнения помогают выработать основную дирижерскую позицию.

Упражнения для выработки свободы рук, плеча с плечевым суставом.

Кисть состоит из трех частей: запястье, пястье и пальцы. При работе с ней необходимо следить за состоянием всей руки, постоянно освобождая мышцы, не напрягая их:

1. Исходное положение: встать прямо, руки свободно опущены вдоль корпуса. Правая рука медленно поднимается в левую сторону, описывая круг вдоль туловища. Упражнение проделывается несколько раз каждой рукой поочерёдно при регулируемом дыхании «вдох – выдох».

2. Упражнение то же, что и предыдущее, только рука движется не в левую, а в правую сторону.

3. Усложнённый вариант этого упражнения выполняется одновременно двумя руками в разные стороны, а затем в одну в параллельном движении.

Упражнения для плоскости туловища направлении
(вперёд и назад):

1. Упражнение начинается с движения всей рукой от плеча в умеренном темпе. Главное – не выполнять круг равномерно, а следить за естественным ускорением в падении и замедлением после него. Рука должна быть цельной, не сгибаться в локтевом суставе. Чтобы круг не ломался, необходимо найти удобный угол по отношению к корпусу, не заводя руку далеко назад. Следует выполнять это движение поочерёдно в разных направлениях, а в дальнейшем и в разных темпах. Быстрый темп поможет лучше ощутить свободу плечевого сустава, цельность руки и позицию круга, а медленный – чередование замедления и ускорения.

2. После выполнения кругов всей рукой можно освоить это движение от локтя. Свободно опущенное плечо лишь поддерживает руку, активно не участвуя в движении. Предплечье и кисть как бы составляют единое целое. Кисть обращена ладонью вниз. В падении она отталкивается от воображаемой плоскости, в верхней части круга движение замедляется.

Упражнения для освобождения предплечья, плеча и кисти.

1. Встать прямо. Поднять одну руку вверх (вдох), затем бросить её вниз, не сгибая в локтевом суставе (выдох), свободно покачать внизу маятникообразным движением. Выполнять поочерёдно и обеими руками. Главная задача – ощущение тяжести и весомости всей руки от плеча в падении и расслаблении после него. Вариант упражнения: с падением рук на выдохе опускать голову для полного ощущения расслабления.

2. Встать прямо. Поднять одну руку вверх. После поднятия руки вверх освобождать руку частями: сначала падает кисть, затем предплечье и плечо. При освобождении предплечья может опуститься и плечо. Следует обратить внимание в этот момент на активность локтя, который удерживает плечо в нужном положении.

3. Встать прямо. Поднять руки вверх (вдох), при падении все части рук освобождаются мгновенно, они мягко соскальзывают вдоль туловища (выдох). Здесь очень важен контраст напряжения вытянутой руки вверх и мгновенного её расслабления (внизу покачать руками как маятники).

4. Кисть расположить на уровне пояса. Медленно выполнять круговые движения кистью сначала по часовой стрелке, затем против нее, избегая толчков. Кисть находиться в положении ладонью вниз всегда, ее форму можно менять (раскрыть, собрать), но нельзя включать в движение предплечье. Начинать с малой амплитуды, добиваясь ровного кругового движения.

5. Крепко держать левой рукой запястье правой, обхватив его и не давая ему возможности двигаться самостоятельно. Кисть независимо от всей руки поднимать вверх и вниз, отклонять вправо и влево. После того как движения будут полностью освоены, их можно усложнить, описывая круги, квадраты, треугольники, «восьмёрки». Упражнение следует проделывать поочерёдно каждой рукой.

6. Встать прямо. Кисть расположить на уровне пояса. Ладонь слегка развернуть в сторону, для этого соединить 1, 2-й пальцы в «колечко» с ощущением опоры на них. Остальные пальцы закруглены. Вести горизонтальную линию в сторону от себя и обратно аналогично ведению смычка. Основной акцент на подвижности лучезапястного сустава. Упражнение выполнять поочерёдно каждой рукой, затем одновременно.

7. Выполнять волнообразные движения вверх и вниз обеими руками как бы «ныряя», «выныривая». Главная задача – активизировать мягкие, плавные движения кистью.

8. Встать прямо, руки свободно опущены вдоль корпуса. Одна рука поддерживает другую у запястья и медленно поднимает ее до уровня груди. Поднимаемая рука свободна со свешенной вниз кистью. Должны появиться различные мышечные ощущения рук: поддерживающей и поддерживаемой. В верхней точке руки остаются некоторое время неподвижными, далее поддерживающая рука выключает свою энергию, и поддерживаемая рука падает вниз под действием собственной тяжести («как плеть»). Упражнение выполняется до ощущения полной свободы. Далее функции рук меняются.

9. Левую руку поднять вперед от локтя, при этом кисть свободно свешивается вниз. Задержать руку в верхнем положении и затем отпустить. Обратить внимание на свободное падение руки. Упражнение повторять поочередно, потом обеими руками вместе.

10. Исходное положение то же. Левая рука медленно и спокойно поднимается вперед-вверх до высоты плеча без поддержки правой. Кисть в процессе не участвует и бессильно свешивается вниз. Проверить степень ее свободы можно путем похлопывания ее правой (свободной) рукой. По истечении 5–10 секунд, энергия, поддерживающая руку, выключается, и рука свободно падает вниз. Упражнение следует повторять обеими руками, сначала поочередно, затем вместе до полного их освобождения. И только тогда, когда это будет достигнуто, можно перейти к следующим упражнениям.

11. Поднять обе руки вверх. Напрячь мышцы рук, затем снимаем напряжение поочередно с пальцев, с кистей, от локтя и полностью со всей руки, одновременно опуская руки вдоль тела. Упражнение помогает студенту осознать, что такое напряжение в руках, и что означает полностью свободная рука.

Корпус дирижера – это спокойное положение без лишнего напряжения, затрудняющего действие рук. Грудь должна быть расправлена вместе с плечами. Грудная клетка должна показывать вместе с движением рук дыхание, его характер, соответственно требованиям динамики, темпа.

Дыхание должно быть выразительно, естественно, но не подчеркнуто утрированно. Следует избегать создающего жалкое впечатление согнутого положения корпуса, с запавшей, ввалившейся грудью. Совершенно недопустимо “влияние” корпуса, а также сопровождение показа вступления наклоном туловища в направлении вступающей партии.

Лицо дирижера есть важная часть аппарата управления исполнением. Внутренняя, психическая сила, которая подчиняет исполнение намерениям и требованиям дирижера, выражается в управлении взглядом.

Взгляд дирижера должен охватывать весь хор и одновременно наблюдать за каждым певцом. глаза дирижера должны быть видны всем исполнителям, так же как все исполнители должны быть в поле зрения дирижера.

Нельзя допускать опущенного положения головы, скрывающего от певцов лицо дирижера, а от взгляда дирижера исполнителей. Недопустимо положение головы, кивающей в соответствии с метро-ритмическим движением рук дирижера. Наряду со слуховым наблюдением необходимо непрерывно контролировать взглядом течение исполнения. Выразительный взгляд должен сопровождать каждое вступление, каждое начало фразы и окончание музыкального построения.

Рот дирижера используется для точного и одновременного вступления хора, а также рот, вместе с грудной клеткой, должен непрерывно участвовать в показе дыхания перед каждым вступлением каждой хоровой партии.

Руки несколько согнуты во время поднимающего их движения и затем, в основной, неподвижной позиции, должны быть вытянуты примерно на 2/3 своей длины. Сохраняя высший уровень в положении руки, кисть останавливается примерно на уровне середины груди дирижера; одновременно с кистью останавливается вся рука. Несколько ниже уровня кисти – локоть.

Кисти рук не должны быть расставлены шире плеч. Дирижеру следует держать кисть перпендикулярно груди.

Позиция ног должна обеспечить крепкое, устойчивое положение корпуса дирижера. Ступни ног должны быть несколько расставлены, со слегка выдвинутой вперед правой ногой. Центр тяжести корпуса должен быть распределен на обе ноги. Такая позиция ног создает достаточно устойчивое положение корпуса дирижера.

Ноги дирижера должны быть совершенно выпрямлены и напряжены, создавая устойчиво-упругую опору. Совершенно недопустимо подсчитывать ногой метр.

Движение дирижера вызывает звучание хора, причем характеру того или иного движения должна соответствовать в части нюансировки определенная сила звучания.

Виды нюансов	Движения по ширине размаха	Плоскости движений
Тихий (*p*)	малые	в плоскости середины груди
Средней силы (*mf*)	средней величины	плеч
Сильный (*f*)	большие	линии глаз
Предельно сильный, сильнейший (*ff*)	предельно большие	верха головы
Тишайший (*pp*)	еле заметные (малейшие)	пояса
Усиливающийся (crescendo)	восходяще-расширяющиеся	не выше верха головы
Стихающий (diminuendo)	нисходяще-суживающиеся	не ниже пояса

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Developing Linguistic Competence of Basic School Students

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Abstract
The article examines the theoretical and methodological foundations for developing linguistic competence among basic school students in the context of modern foreign language education. The importance of linguistic competence as the structural basis of communicative ability is emphasized, alongside the role of effective teaching methods such as communicative, task-based, lexical, and integrated approaches. The study analyzes how these methods contribute to forming accurate and meaningful language use and proposes pedagogical strategies suitable for Kazakhstan's competency-based educational standards.

Introduction

In the modern educational environment, developing linguistic competence has become one of the most important objectives of teaching foreign languages. The ability to use language accurately and effectively is not only an educational outcome but also a key life skill that allows learners to communicate and participate in global society. As Hymes (1972) noted, linguistic competence represents the foundation of communicative competence — without it, learners cannot construct grammatically correct and contextually appropriate utterances.

In Kazakhstan, the modernization of education has shifted the focus from rote memorization of linguistic forms to the functional use of language in communication. The State Educational Standards now emphasize the competency-based and communicative approaches, which require teachers to design lessons that develop both accuracy and fluency (Kunanbayeva, 2013). Therefore, understanding and applying effective methods for developing linguistic competence is an essential requirement for modern English language teaching in basic schools.

1. The Nature of Linguistic Competence

The concept of linguistic competence was first introduced by Chomsky (1965), who described it as the internalized system of grammatical rules that enables speakers to produce and understand an infinite number of sentences. Later, this concept was expanded by Hymes (1972) and Canale and Swain (1980), who distinguished between linguistic, sociolinguistic, discourse, and strategic components of communicative competence.

Linguistic competence includes phonological, lexical, morphological, and syntactic knowledge (Richards & Schmidt, 2010). For basic school students, this means mastering correct pronunciation, appropriate vocabulary use, sentence structure, and grammatical accuracy. The challenge for teachers lies in making this process engaging and communicatively relevant rather than mechanical or purely theoretical.

Developing linguistic competence is especially crucial at the basic education level because it provides the foundation for all subsequent language learning. As Piaget (1970) and Vygotsky (1978) emphasized, cognitive and social interaction plays a vital role in language development. Thus, instruction must integrate both linguistic input and meaningful communication to ensure sustainable learning outcomes

2. Effective Methods for Developing Linguistic Competence

Modern language pedagogy employs a variety of methods aimed at forming linguistic competence through meaningful practice and authentic communication.

2.1 Communicative Method

The communicative method prioritizes the functional use of language. According to Richards and Rodgers (2001), its main goal is to create real communication in the classroom through pair work, group discussions, and problem-solving tasks. Learners are encouraged to use the target language in authentic contexts, which allows them to internalize grammatical and lexical structures naturally. This method shifts attention from rule memorization to fluency and meaningful expression.

2.2 Task-Based Learning

Task-Based Learning (TBLT), described by Willis (1996) and Ellis (2003), focuses on completing real-world tasks that require active language use. Tasks such as planning, describing, or creating stimulate students' linguistic and cognitive engagement. Through pre-task preparation, performance, and post-task reflection, learners develop both accuracy and communicative ability. This method aligns with constructivist principles, as students construct knowledge through experience.

2.3 Lexical Approach

The lexical approach, proposed by Lewis (1993), views vocabulary as the central component of linguistic competence. Rather than focusing solely on grammar, it emphasizes learning collocations, fixed expressions, and lexical chunks. For instance, phrases like *make a decision* or *as a result* help learners produce natural and accurate speech. The approach encourages noticing and reusing language patterns from authentic materials, which enhances both comprehension and production skills.

2.4 Grammar in Context

While modern methodologies promote communication, grammar remains a crucial element of linguistic competence. Harmer (2007) argues that grammar should not be taught in isolation but embedded in meaningful contexts. Teachers can introduce new structures through texts, dialogues, or situations, followed by guided practice and communicative application. Contextualized grammar teaching helps students understand not only the form but also the function and meaning of structures in real communication.

2.5 Integrated and CLIL Approaches

Content and Language Integrated Learning (CLIL), developed by Coyle et al. (2010), combines subject learning with language development. Students learn content areas such as science or geography in English, which naturally broadens their vocabulary and improves their linguistic competence. CLIL promotes motivation and demonstrates the practical use of English beyond the classroom. When combined with communicative and task-based methods, it supports both academic and linguistic growth.

3. Pedagogical Implications

To develop linguistic competence effectively, teachers should apply an integrated methodological approach that balances accuracy and fluency. Lessons should include various stages — input, controlled practice, and communicative output — to ensure gradual skill formation. The integration of authentic materials, multimedia resources, and interactive tasks increases engagement and contextual understanding.

Assessment should also reflect the multidimensional nature of linguistic competence. Instead of focusing only on grammar tests, teachers can evaluate pronunciation, vocabulary use, and sentence formation through oral interviews, written reflections, and project presentations (Brown & Abeywickrama, 2010). Feedback should encourage self-correction and awareness of language form and meaning.

Conclusion

Developing linguistic competence among basic school students is a complex and multidimensional process that requires systematic methodological support. It involves not only the acquisition of grammar and vocabulary but also the ability to use them meaningfully in communication. The communicative, task-based, lexical, and CLIL approaches offer effective tools for achieving this goal. By combining these methods, teachers can create a learning environment that fosters both linguistic accuracy and communicative confidence. In Kazakhstan's context, such an approach aligns with the national educational priorities and contributes to forming globally competent learners capable of using English as a means of interaction and learning.

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Developing Linguistic Competence of Basic School Students

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Abstract

The article examines the theoretical and methodological foundations for developing linguistic competence among basic school students in the context of modern foreign language education. The importance of linguistic competence as the structural basis of communicative ability is emphasized, alongside the role of effective teaching methods such as communicative, task-based, lexical, and integrated approaches. The study analyzes how these methods contribute to forming accurate and meaningful language use and proposes pedagogical strategies suitable for Kazakhstan's competency-based educational standards.

Introduction

In the modern educational environment, developing linguistic competence has become one of the most important objectives of teaching foreign languages. The ability to use language accurately and effectively is not only an educational outcome but also a key life skill that allows learners to communicate and participate in global society. As Hymes (1972) noted, linguistic competence represents the foundation of communicative competence — without it, learners cannot construct grammatically correct and contextually appropriate utterances.

In Kazakhstan, the modernization of education has shifted the focus from rote memorization of linguistic forms to the functional use of language in communication. The State Educational Standards now emphasize the competency-based and communicative approaches, which require teachers to design lessons that develop both accuracy and fluency (Kunanbayeva, 2013). Therefore, understanding and applying effective methods for developing linguistic competence is an essential requirement for modern English language teaching in basic schools.

1. The Nature of Linguistic Competence

The concept of linguistic competence was first introduced by Chomsky (1965), who described it as the internalized system of grammatical rules that enables speakers to produce and understand an infinite number of sentences. Later, this concept was expanded by Hymes (1972) and Canale and Swain (1980), who distinguished between linguistic, sociolinguistic, discourse, and strategic components of communicative competence.

Linguistic competence includes phonological, lexical, morphological, and syntactic knowledge (Richards & Schmidt, 2010). For basic school students, this means mastering correct pronunciation, appropriate vocabulary use, sentence structure, and grammatical accuracy. The challenge for teachers lies in making this process engaging and communicatively relevant rather than mechanical or purely theoretical.

Developing linguistic competence is especially crucial at the basic education level because it provides the foundation for all subsequent language learning. As Piaget (1970) and Vygotsky (1978) emphasized, cognitive and social interaction plays a vital role in language development. Thus, instruction must integrate both linguistic input and meaningful communication to ensure sustainable learning outcomes

2. Effective Methods for Developing Linguistic Competence

Modern language pedagogy employs a variety of methods aimed at forming linguistic competence through meaningful practice and authentic communication.

2.1 Communicative Method

The communicative method prioritizes the functional use of language. According to Richards and Rodgers (2001), its main goal is to create real communication in the classroom through pair work, group discussions, and problem-solving tasks. Learners are encouraged to use the target language in authentic contexts, which allows them to internalize grammatical and lexical structures naturally. This method shifts attention from rule memorization to fluency and meaningful expression.

2.2 Task-Based Learning

Task-Based Learning (TBLT), described by Willis (1996) and Ellis (2003), focuses on completing real-world tasks that require active language use. Tasks such as planning, describing, or creating stimulate students' linguistic and cognitive engagement. Through pre-task preparation, performance, and post-task reflection, learners develop both accuracy and communicative ability. This method aligns with constructivist principles, as students construct knowledge through experience.

2.3 Lexical Approach

The lexical approach, proposed by Lewis (1993), views vocabulary as the central component of linguistic competence. Rather than focusing solely on grammar, it emphasizes learning collocations, fixed expressions, and lexical chunks. For instance, phrases like *make a decision* or *as a result* help learners produce natural and accurate speech. The approach encourages noticing and reusing language patterns from authentic materials, which enhances both comprehension and production skills.

2.4 Grammar in Context

While modern methodologies promote communication, grammar remains a crucial element of linguistic competence. Harmer (2007) argues that grammar should not be taught in isolation but embedded in meaningful contexts. Teachers can introduce new structures through texts, dialogues, or situations, followed by guided practice and communicative application. Contextualized grammar teaching helps students understand not only the form but also the function and meaning of structures in real communication.

2.5 Integrated and CLIL Approaches

Content and Language Integrated Learning (CLIL), developed by Coyle et al. (2010), combines subject learning with language development. Students learn content areas such as science or geography in English, which naturally broadens their vocabulary and improves their linguistic competence. CLIL promotes motivation and demonstrates the practical use of English beyond the classroom. When combined with communicative and task-based methods, it supports both academic and linguistic growth.

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To develop linguistic competence effectively, teachers should apply an integrated methodological approach that balances accuracy and fluency. Lessons should include various stages — input, controlled practice, and communicative output — to ensure gradual skill formation. The integration of authentic materials, multimedia resources, and interactive tasks increases engagement and contextual understanding.

Assessment should also reflect the multidimensional nature of linguistic competence. Instead of focusing only on grammar tests, teachers can evaluate pronunciation, vocabulary use, and sentence formation through oral interviews, written reflections, and project presentations (Brown & Abeywickrama, 2010). Feedback should encourage self-correction and awareness of language form and meaning.

Conclusion

Developing linguistic competence among basic school students is a complex and multidimensional process that requires systematic methodological support. It involves not only the acquisition of grammar and vocabulary but also the ability to use them meaningfully in communication. The communicative, task-based, lexical, and CLIL approaches offer effective tools for achieving this goal. By combining these methods, teachers can create a learning environment that fosters both linguistic accuracy and communicative confidence. In Kazakhstan's context, such an approach aligns with the national educational priorities and contributes to forming globally competent learners capable of using English as a means of interaction and learning.

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IMPROVING WRITING AND SPEAKING SKILLS OF SECONDARY SCHOOL STUDENTS ON THE BASIS OF AUTHENTIC NEWS ARTICLES

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ABSTRACT

This article discusses ways, methods, and mechanisms for improving the writing and speaking skills of secondary school students based on authentic news articles. The authentic material used is the children's news program BBC Newsround, which covers topics such as the environment, sports, scientific research, culture, and education, using simplified English. This allows middle school students to learn new words, pronounce sentences correctly, and learn useful information in English in an interactive and understandable way. The study conducts an experiment with middle school students, analyzes and evaluates the results before and after the experiment, describes the main problems of implementing this method of teaching a foreign language, and develops recommendations to eliminate existing problems. The article concludes that the use of authentic information in the form of news articles can improve the assimilation of material and increase student engagement in the learning process. The study examines methods, mechanisms, techniques, and means of teaching English as a foreign language using authentic materials and analyzes the effectiveness of BBC Newsround news programs, allowing for a theoretical and practical examination of the research topic. The study includes diagrams and statistics in tabular form, allowing the key points of the study to be viewed in an interactive and convenient format with easy-to-understand illustrations. It is worth mentioning the description of the problems of integrating communicative approaches to teaching English using authentic materials, as a result of which, thanks to the analysis of existing problems, it is possible to achieve a methodological solution in various practical situations that arise in the process of teaching English to middle school students in educational institutions in non-English-speaking countries.

Keywords: News articles, BBC Newsound, Secondary school, writing instruction, speech instruction.

INTRODUCTION

Teaching English in non-English-speaking countries is a mandatory part of secondary education, as it allows the younger generation of students to acquire useful English writing and speaking skills from an early age, which can later play a key role in their careers, place of residence, choice of partner, and overall existence. In general, it is important to understand that the mental makeup of secondary school students, their behavioral characteristics, and habits must be carefully taken into account when choosing methods for teaching English as a foreign language (EFL). Standard teaching methods are not sufficient for developing these skills due to the excessive standardization of the educational process without an individual approach to students. As a result, there is now an urgent need not only to modernize foreign language teaching methods, but also to include the use of authentic news articles in the teaching process. Of course, representatives of the educational systems of non-English-speaking countries, in the form of deputies, teachers at the legislative and educational levels are introducing new approaches to foreign language learning using communicative and task-based approaches in English language teaching with the aim of developing middle school students' skills in fluent reading of English texts and improving the quality of pronunciation and comprehension of the material. The authentic material used in this study is BBC Newsround, which is a children's version of BBC News, but with a more simplified language format, i.e., simple words and sentences are used so that even the youngest viewers can understand the information being broadcast. The program's materials include information using video images and audio accompaniment on various topics, such as the environment, science, sports, culture, and education. It is this selection of content that ensures that teenagers are interested in watching this program. Every teenager has their own distinctive characteristics, worldview, hobbies, and interests, which is why BBC News is the most effective way to increase the interest of the majority of middle school students. The integration of authentic materials not only improves the quality of the educational process, but also adapts the information to students who are learning English as a foreign language. Teenagers have the opportunity not only to obtain useful information on real topics, but also to solve pressing issues that affect their lives and extracurricular activities in one way or another. As a rule, the quality of the educational process is formed from two elements: learning during class and learning outside of class. While the former is mandatory, the latter can only be implemented if the teenager themselves wants it. Every teacher and parent strives to instill in their child a desire to learn a foreign language, and it is precisely the use of authentic materials that can enable significant progress in this area. Authentic materials, such as BBC Newsround, correspond in their parameters to the principles of the communicative approach (Communicative Language Teaching- CLT), as a result of which mechanisms of communication and interaction using English in real learning situations through the completion of specific tasks appear in the educational process. Activities such as summarizing, discussing, and rephrasing news texts allow middle school students to expand their vocabulary with each lesson, improve their diction and pronunciation, develop fluency in speaking and writing, and improve their grammatical accuracy.

Today, there is a huge amount of research devoted to the use of authentic materials. On the one hand, this is good because researchers can analyze each other's materials and use this to develop more sophisticated and accurate research that can be used in practical teaching activities. However, there is still a significant gap in the extensive study of the use of authentic materials in English language teaching, which lies in the lack of clarity on the use of simplified authentic resources, such as BBC Newsround and others. Thus, due to the relevance of this topic, the level of development among researchers, and the existence of problems requiring solutions, the aim of this study is to explore the potential for using and integrating BBC Newsround into English lessons to achieve high results in speaking and writing in foreign English among middle school students. To achieve this goal, the following three research tasks will be considered and solved in this study:

1) to describe the methods, means, and tools for teaching English as a foreign language using authentic materials;

2) analyze and evaluate the effectiveness of BBC Newsround programs;

3) conduct an experiment with a focus group of middle school students, assessing their reading and speaking results before and after the integration of authentic materials in the form of BBC Newsround.

It is worth mentioning that the practical and scientific significance of this study is due to the experiment itself, i.e., during the study, a sample of middle school students was selected who were taught materials in English classes using authentic programs. Using Google Forms, it was possible to record the results of teaching effectiveness and information perception among middle school students using authentic materials in the form of tables, illustrations, and diagrams. As a result, the research results allow us to analyze the correlation between pre- and post-test indicators, which, in turn, enables teachers in non-English-speaking countries to teach English to children in a more effective format and achieve higher indicators of information assimilation, improved diction, grammar, and pronunciation in speech.

It should also be noted that there are currently serious problems with the use of authentic materials. Although communication methods are quite effective in the context of teaching English, it is nevertheless necessary to understand that with each successive generation of middle school students, behavioral habits, characteristics, beliefs, and communication methods change. For example, if you use slang expressions, humor, and simplified teaching formats in a moderately entertaining way when communicating with middle school students, you can achieve higher results than if you simply teach according to a dry methodological guide. This study also examines and analyzes this as one of the key problems in foreign language teaching and provides solutions to these problems in the form of recommendations. The recommendations, in turn, are directly based on the results of the experiment in this study, which means that they also have high scientific, practical, and theoretical value. English has been taught in most countries around the world for more than a decade or two, and the methods and means of transmitting information are changing: artificial intelligence, digital devices, interactive whiteboards, and projectors are beginning to be used. Students are starting to use laptops and tablets to record information on digital media and view it in a form that is convenient for them. For example, with the help of a smartphone, a student can study English while walking down the street, riding the bus or taxi, or at home while sitting at a computer or laptop, and during breaks between games, watching TV series or movies. Achieving this result in a broader format is the most crucial aspect of teaching English, i.e., forming the concept that teenagers themselves want to learn English even outside the educational process. As a result, the overall goal of the study on a metaphysical level is to create comfortable conditions during the learning process using interesting information and authentic materials so that middle school students develop an active desire to learn English at inconvenient times. This will also be recorded in the results of the study in the form of a survey of the participants in the experiment.

It is also worth mentioning that the issue of improving the writing and speaking skills of secondary school students based on authentic news articles is also analyzed through the prism of teachers. In other words, this study also analyzes the problems that teachers encounter when implementing communication approaches using authentic methods. The study describes the training and preparation processes for teachers, as well as the methods and types of information delivery to them so that they can effectively optimize the foreign language learning process and increase the effectiveness of integrating authentic materials. If this issue is not addressed by teachers, the quality of information assimilation by secondary school students will decline because teachers will not be able to able to convey information and conduct classes effectively.

To this end, teachers themselves are also surveyed to determine whether they have correctly understood how to teach a foreign language using authentic methods. During the experiment, after the students were surveyed, the teachers themselves were also surveyed, which also increases the practical value of the research, since it touches on literally all parties involved in the educational process, i.e., those who study and those who teach. It is worth mentioning separately the sources of literature that were used in the writing process. They made it possible to describe the theoretical and methodological part of the study in a structured form, since, as mentioned at the outset, this topic is of high theoretical and scientific importance. It is examined by many researchers from different angles, which, again, creates a comprehensive and multi-component structure of the study, touching on related areas, as well as those directly related to the use of authentic news articles.

LITERATURE REVIEW

A growing number of researchers have emphasized the importance of authentic materials in language learning, noting their role in developing both writing and speaking skills (Mishan & Timmis, 2015; Setyowati & Sukmawan, 2021; Elmoisheer & Elsawy, 2022; Lukman et al., 2023). Authentic materials, created for real-life communication rather than for instructional purposes, expose learners to natural language use, idiomatic expressions, and real-world contexts (Sukmawan, Setyowati, & El-Sulukiyyah, 2020). By working with authentic input, students can practice interpreting information, expressing opinions, and producing coherent written and spoken responses (Rahman, 2020). BBC Newsround represents an ideal example of authentic yet accessible material for young learners. Unlike standard BBC News, Newsround articles are designed for readers aged 7-14, with simplified syntax and familiar vocabulary while retaining genuine content and journalistic style. Such texts introduce learners to diverse topics-environmental issues, science and technology, culture, sports, and education-making them valuable for building both linguistic competence and general knowledge (Rahimi & Zhang, 2021).

When students engage with these materials through classroom discussions, written summaries, and role-plays, they not only acquire vocabulary and grammatical accuracy but also develop confidence in expressing ideas orally and in writing. Elmoisheer and Elsawy (2022) demonstrated that reading and rewriting authentic texts improve lexical range, cohesion, and written fluency. Similarly, Lukman et al. (2023) found that authentic resources enhance both syntactic awareness and speaking confidence. Setyowati and Sukmawan (2021) highlighted the necessity of teacher guidance and scaffolding-such as pre-teaching vocabulary, analyzing text structure, and modeling communication strategies-to ensure students can successfully transition from comprehension to production. These principles apply equally to Newsround-based lessons, where authentic topics can serve as a springboard for interactive speaking tasks and structured writing exercises. At the same time, researchers note potential challenges in using authentic materials with younger learners, including complex vocabulary and unfamiliar cultural references (El-Sulukiyyah & Aisyah, 2019). BBC Newsround effectively mitigates these challenges by providing linguistically accessible and pedagogically suitable content.

Therefore, the use of Newsround articles can bridge the gap between authentic exposure and age-appropriate comprehension, supporting the development of both written and spoken English in a motivating and meaningful way. While much research has focused on authentic materials at the tertiary level, relatively few studies have investigated their role in secondary EFL classrooms. This study, therefore, seeks to contribute to this area by analyzing how BBC Newsround can be effectively used to enhance the writing and speaking competence of students aged 10-14 and by proposing practical teaching strategies for language educators.

All of the above-mentioned foreign and domestic scientific studies have influenced the writing and design of this study in one way or another, both in terms of theory and practice, at least in terms of explaining terms, processes, and phenomena directly related to the use of authentic materials in teaching English. This helped not only in resolving controversial issues and discussing the results, but also in compiling comprehensive recommendations for teachers on teaching English using authentic materials for middle school students, which also increased the uniqueness of this study and contributed to the compilation of accurate and proven results.

METHODS

Quantitative indicators were used to analyze the results of this study. The purpose of reflecting statistical indicators was, as a rule, to show in quantitative terms the progression of the scale of effectiveness of information assimilation among middle school students, to assess teachers' awareness of the use of authentic materials in teaching English, and to correlate the indicators with each other, As a result, it was possible to adapt the methodology to the needs and tasks of students and teachers in order to increase the effectiveness of the educational process using authentic materials. The study targeted students in grades 4 to 8, aged 10 to 14, who study English as a foreign language in educational institutions. The research was based at Gymnasium No. 6, located in the former capital of Almaty in the Republic of Kazakhstan, with over 1,000 students. The researchers conducted a survey of 20 students aged 10 to 14 in grades 4 to 8 at this educational institution, as well as the teachers who teach English. The main tool for data collection was an online survey, which allowed us to collect responses from all participants and obtain accurate results. The survey was conducted using Google Forms.

The survey consisted of an individual questionnaire designed specifically for English teachers at the educational institution as well as for students. The questions were related to understanding terms and explanations of authentic materials. Quantitative data was collected, tested, and analyzed using Excel to determine the exact percentage of responses and summarize the responses of the study participants.

Before conducting the survey, both middle school students and teachers were briefed explaining the reason for the survey, how many times it would be conducted, and that they should answer the questions honestly without using third-party applications, artificial intelligence, the internet, etc., based solely on the knowledge, skills, and information they had acquired during consultations with teachers and in the course of classes using authentic materials. As a result of explaining the technical regulations, it was possible to achieve full participation from all participants in the process, which also had a positive effect on the quality and accuracy of the research and experiment results.

The management of the educational institution and the parents of middle school students aged ten to fourteen in grades four through eight were also notified about this study in order to minimize the number of disputes, conflicts, and other negative situations that could arise during an uncoordinated experiment. At the same time, in terms of the technical aspects of recording the research results, diagrams were also used, taken directly from Google Forms and constructed manually in the Office Word application, which made it possible to structure all the information obtained into a coherent and understandable picture for the reader of this study, which also testifies to its high practical significance. It should also be noted that the individual digital survey for teachers was compiled using OpenAI and DeepSeek artificial intelligence, and information from authentic materials and BBC Newsround was entered into their registry, after which a series of questions was compiled, which were then rephrased and optimized using the resources and skills of researchers, which made it possible to significantly optimize the process of surveying teachers. Table 1 shows statistical data on the number of participants in the experiment and their ages (see Table 1).

Table 1. Statistical Information of Participants

Age	10-12	13-14	30+	Total
%	32%	39%	29%	100%

According to Table 1, it can be seen that the number of participants in the experiment is divided into three segments:

-Students aged 10 to 12 (9 participants) 32%;

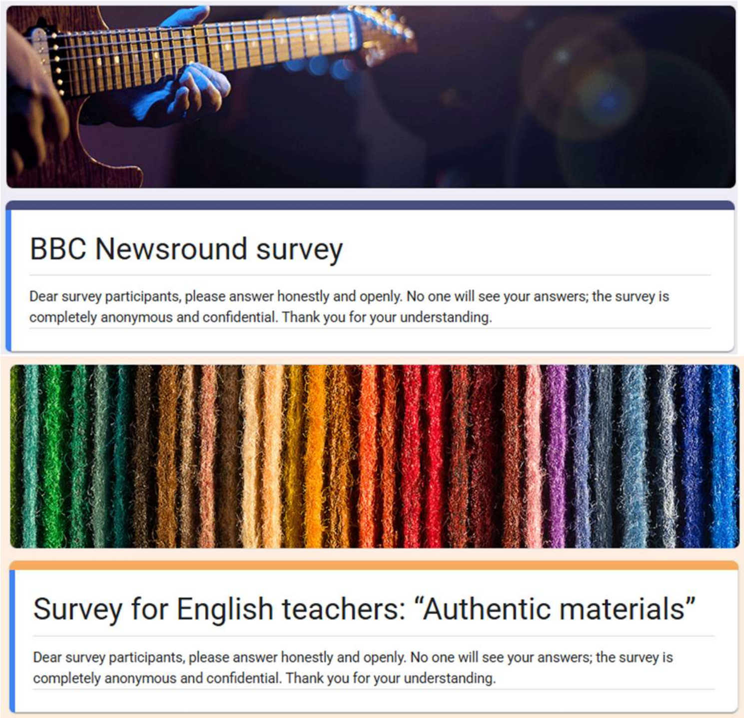
-Students aged 13 to 14 (11 participants) 39%;

-Teachers aged 30+ (8 participants) 29%.

The questionnaires were created in digital form with anonymous answers, which increased the loyalty and transparency of the information gathering process, as participants were not constrained by the feeling of not meeting expectations or showing their incompetence. If the answer was incorrect, only the organizers of the experiment could see it, not the participants.

The figureshows a screenshot of Google Forms for teachers and middle school students.A bright and eye-catching design was chosen for students, using a photoof a musical instrument in the form of a guitar. For teachers, abright but restrained design was also chosen so that it would not interfere with the selection of answers (see Figure 1.)

Figure 1. Screenshot of Google surveys used in the study



The survey of middle school students consists of eight questions, each with four answer options, only one of which is correct. A distinctive feature of the survey is its flexibility, since BBC Newsround broadcasts information about everything in understandable language, and the survey should also be similar in nature (see Table 2).

Table 2. Student interest survey

Question	Answers
1. Do you like learning English?	A) Yes, very much B) A little C) Not really D) No, I don't
2. How often do you watch BBC Newsround?	A) Every day B) A few times a week C) Sometimes D) Never
3. What do you like most about BBC Newsround?	A) Interesting stories B) Funny presenters C) Music D) Pictures
4.s it easy for you to understand English in BBC Newsround?	A) Yes, it's easy B) Sometimes C) It's hard D) I don't understand anything
5 What helps you understand the news better?	A) Pictures and videos B) Subtitles C) Teacher's explanation D) All of the above
6 Do you learn new English words from BBC Newsround?	A) Yes, a lot B) A few C) Not many D) No
7 What topics do you like the most?	A) Animals and nature B) Sports C) Technology D) Celebrities
8 Does watching BBC Newsround make English more interesting for you?	A) Yes, definitely B) A little C) Not really D) No

The survey of participants in the experiment in Table 2 is a control survey conducted at the time of the first lesson using authentic materials and on the last day of the lesson, which allows us to assess the overall progression of satisfaction with the choice of material and method of teaching a foreign language using BBC Newsround news articles. Table 3 shows the general schedule for conducting the experiment on participants who are middle school students, the number of classes, the number of hours, and the names of the BBC Newsround videos used for the classes. The videos are taken from YouTube (see Table 3).

Table 3. General provisions of the experiment

Experiment dates	Number of foreign language classes	Number of hours	Video titles
2 weeks	6	4,5 hours	1)How AI is helping Scientists Your Planet; 2)Why Do We Laugh? The Amazing Science Explained; 3) What Did Someone Make Out of Pumpkins? 4) What Is the World Artistic Gymnastics Championship? 5) Why Are Giant Pumpkins Causing Chaos? 6) Who Is the 10-Year-Old Wildlife Photography Star?

In accordance with the selected BBC Newsround videos, survey questions were compiled in the form of a Google form (see Figure 1). There are 6 questions, 4 answer options, 1 correct answer, and 3 incorrect answers. Table 4 presents the questions and answers used in the Google form for middle school students participating in the experiment (see Table 4).

Table 4. BBC Newsround program testing questions and answers

1. What helps scientists study our planet?	A) Rockets B) Artificial intelligence + C) Virtual reality D) Space telescopes
2. What does science study about laughter?	A) Why we cry B) Why we laugh + C) Why we yawn D) Why we are sad
3. What did someone make out of pumpkins?	A) A huge sculpture + B) Paintings C) A house D) A costume
4. What is the World Artistic Gymnastics Championship?	A) Swimming competitions B) Long jump championship C) Artistic gymnastics competitions + D) International Olympics
5. Why are giant pumpkins causing chaos?	A) Because of their huge size + B) They are too heavy to transport C) They cause allergies D) Because they are edible
6. Who is the 10-year-old wildlife photography star?	A) Johnny Davis B) Laura Green C) Luca Thompson D) Vanessa Reynolds +
7. What is the role of artificial intelligence in protecting the planet?	A) It helps build houses B) It helps predict disasters + C) It controls transportation D) It makes artificial plants

At the same time, Table 5 shows questions and answers for a survey of teachers on the use of authentic variants. There are no right or wrong answers in their survey; each teacher chooses the option that best suits their type of teaching English as a foreign language in middle school (see Table 5).

Table 5. Survey for educators on authentic materials

Which of the following materials do you most often use in your lessons?	A) News articles in English B) Books in Russian C) Entertaining YouTube videos
How do you adapt authentic materials for your students?	A) I simplify the language of the material B) I don't adapt the materials C) I only use materials with a Russian translation
Which topics from authentic materials are most interesting to your students?	A) Scientific news B) Political news C) Historical events
How do you evaluate the impact of authentic materials on student motivation?	A) Students become more interested in learning the language B) Students lose interest in lessons C) It does not affect student motivation
What challenges do you face when using authentic materials in the classroom?	A) The language is too difficult for students B) There is not enough time to prepare materials C) Students are not interested in the topic

RESULTS

The study was conducted over two weeks at Secondary School No. 6. On the first day, English teachers and secondary school students were tested, and secondary school students were shown a YouTube video about BBC Newsround at the beginning of their first 45-minute lesson. The title of the video, according to Table 3, was "How AI is helping Scientists Your Planet." After the video ended, the teacher began to explain what had been shown, describing the key points and giving hints, advice, and explanations to questions asked by the participants in the experiment. Fifteen minutes before the end of the lesson, the teacher sent a link to a Google form (see Table 4) with a survey, which yielded the following data (see Table 6):

Table 6. Results of the first testing of teenagers

Question number	The correct answer	%
1	6/20	30%
2	4/20	20%
3	5/20	25%
4	10/20	50%
5	3/20	25%
6	5/20	10%
7	6/20	25%

According to Table 6, it can be seen that the results of the first test after the lesson using authentic materials did not have a positive effect. None of the 20 participants in the experiment were able to answer more than 60% of the questions correctly. The overall indicator is as follows: for the first question, the number of correct answers was 6, or 30% of the total number of answers. Only 4 participants were able to answer the second question correctly, which is only 20% of the sample. Five out of 20 participants answered the third question correctly — accordingly, the number of correct answers varies within 25%.

Ten out of 20 participants answered the fourth question correctly, which is a good indicator, but still not satisfactory, as it does not exceed the 50% threshold, i.e., it does not even exceed half of the correct answers. The situation was similar with the 5th, 6th, and 7th questions, which leads to the conclusion that on the first day of the study, participants were unable to effectively perceive the authentic information presented in the form of an interactive video on YouTube with a detailed explanation from the teacher. After testing the questions on the topic, an additional survey was conducted to obtain information about the students' opinions on the use of authentic materials.

Table 7. Opinion of the participants in the experiment

Question number	Selected answers			
1	A	B	C	D
	30% (6)	0% (0)	25% (5)	45% (9)
2	A	B	C	D
	25% (5)	0% (0)	5% (1)	70% (14)
3	A	B	C	D
	30% (6)	5% (1)	20% (4)	45% (9)
4	A	B	C	D
	25% (5)	0% (0)	5% (1)	70% (14)
5	A	B	C	D
	0% (0)	5% (1)	15% (3)	80% (16)
6	A	B	C	D
	25% (5)	0% (0)	15% (3)	60% (12)
7	A	B	C	D
	10% (2)	10% (2)	20% (4)	60% (12)
8	A	B	C	D
	25% (5)	0% (0)	25% (5)	50% (10)

The results of a survey conducted among students on the topic of learning English using authentic materials, based on the example of the BBC Newsround program, show that most participants have mixed feelings about learning the language and perceiving the materials. When asked if they enjoyed learning English, 30% of respondents said they really enjoyed it, but 45% said they did not, indicating a lack of motivation among some students. The remaining 25% also did not express much interest. When asked how often they watch BBC Newsround, the majority of students (70%) said they never watch the program, which may indicate low interest or insufficient use of this resource in learning. Only 25% of students watch the program several times a week, and 5% do so daily, which indicates inconsistent engagement with the use of authentic materials. When respondents were asked what they liked most about the program, 45% chose visual accompaniment, such as pictures and videos, confirming the importance of visual materials for better perception and assimilation of information. 30% noted interesting stories as the main attraction of the program, but only 20% and 10% chose music and presenters, respectively. When asked if it was easy for students to understand the English speech in the BBC Newsround program, the majority, namely 70%, said that they found it difficult to understand the speech, which may indicate difficulties in perceiving the material by ear. Only 25% responded that they understood the program easily, which also highlights the need for additional teaching methods to improve listening skills. When asked what helps students better understand the news, 80% of respondents indicated that they use all of the following options for better understanding: pictures, videos, and teacher explanations. This confirms the importance of a comprehensive approach when using authentic materials, where various types of support play a key role.

The majority of students, namely 60%, do not learn new words while watching the program, which may be due to the program's insufficient lexical load or difficulties in perceiving unfamiliar words. 25% of students reported that they learn many new words, and only 15% learn a few, which highlights the need for more active work with vocabulary in class. Regarding the topics that interest students the most, it can be noted that 60% of respondents chose topics related to celebrities, while only 10% of students expressed interest in animals and nature. This may indicate a preference for lighter, more entertaining topics, which is important to consider when selecting materials for lessons. Finally, when asked whether the BBC Newsround program makes lessons more interesting, 50% of participants responded that the program does not make their lessons more interesting, while 25% of students believe that the program does indeed add interest. This indicates that using the program in its current format may not be engaging enough for all students, and that adaptation of the materials or methodology is required. Table 8 shows the results of testing teachers on the use of authentic materials in teaching English as a foreign language (see Table 8).

Table 8. Teachers survey

Question number	Answer	Number of participants	%
1,2,3,4	A	8	100%
5	C	8	100%

Based on the survey results and the data presented in Table 8, it can be concluded that all teachers are familiar with methods of using authentic material in teaching English, which indicates a high level of competence in implementing educational programs in secondary school. After conducting the first lesson and collecting information over the course of six lessons and 4.5 hours of total teaching time, the participants in the experiment were shown other videos, after which the teacher explained everything in detail, answered questions, and gave hints to the students, which resulted in some extremely interesting data at the end of the study.

Table 9.Results of the final testing of teenagers

Question number	The correct answer	%
1	15/20	75%
2	14/20	70%
3	13/20	65%
4	16/20	80%
5	12/20	60%
6	14/20	70%
7	15/20	75%

On the first question, the indicator rose from 6/20 (30%) to 15/20 (75%) — an increase of +9 people, which is equal to +45 percentage points. On the second question, it rose from 4/20 (20%) to 14/20 (70%) — +10 people, +50 percentage points. On the third question, the indicator rose from 5/20 (25%) to 13/20 (65%) — an increase of 8 people, or 40 percentage points. On the fourth question, the indicator rose from 10/20 (50%) to 16/20 (80%) — an increase of 6 people, or 30 percentage points. For the fifth — from 3/20 (15%) to 12/20 (60%) — +9 people, +45 percentage points. For the sixth — from 5/20 (25%) to 14/20 (70%) — +9 people, +45 percentage points. For the seventh question, from 6/20 (30%) to 15/20 (75%) — +9 people, +45 percentage points. On average, the proportion of correct answers increased from approximately 27.9% to 70.7% — an average increase of +42.9 percentage points per question.

This trend indicates a significant improvement in results after the intervention: all seven questions show a noticeable increase in both absolute numbers and percentage points. The largest increase in absolute terms is observed for question 2 (+10 people), and the smallest for question 4 (+6 people), which is explained by the fact that the initial level for question 4 was already higher (50%). It can be assumed that the intervention (lessons with authentic materials, additional explanations, etc.) had a strong positive effect, but to confirm the durability of the effect, it is worth conducting retesting after some time and checking knowledge retention. The table shows the opinions of middle school students after the experiment (see Table 10).

Table 10. Opinion of the participants in the experiment at the end

Question number	Selected answers			
1	A	B	C	D
	75% (15)	15% (3)	5% (1)	5% (1)
2	A	B	C	D
	25% (5)	50% (10)	15% (3)	10% (2)
3	A	B	C	D
	60% (12)	20% (4)	10% (2)	10% (2)
4	A	B	C	D
	55% (11)	15% (3)	15% (3)	15% (3)
5	A	B	C	D
	60% (12)	15% (3)	15% (3)	10% (2)
6	A	B	C	D
	65% (13)	15% (3)	10% (2)	10% (2)
7	A	B	C	D
	50% (10)	15% (3)	20% (4)	15% (3)
8	A	B	C	D
	70% (14)	10% (2)	10% (2)	10% (2)

After analyzing the data presented in Table 10, it becomes clear that there is a positive trend: 75% (15) of students are actively interested in learning English, and 50% (10) watch BBC Newsround several times a week. 60% (12) believe that pictures and videos help them learn the material, and 55% (11) note that the program makes lessons interesting. In terms of listening comprehension, 55% (11) easily understand the speech, and 65% (13) remember new words. Topics such as animals and nature are of interest to 50-60% (10-12), confirming the relevance of the content. It is recommended to retain visual elements and active vocabulary work using subtitles and discussions to improve comprehension and retention.

DISCUSSION

The results of the study show a fairly direct parallel in development. Indeed, after the introduction of BBC Newsround into the English language learning process among the participants in the experiment, namely secondary school students, significant changes took place. While the initial test results were rather disappointing, after two weeks of the experiment, when the teacher systematically explained and interpreted the material, high levels of effectiveness in learning the material were achieved. Of course, it is important to understand that BBC Newsround should not be perceived as a magic mechanism capable of raising the quality of lessons to an incredible level. There is a suggestion that such a rapid improvement in performance is due, in particular, to the individual qualities of the teachers who presented the information correctly.

As a rule, it is not advisable to use only one teaching method; it is necessary to combine different approaches and select material individually for each student. With the development of technology and artificial intelligence, individualizing material is indeed becoming an extremely simple task. In this case, it is recommended to use neural networks and artificial intelligence, such as Deepseek, Copilot, and ChatGpt. It is quite difficult to talk about improving the quality of students' written and spoken language, since a program or television broadcast cannot be a powerful stimulus that will contribute to fundamental changes in a child's psychology, behavior, and desire to learn English.

Nevertheless, it cannot be denied that quantitative indicators have shown that after watching BBC Newsround, children were able to answer most of the test questions, increasing their scores several times over, and also changed their opinion of the program. As a result, it can be concluded that the use of BBC Newsround educational programs in conjunction with other foreign language teaching methods is an effective tool for improving the overall quality of education, as well as awareness and understanding of the material.

The statistics in Table 6 show that the students' scores did not exceed the threshold value of 50%, i.e., the assimilation and interpretation of the material in the answers to the questions was at a low level. After the integration of the BBC Newsround educational television program, the results shifted significantly toward more positive dynamics. On average, out of 20 study participants, at least 12 answered 7 questions correctly, as a result of which the minimum threshold percentage of correct answers changed from 10% (the lowest percentage of correct answers) to 60%, which can undoubtedly be called a success and a positive result of the study. It is worth mentioning that the testing of students was carried out in several stages, both the first and final tests, based on three tests, and a table with an average indicator of correct answers was formed. This made it possible to obtain verified results and prove the validity of using news programs in foreign language teaching.

CONCLUSION

The study showed that using authentic materials to teach English as a foreign language in secondary school can really boost kids' desire to learn. Statistics show significant positive trends, indicating that the use of authentic materials and news articles as a combined approach to teaching is currently an effective solution. BBC Newsround is a truly useful program that allows young people for whom English is not their native language to obtain valuable information and learn a foreign language more effectively in an understandable and convenient form, which is also a positive trend.

However, as mentioned earlier, when using authentic materials, it is still necessary to pay attention to the individualization of English lesson materials in order to increase the effectiveness of teaching. Even in the first test, most participants responded that they only understand the material when it is explained by the teacher. As a result, it can be concluded that individualization will contribute to improving the quality of writing, speaking, and pronunciation. At the same time, it is undoubtedly necessary to discuss separately the specific effectiveness of this method of teaching a foreign language using BBC Newsround news programs. According to Table 6 and Table 9, the maximum number of correct answers per question in the first test did not exceed 50%. In the final test, students were able to shift the results in a more positive direction, as a result of which the maximum number of correct answers to a given question increased to 80%. A difference of 30% is significant, especially when it comes to tested results that have been verified repeatedly, which again proves the direct, rather than indirect, effectiveness of using news materials and articles in foreign language teaching.

During the literature review and analysis, it was found that there are not enough studies on using authentic news articles to improve writing and speaking skills. As a result, this study, with its theoretical, methodological, and practical components, is of high practical value for teachers, parents, and for improving the quality of education in the Republic of Kazakhstan in the field of foreign language learning, such as English. General recommendations for integrating authentic news articles into the educational process and foreign language teaching are as follows: -individualization and personalized teaching and teacher participation in the lives of students;-use of digital technology devices (smartphones, laptops, tablets, projectors, interactive whiteboards, artificial intelligence, etc.) in the direct use of authentic materials;-systematically using authentic news articles at least once a week in foreign language teaching (devoting 1-2 lessons per week to this).

The above recommendations will effectively improve the quality of education and foreign language teaching among non-native speakers. The study proved the effectiveness of this teaching method, as shown in Table 6 and Table 9.

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Economic Sciences

Формирование корпоративной культуры предприятия: теоретический аспект

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Культура в широком смысле означает объективные результаты деятельности людей (машины, конструкции, результаты познания, произведения искусства, морально-правовые нормы и т.д.).), а также силы и способности человека (образование, навыки, уровень), на которых осуществляется действие. В частности, в области развития интеллекта, нравственного и эстетического развития, мировоззрения, способов и форм взаимоотношений между людьми).

Корпоративная культура как составная часть культуры в целом отражает уровень развития предприятия, творческие силы и способности сотрудников, работающих на нем.

Корпоративная культура — это система материальных и духовных ценностей, проявлений, характерных для конкретной корпорации, которые выражают ее индивидуальность и восприятие себя и других в социальной и материальной среде, проявляются в поведении, взаимодействии, взаимодействии с другими, восприятии себя и себя, окружающая среда

Корпоративная культура является неотъемлемой частью любой компании, она существует независимо от желания менеджеров, поскольку она проявляется даже в обычных взаимодействиях сотрудников. Корпоративная культура или организационная культура — это совокупность взглядов и нравов сотрудников в процессе внутренней и внешней интеграции.

Корпоративная культура — это сложный набор ценностей и инструментов, которые принимают все члены компании.

В современном обществе культура организации является мощным инструментом формирования стратегии организации и позволяет всем отделам и каждому отдельному сотруднику ориентироваться на достижение общих целей и продуктивного взаимодействия.

Понятие "корпоративная культура" состоит из двух слов: культура и корпорация. Культура - совокупность норм и ценностей, общих для всех членов организации. Корпорация — это сложный организм, в котором культура играет важную роль, является основой для формирования отношений между членами коллектива.

В энциклопедическом словаре: Культура (лат. Ciiltura воспитание, воспитание, образование, развитие, культивирование) исторически определенный уровень творческих сил и способностей человека, проявляющийся в видах и формах организации жизни и быта людей. в деятельности, а также в материальных и духовных ценностях, которые они создают; понятие культура используется для описания определенных исторических эпох (древняя культура), конкретных обществ, народов и наций (культура майя), а также конкретных сфер деятельности или жизни (трудовая, бытовая культура, художественная культура); в узком смысле сфера жизни людей, духовная.

В связи с необходимостью новых подходов к менеджменту, крупному и среднему бизнесу в 80-х годах XX века в США была разработана концепция корпоративной культуры. В дальнейшем многие организации переняли эту практику, и корпоративная культура прочно вошла в порядок управления.

Корпоративная культура — это система взаимодействующих духовных и материальных ценностей, отражающих индивидуальность и восприятие самой компании и окружающей среды, которая проявляется во взаимодействии, поведении и восприятии себя и персонала. окружающей среды.

Есть и другие определения: корпоративная культура — это уникальная общая психология организации.

Корпоративная культура — это уникальные характеристики организации, признаки, которые отличают ее от всех остальных в отрасли.

Эдгар Шейн говорит, что корпоративная культура — это совокупность основных предположений, разработанных группой для решения проблем внешней адаптации и внутренней интеграции. Этот комплекс работает уже долгое время, и для подтверждения его жизнеспособности он был переведен и на новые органы.

Искусственный интеллект. По мнению Кибанова, корпоративная культура — это совокупность важных правил, которые используются членами организации и проявляются в ценностях, которые провозглашает организация, дающие людям указания в их поведении и характере.

Стеклова О.Е. Корпоративная культура является сложным организационным явлением, объединяющим экономические, производственные и социальные аспекты предпринимательства, а также демонстрирующим механизм реализации инновационного потенциала, основанный на мотивации.

Василенко С.В. Корпоративная культура - это совокупность правил внутренней и внешней деятельности организации. Эти ценности проявляются различными способами в соответствии с целями деятельности.

Различные способы определения этого понятия приведены в обобщенном виде, поэтому при проведении содержательного анализа можно определить наиболее распространенные понятия. Таким образом, во многих интерпретациях авторы ссылаются на основные модели поведения, которым придерживаются члены организации.

В нынешних условиях руководство организаций заинтересовано в гибкости и инновациях в корпоративной культуре компании.

Э.Шейн демонстрирует своеобразный подход к классификации уровней корпоративной культуры: артефактов, ценностей и основных убеждений.

Артефакты являются организационными уровнями физической и социальной среды, которые являются видимыми и являются внешним проявлением корпоративной культуры. На этом уровне можно увидеть как неестественные продукты, так и технологии, и продукты цивилизации.

Ценности промежуточный уровень, характеризующийся низким уровнем знания корпоративной культуры. На этом уровне происходит процесс трансформации ценностей через убеждения. Когда ценности становятся нормальными в организации, происходит процесс их превращения в представления, они переходят из сознания в сознание, и действия становятся автоматическими. Например, если компания плохо работает, скажем, продажи, менеджеры пытаются увеличить их с помощью рекламы, но только после того, как сотрудники используют это решение, это становится общепринятым убеждением для всех.

Однако есть и ценности, которые объявлены на сознательном уровне без всякой проверки. Например, в уставе компании указано, что сотрудники являются главной ценностью в организации.

Основные убеждения — это бессознательный уровень корпоративной культуры, который не видит и объединяет восприятие времени и пространства, человеческой природы, мира и отношений.

В книге " Корпоративная культура как инструмент эффективного управления персоналом " Василенко С.В. различает два уровня корпоративной культуры: внутренний и внешний. Автор разделяет внутренний уровень на осознанный и необъективный.

Уважаемый уровень сотрудников отражается в том, что они делают, говорят и делают. Этот уровень является отражением основных ценностей организации.

Ценности на внутреннем объективном уровне являются наиболее важными. Эти ценности лежат в сознании сотрудников.

Основные ценности для управления на внутреннем уровне могут иметь иной характер:

1) недоверие, выражающееся в полном контроле за действиями сотрудников, ограничении их свободы действий;

2) доверие между начальством и подчиненными, свобода в принятии решений, коллективная работа.

Внешний уровень корпоративной культуры включает в себя культурные артефакты, а также видимые предметы и различные мероприятия: образ одежды; конкретные поведенческие установки людей в организации; местоположение офиса; корпоративные события.

На всех уровнях существует связь между фундаментальными ценностями и системой взаимодействия организации. Основные ценности выражаются в визуальных образах: символы, лозунги, ритуалы, герои, легенды, события.

Корпоративная культура возникает в структурных группах и укрепляется со временем. Обычно корпоративная культура возникает сама по себе и передается через индивидуальный образец. Харизматичные личности, неформальные лидеры, вносят большой вклад. Их нравы и привычки в организации объективно копируются другими сотрудниками фирмы.

Итак, из всех элементов корпоративной культуры, которые мы уже определили, основными являются ценности. Они проявляются во всей организации, а также в ее политике и целях. Мировоззрения, идеи компании — все это касается ценностей организации. Они дают сотрудникам уверенность в том, что их деятельность в организации отвечает их личным потребностям и интересам, интересам коллектива, конкретного подразделения и корпорации в целом.

Изучая тему корпоративной культуры, мысли председателя совета директоров Агентства стратегических событий Михаила Воронина, а также автора книги о создании и управлении корпоративной культурой в организации Завоевание сердец. Пусть сердца сотрудников, считает, что уровень лояльности сотрудников является важнейшим элементом корпоративной культуры, состоящей из определенного уважения к нескольким факторам организации, некоторые из которых должны использоваться чаще, а другие - в меньшей степени. Именно поэтому мы создали диаграмму, которую мы называем пирамидой лояльности, которая показывает основные составляющие корпоративной культуры в процентах, которые должны быть в организации.

Корпоративная культура организации определяется сферой деятельности. Таким образом, финансовые организации формируют его более строго и конкретно, здесь стиль общения формален. Торговые организации формируют свою культуру различными способами: она позволяет свободное, мало определенное, стиль общения, характер, где лидерство демократическое, социализм и энергия в таких компаниях приветствуются.

В настоящее время Абрамова С.И., Костенчук И. выделяют 4 наиболее известных и используемых на практике классификатора.

Первый критерий классификации в соответствии с степенью взаимного соответствия приоритетной иерархии ценностей, а также методами реализации:

стабильность, характеризуется высокой степенью адекватности, четкими традициями и нормами нравственности;

характеризуется нестабильностью, низким уровнем культурной адекватности, постоянными изменениями социального положения работников, отсутствием понятий о приемлемом и неприемлемом поведении на предприятии.

Второй критерий классификации соответствует уровню иерархии ценностей внутри группы и индивидуальным ценностям сотрудников. Здесь интеграционная культура отличается высокой степенью соответствия и низкой дезинтеграционной культурой. Интегративная культура — это консенсус и организованность внутри группы, а культура разобщения — это отсутствие консенсуса, высокий уровень конфликта и разобщенности.

Третий критерий классификации соответствует содержанию приоритетных ценностей в организации: личностно-ориентированная культура и функционально-ориентированная культура. Первая включает в себя такие ценности, как самореализация и саморазвитие людей, занимающихся трудовой деятельностью, вторая придерживается функционально установленных механизмов осуществления профессиональной трудовой деятельности и алгоритмов поведения сотрудника, основанных на его статусе.

Четвертый критерий классификации, определенный учеными, зависит от того, как корпоративная культура влияет на деятельность предприятия и его показатели: положительная и отрицательная корпоративная культура.

Многие исследователи склонны придерживаться таких форм корпоративной культуры, как праксеологическая, предпринимательская, патриархальная, бюрократическая.

Некоторыми характеристиками являются совместная деятельность, масштаб общих ценностей, методы распределения ресурсов в организации, приоритетные виды лиц, механизм управления, форма собственности предприятия, роль менеджера, оценка результатов управления. Это позволяет нам оценить корпоративную культуру. Российские исследователи Радугин А.А. и Радугин К.А. В этом случае мы можем различать: культуру власти, культуру роли, культуру личности и культуру задания.

Таким образом, можно сделать вывод, что только изменяя параметры культуры, можно вывести организацию на новый уровень. Но для того, чтобы внести необходимые изменения в этой сфере организации, менеджеру необходимо тщательно изучить все составляющие культуры своей организации, какие функции выполняет корпоративная культура и какие последствия ожидаются при изменении той или иной части организации, другой структурный элемент.

АКТУАЛЬНЫЕ НАПРАВЛЕНИЯ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ УПРАВЛЕНИЯ ПРЕДПРИЯТИЕМ

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В современных условиях рыночной экономики в основе успешной деятельности любой компании в нашей стране лежит повышение эффективности управления. Существует множество способов повышения эффективности менеджмента. Их объектами могут выступать руководитель, личные и профессиональные качества управленцев, элементы управленческой деятельности. Работа в области повышения эффективности управления организации может быть начата с любого ее элемента, т. е. с наиболее актуального для предприятия. Необходимо только учитывать взаимосвязь элементов системы управления друг с другом. Пути повышения эффективности управления предприятия условно делят на восемь групп:

1) совершенствование структуры управления предприятия направлено на ее максимальное упрощение, децентрализацию, распределение и определение полномочий сотрудников управления с учетом требований к квалификации и личным качествам;
2) разработка стратегии развития предприятия на основе анализа ее деятельности, оценки сильных и слабых сторон, выработка философии, концепции, миссии и политики предприятия;
3) разработка и внедрение информационной системы компании, которая должна обеспечивать эффективную коммуникационную связь между сотрудниками и подразделениями;
4) внедрение системы принятия и разработки управленческих решений, правил и процедур управления, систем стимулирования и мотивации;
5) разработка и внедрение системы непрерывного повышения квалификации сотрудников на основе обучения, переподготовки, развития инициативы, творчества;
6) разработка алгоритма, регламента или систем подбора, обучения, аттестации или оценки руководящего персонала компании, планирование карьеры руководителей, применение стиля руководства, адекватного внутренним и внешним факторам, воздействующим на организацию;
7) применение наиболее эффективных методов подбора персонала, его оценки, формирование работоспособного, совместимого состава работников, создание максимально благоприятного социально-психологического климата;
8) работа по созданию культуры организации, выработке совместных ценностей, признаваемых и одобряемых сотрудниками.

Рассмотрим более детально некоторые из путей повышения эффективности менеджмента. В современных условиях для эффективности управленческого процесса необходимо, чтобы любой менеджер не только имел глубокие и разносторонние знания, но и отличался оперативностью и деловитостью, обладал чувством нового, постоянно проявлял инициативу.

На развитие эффективности трудовой деятельности работника, в том числе и в сфере управления, можно воздействовать. Важным стимулом квалификационного роста руководящего работника и развития его инициативы является систематическое продвижение по службе. Менеджер должен твердо знать, что вопрос о его продвижении подлежит обязательному периодическому рассмотрению. Однако это продвижение будет зависеть во многом от того, как он повышает деловую квалификацию, насколько активен в работе.

Продвижение менеджеров может осуществляться в форме:

– перемещения в рамках той же должностной категории и размеров заработной платы, но с расширением выполняемых функций;

– повышения заработной платы без повышения в должности;

– продвижения его по ступеням должностной лестницы.

Росту эффективности менеджмента способствует система повышения квалификации с отрывом и без отрыва от производства. Повышение квалификации направлено на совершенствование и углубление знаний, умений и навыков работника в конкретном виде деятельности.

Стимулирующая роль в повышении эффективности труда руководящих работников выполняет их периодическая аттестация. Основная цель аттестации – выявить, на что способен тот или иной работник, чего он заслуживает. Но при этом проявляется и ее вторая сторона. Чувство ответственности перед предстоящей аттестацией побуждает менеджера к более полному использованию своих способностей, к достижению лучших результатов в труде.

Одним из наиболее важных путей повышения эффективности управления считается активная поддержка новаторства в организации. Создание и поддержка атмосферы творческого поиска – прямая задача руководителей компании.

Факторами, поддерживающими новаторство, считают: предоставление необходимой свободы при разработке новшества, обеспечение новаторов необходимыми ресурсами и оборудованием, поддержка со стороны высшего руководства; ведение дискуссий по обмену идеями; поддержание эффективных коммуникаций с коллегами, другими подразделениями, вузами и внешними научными организациями; углубление взаимопонимания между работниками.

Одним из наиболее действенных путей повышения эффективности управления является мотивация. Мотивация – стимулирование к деятельности, процесс побуждения себя и других к работе, воздействие на поведение человека для достижения личных, коллективных и общественных целей.

Существует определенная система мотивов к труду. В нее входят мотивы: содержательности труда, его общественной полезности; статусные, связанные с общественным признанием плодотворности трудовой деятельности; получения материальных благ; ориентированные на определенную интенсивность работы.

Одной из основных задач менеджера для повышения эффективности управления является определение мотивов деятельности каждого сотрудника и согласование этих мотивов с целями предприятия.

Важную роль в обеспечении эффективного управления играет делегирование, которое означает поручение выполнения определенных задач подчиненным. Преимуществами делегирования являются:

- высвобождение руководителя для выполнения наиболее важных работ;
- расширение объема выполняемых организацией заданий;
- развитие у подчиненных инициативности, умения и навыков, профессиональной компетенции;
- расширение уровня принятия решений.

Менеджеру следует помнить о том, что делегирование заданий и полномочий не освобождает его от ответственности. Делегирование – это не способ уйти от ответственности, а форма разделения управленческого труда, позволяющая повысить его эффективность.

Эффективность или неэффективность управления в значительной степени определяется организационной структурой менеджмента на предприятии. От правильного выбора организационной структуры зависят быстрота и экономичность принятия решений, результативность выполнения поставленных руководством задач, а, следовательно, и общая эффективность менеджмента на предприятии.

Для повышения эффективности управления предприятию можно внести какие-либо изменения в существующую структуру управления или полностью изменить ее.

Организационная структура формируется, как правило, с учетом специфики и масштабов деятельности предприятия, количества рынков сбыта, размера управленческого штата и т. д. Процесс деления организации на отдельные блоки, связанные с организационным выделением и обособлением групп сложных работ, называют департаментизацией.

В настоящее время существуют следующие виды организационных структур управления:

1) линейная департаментизация – характеризуется простотой, одномерностью связей (только вертикальные связи) и возможностью самоуправления; эффективна при выполнении организацией однотипных работ без дифференциации специалистов (например, в низовых производственных звеньях, семейном и малом бизнесе и т. д.);

2) функциональная департаментизация – процесс деления организации на отдельные элементы, каждый из которых имеет свою четко определенную задачу и обязанности. целесообразно использовать в организациях, выпускающих ограниченную номенклатуру продукции, действующих в стабильных внешних условиях;

3) департаментизация по продукту (продуктовая) – выделяются блоки, связанные с производством и реализацией какого-либо продукта;

4) по такому же принципу строится департаментизация по потребителю и по рынку: группирование работ осуществляется вокруг конечного потребителя или в отношении географических и отраслевых рынков производства и продаж (территориальные отделения крупной компании);

5) традиционная департаментизация основана на комбинации линейной и функциональной департаментизации; основой этой структуры являются линейные подразделения, осуществляющие в организации основную работу и обслуживающие их специализированные функциональные подразделения;

6) девизиональная организация – сочетание централизованного планирования наверху и децентрализованной деятельности производственных отделений; эффективна в условиях много продуктового производства или многонациональных компаниях с большой территориальной разобщенностью;

7) матричная организация комбинация функционального и продуктового подходов, где функциональная часть матрицы ответственна за обеспечение работы спецификациями, техническим руководством и т. д., а продуктовая – отвечает за выполнение работы, управление и оценку результатов, выполнение рабочих операций, достижение целей.

Матричные организации создаются в том случае если стратегия создана с упором на получение высоких результатов по большому количеству проектов в области высоких технологий.

Выбор оптимальной организационной структуры в значительной степени повышает эффективность менеджмента и результаты деятельности организации в целом.

В деятельности предприятия существенную роль играют информационные системы, обеспечивающие коммуникационные связи между сотрудниками и подразделениями.

При формировании эффективной информационной системы организации используют различные способы, но необходимо понимать, что только системный подход к информационному обмену позволит гибко управлять работой компании.

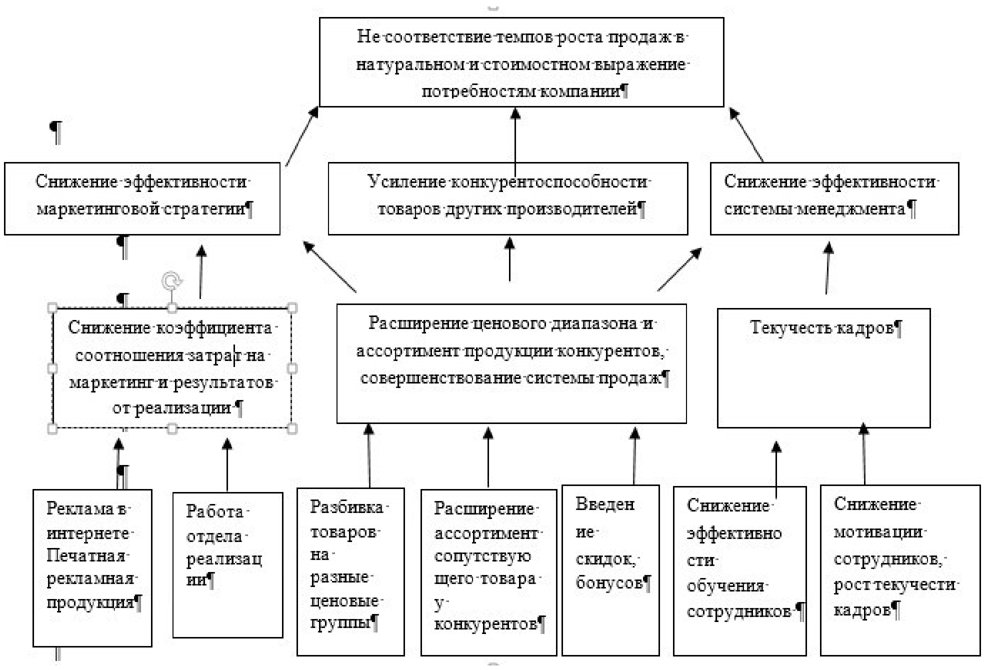
Существует большое разнообразие путей и методов стимулирования роста эффективности менеджмента, каждый из которых ориентирован на какую-то определенную область деятельности организации.

Повысить эффективность управления можно также, используя различные методы воздействия непосредственно на менеджера: повышение квалификации, дополнительное образование, рост мотивации и т.д.

Каждое предприятие самостоятельно решает вопрос о выборе методов стимулирования роста эффективности менеджмента, в зависимости от особенности деятельности и особенностей существующей системы управления.

Таким образом, каждому руководителю необходимо сознавать, что наибольшая эффективность управленческой деятельности достигается в том случае, если используются различные методы в комплексе, при этом они ориентированы на цели и стратегии развития организации.

Осознание проблемы состоит в установлении факта ее существования по результатам контроля деятельности или исследования рыночных возможностей. Проблема, достигшая определенной остроты, трансформируется в мотив для деятельности организации и ее менеджеров. Структурировать проблему позволяет процесс построения дерева проблем. Дерево проблем приведено на рисунке.



По результатам работы по выявлению проблемы, перед предприятием была поставлена цель – увеличить объемы сбыта продукции и снизить текучесть кадров, а также снизить дебиторскую задолженность.

В целом, основная проблема снижение эффективности продаж связана с перестройкой стратегии фирмы. В рамках решения данной проблемы можно выделить несколько направлений ее решения. С одной стороны, это изменение методологического подхода к организации службы маркетинга на предприятии. А с другой стороны, это изменение влияния человеческого фактора на решение проблемы.

Анализ внутренней и внешней среды – это очень важный для выработки стратегии организации и очень сложный процесс, требующий внимательного отслеживания происходящих в среде процессов, оценки факторов и установления связи между факторами и теми сильными и слабыми сторонами организации, а также возможностями и угрозами, которые заключены во внешней среде. Очевидно, что, не зная, что происходит во внешнем окружении и не развивая свои внутренние компетентные стороны, компания очень скоро начнет терять конкурентное преимущество, а затем может просто исчезнуть с рынка.

Во-первых, в ходе проведения анализа динамики, состава и структуры источников формирования капитала и его размещения было определено, что предприятие как на начало, так и на конец периода имело «легкую» структуру активов; при этом структура оборотных активов сформирована за счет денежных средств, запасов и дебиторской задолженности. Кроме того, возросла стоимость как внеоборотных, так и оборотных активов. Что касается пассивов, то на конец периода изменилось соотношение собственных и заемных средств, в пользу первых (их доля в структуре пассивов увеличилась), что свидетельствует о благоприятной тенденции. Краткосрочные обязательства в абсолютном изменении уменьшились, за счет снижения отдельных статей, таких как задолженность перед персоналом организации и прочими кредиторами. Однако значительно растет задолженность по налогам и сборам, что свидетельствует о невыполнении предприятием своих обязательств перед государством.

Во-вторых, в ходе проведения анализа ликвидности баланса было выявлено, что на начало периода у условного предприятия наблюдался недостаток наиболее ликвидных активов для покрытия наиболее срочных обязательств, что свидетельствует о текущей ликвидности баланса. Но уже к концу периода ликвидность стала абсолютной в результате увеличения денежной наличности на счетах предприятия.

Далее был проведен анализ финансовой устойчивости, который выявил, что на начало периода предприятие находилось в кризисном состоянии, однако к концу периода за счет увеличения собственных средств, вызванного ростом нераспределенной прибыли, устойчивость стала абсолютной.

Резюмируя вышесказанное, можно сделать вывод, что единственно правильным вариантом поведения компании для достижения эффективного долгосрочного функционирования и успешного развития уделяется повышенное внимание осуществлению анализа внешнего и внутреннего окружения. Это подразумевает проведение комплексного анализа, который может быть проведен с использованием вышеперечисленных методик, который дает достаточно ясное и объективное представление о конкурентном положении компании. Только при этом условии можно рассчитывать на эффективность принимаемых стратегических и оперативных управленческих решений.

Организация системы планирования в дорожно-строительной организации

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Актуальность

Направление исследования актуально в контексте современных вызовов и потребностей дорожно-строительной отрасли, где вопросы планирования становятся все более критичными для обеспечения эффективного функционирования организаций и достижения стратегических целей. В условиях высокой динамики внешней среды и необходимости адаптации к новым условиям хозяйствования, высокой инфляции, недоступности каналов финансирования, важно применять новые подходы и методические решения, которые позволят улучшить качество планирования и обеспечить успешное развитие дорожно-строительных организаций. Так, в современных условиях наблюдается тенденция перехода к организации плановой деятельности хозяйствующих субъектов на всех уровнях на основе принципов планомерности и риск защищенности (безопасности), объективной ответственности, свойственной командно-административной экономике и государственному управлению. Социальные обязательства, многоуровневость экономических отношений, разнообразие взаимодействий и взаимосвязей, а также различия в уровне цифровой зрелости элементов планирования требуют своевременной формализации стандартных единиц задач, заданий и знаний в процессе планирования, обеспечение целевого динамического нормирования количественных и качественных показателей плана для оценки промежуточных результатов и достижения конечных целей.

Научный пробел

Одним из пробелов в методическом обеспечении системы стратегического планирования для организаций дорожно-строительной отрасли является отсутствие систематизированного подхода к учету, анализу и прогнозу внешних факторов, таких как изменение климатических условий, колебания цен на сырье и материалы, а также изменения в законодательстве и стандартах. Это приводит к недостаточной гибкости и адаптивности планов, затрудняет их своевременную корректировку и снижает эффективность реализации проектов. Кроме того, существует недостаток специализированных инструментов и методик для оценки рисков и неопределенностей, связанных с дорожным строительством, что увеличивает вероятность ошибок и непредвиденных расходов.

Цель исследования

Целью является разработка методических основ к организации планирования в дорожно-строительной организации для достижения ее стратегических целей, а именно применение речевых логико-лингвистических моделей в системах планирования, основанных на ситуационном управлении и динамическом формате преставления знаний.

Научная новизна

Новизна заключается в применении комплексного подхода к планированию, который объединяет различные научные теории и методики, такие как теория ситуационного управления, теория адаптивного управления, ресурс ориентированный подход и методы цифровой трансформации. Это позволяет создать целостную систему стратегического планирования, которая помогает организациям достигать устойчивого развития и безопасности в сложных экономических условиях.

Авторская гипотеза

Автор предполагает, что внедрение системного подхода к планированию в сочетании с современными цифровыми технологиями, использующими динамический формат знаний, может значительно повысить эффективность и качество планирования в организациях дорожно-строительной отрасли.

Методология

Системный подход в стратегическом планировании путем структуризации задач и синтеза функций управления ставит задачи для исследователей методологии планирования научные вопросы не только по поиску рационального решения, но и определению метода переключения относительно различных научных школ и концептов планирования. Каждая из них имеет свою специфическую методологию и концептуальный подход. "Балансовый метод" представлен группой ученых, таких как Н.А. Вознесенский, М.З. Бор, Ш.Я. Турецкий и др, которые использовали балансовый метод для анализа экономики и составления планов. Они рассматривали взаимосвязь между различными секторами экономики и пытались достичь баланса между спросом и предложением. "Прогнозный метод" был развит под руководством А.И. Анчишкин, и его применение на практике акцентировалось на долгосрочном прогнозировании и использовании математических моделей для предсказания будущих экономических тенденций. "Системный метод" был предложен Л.И. Абалкиным, В.М. Глушковым, Ю.В. Якутиным, которые рассматривали экономику как целостную систему и использовали кибернетические подходы для управления ею. "Теория рационального поведения" связана с работами В.С. Немчинова, Л.В. Канторовича, В.В. Новожилова, которые изучали оптимальное распределение ресурсов и использование математических методов для принятия экономических решений.
Для создания элементов методологии стратегического планирования предлагается использовать комплексный подход, основанный на теории ситуационного управления Д.А. Поспелова [4] (ИПУ РАН) и двойственном определении социально-экономической системы в рамках общей параметрической теории А.И. Уемова, теории адаптивного управления Б.Л.Кукора [5], методический функциональный подход к целеуказанию А.Е. Карлика и В.В. Рохчина [6], ресурс ориентированный подход к планированию В.В.Платонова [7], основы стратегического планирования О.О. Смирновой, методы и модели цифровой трансформации Е.А.Яковлевой и И.А.Толочко [8].

Основы методического обеспечения стратегического планирования

Основой такого подхода является актуализированный концептуальный каркас сложной экономической системы с учетом предметной области исследования- дорожное строительство- и риск защищённые технологии планирования- динамические когнитивные сценарии, фреймовое представление знаний, технологии целевого нормирования.

Концептуальный каркас как информационная логико-лингвистическая модель предназначен для проектирования деятельности дорожно-строительной организации с целью разработки стратегии ее устойчивого развития и безопасного (равновесного) функционирования. Он включает множество элементарных объектов управления (например, субъекты, объекты, ресурсные комплексы), описывает их свойства, отношения и функции управления, формирует дилеммы равновесия (безопасности), строит сетевые графики достижения целей развития и создает информационную модель для прогнозирования и разрешения стратегических проблемных ситуаций в виде дискретно-ситуационной сети проблемных ситуаций (как стандартные единицы задач).

Дискретно-ситуационная сеть проблемных ситуаций — это логико-лингвистическая модель «причинно-следственных связей» [9, с.75] между стратегическими проблемными ситуациями. Логико-лингвистические модели [10, с.464] могут быть полезны в системе планирования, основанной на ситуационном управлении для обработки естественного языка [11, с.27]; для повышения качества ситуационной осведомленности, автоматизации управленческих процессов, анализа данных, интерпретации информации и управления знаниями. Предлагаемые модели позволяют обрабатывать текстовые данные, включая анализ и интерпретацию речи, что важно для сбора информации и анализа текущих ситуаций, помогают идентифицировать ключевые проблемные элементы в ситуации и строить прогнозы относительно развития событий, что критически важно для ситуационного управления. Эти модели могут автоматизировать некоторые задачи, такие как генерация отчетов или принятие решений на основе заранее определенных правил и сценариев в динамике, онлайн. Логико-лингвистические модели также могут предоставлять контекстуальную информацию и рекомендации для лиц, принимающих решения, улучшая качество этих решений [12, с.120-140], анализировать большие объемы текстовых данных, выявлять тенденции и закономерности, что помогает принимать более информированные решения.

Для того чтобы удовлетворить требованиям защиты от рисков и безопасности в организационной и координационной деятельности, управление следует применять динамичный способ представления знаний. Это подразумевает объединение знаний из различных областей на каждом уровне управления, что позволит использовать модели логико-лингвистического анализа в системах планирования, построенных на основе ситуационного управления. В таком случае для информационной поддержки стратегического планирования следует использовать динамические когнитивные сценарии [13, с. 99], которые будут служить инструментом для поддержки принятия плановых решений и реализации соответствующих функций. Это создаст основу для двустороннего взаимодействия между заинтересованными сторонами (например, предприятиями), выбора приоритетов выполнения задач стратегического планирования, мониторинга достижения плановых показателей и общей координации стратегических решений.

Таким образом, методическое обеспечение стратегического планирования должно включать описание состава элементов (компонентов), детальные условия и требования к созданию информационной модели плана (с механизмом для проверки гипотез), определение правил и алгоритмов её функционирования на основе логических правил и лингвистических (качественных) переменных, представленных в динамической фреймовой структуре [14, с.109]. Логико-лингвистические модели могут обеспечивают в системе планирования, основанной на ситуационном управлении анализ и интерпретация информации, формирование и проверка гипотез.

Результаты

К основным результатам исследования в теоретическом направлении - следует отнести аргументированное обоснование основных компонентов новой системы стратегического планирования и конкретизацию характеристик ее обеспечивающих подсистем, оценку требований к ним.

Обоснование основных компонентов новой системы стратегического планирования

Тогда **новая система стратегического планирования** дорожно-строительной организации представляет собой комплекс динамически связанных компонентов (основных блоков управления и принятия решений и поддерживающих подсистем), взаимосвязанных информационно-логическими процессами (организации планирования, его координации и контроля) для достижения стратегических целей (заданных целевых нормативов, приоритетных направлений развития) для упорядоченного решения стратегических проблемных ситуаций развития предприятия (компании) и функционирования с учётом государственной стратегии развития и актуального перечня социально-экономических и экологических задач.

Это предполагает агрегирование данных, информации и знаний в системе через их фреймовое представление (включая риски и угрозы устойчивому развитию), определение свойств и характеристик взаимосвязей между элементами управления [15, с.18-20] и семантическое моделирование [16, с.1812] последствий принимаемых решений для визуализации результатов плана.

Характеристика обеспечивающих подсистем и анализ требований к ним

Свойство планомерности [17, с.21] предполагает организацию механизма осознанного выбора структуры потока продукции и услуг. В системе стратегического планирования должны быть интегрированы следующие обеспечивающие подсистемы: для стратегического (долгосрочного) - организация механизма осознанного выбора структуры потока продукции и услуг; для среднесрочного - организация механизма адаптивного управления; для текущего - организация механизма динамического нормирования; для оперативного- организация способов актуализации информации, стадийного планирования по опережению.

Система стратегического планирования включает подсистемы, обеспечивающие организацию механизма осознанного выбора структуры потока продукции и услуг, адаптивного управления, динамического нормирования и способы актуализации информации и стадийного планирования по опережению.

Для эффективного функционирования **системы целевого динамического нормирования** и **механизма адаптивного управления** необходимо согласовать взаимодействие между подсистемами. Это включает регулирование вопросов организации подсистемы взаимодействия с информационными и геоинформационными системами, а также подсистем административного контроля, мониторинга и оценки результатов.

Высокая динамика изменений внешней среды дорожно-строительных организаций ведет к увеличению внимания хозяйствующих субъектов дорожного хозяйства к поиску наиболее эффективных способов взаимодействия с внешней и внутренней средой. Управляющие структуры (решающие центры дорожно-строительной организации) на основе применения механизма адаптивного управления и когнитивных динамических сценариев, решают эти задачи посредством своей коммуникационно-информационной подсистемы.

Стратегические плановые решения (как стандартные единицы заданий) содержат, в том числе речевые, коммуникативные акты, учитывают взаимосвязь между средствами коммуникации и их функциями управления, включая тексты договоров и инструкций, которые содержат документированную информацию о стратегических решениях. Эти документы разрабатываются и рассматриваются компетентными и уполномоченными участниками процесса планирования. Каждое высказывание, речевой акт, письменное сообщение выполняет определенные коммуникативные функции, среди которых главными являются управление и влияние. Управляющее воздействие включает подфункции инструктирования (целенаправленного действия) и мотивации (конкретизирует удельную ценность альтернатив выбора решений), оно передает коммуникативную установку, которая определяет «воздействие на адресата и его реакцию» [18, с.889], по сути, являясь как стандартные единицы знаний в системе планирования.

Основная цель терминологической системы заключается в обеспечении единообразных и точных определений понятий и терминов, применяемых в стратегических планах и программах посредством- стандартных единиц задач- стандартных единиц заданий - как стандартные единицы знаний (в виде динамических структур, т.е. фреймов) для дальнейшей обработки и поддержки решений. В ней необходимо конкретизированная сущность важных понятий: «Стратегия представляет собой набор правил для достижения целей. Стратегическое планирование – это процесс принятия плановых решений, направленный на устранение узких мест и дисбалансов в ресурсных комплексах предприятия с учетом их фаз функционирования и жизненного цикла. Стратегическая организация – это процесс принятия организационных решений, направленный на объединение разрозненных элементов в систему, её совершенствование и достижение требуемого уровня информационно-аналитического обеспечения, а также перестройку управляющей структуры. Стратегическая координация – это процесс принятия координационных решений, направленный на согласование целей и интересов управляющих элементов в системе, пространстве и времени. Стратегический контроль – это процесс отслеживания принятия решений с использованием дескриптивной функции на основе фреймового представления знаний. Система управления промышленным предприятием – это комплекс взаимосвязанных и взаимодействующих обеспечивающих подсистем объекта и субъекта, направленный на планомерное достижение целей промышленного предприятия через предвидение проблемных ситуаций и их упорядоченное решение» [5].

Визуализация семантической сети проблемных областей помогает понять связи и зависимости между различными аспектами стратегического планирования, что позволяет органам и должностным лицам в сфере стратегического планирования проводить анализ и принимать более обоснованные решения.

Подсистема целевого динамического нормирования предназначена для оценки рисков и адаптации стратегии. Она состоит из объектов, целевых установок, субъектов, методологии и документов стратегического планирования. Значимость каждого элемента в процессе планирования определяется их регулятивными функциями и аспектами. Достижение целей управления объектом осуществляется через выполнение функций управления субъектом (управляющей структурой, руководством, лицами, принимающими решения).

Подсистема ситуационного управления и анализа эффективности инновационной деятельности дает возможность оценить результаты инновационных проектов и программ в дорожном строительстве, а уполномоченным органам и должностным лицам в области стратегического планирования требуется разрабатывать механизмы ситуационного управления для приспособления к изменяющимся условиям [19, с.117].

Подсистемы взаимодействия с информационными системами и геосистемами обеспечивают обмен данными и информацией с разнообразными партнерскими и внешними системами.

Подсистемы администрирования, мониторинга и оценки результатов способствуют эффективному управлению и контролю за реализацией стратегических планов.

В указанных подсистемах планирования, логико-лингвистическое и экономико-математическое моделирование играют ключевую роль в автоматизации плановых расчетов и цифровизации плановых решений, предоставляя органам и должностным лицам возможности для прогнозирования результатов стратегических планов и оценки их эффективности.

При этом, подчеркнем, что автоматическая проверка гипотез плана, сценариев может и должна происходить на основе экспертных систем, сквозных технологий управления в цифровом формате и такой высокий уровень их прогнозируемости позволяет предсказывать будущие события и тенденции на основе анализа данных и статистических моделей. Кроме того, современные экспертные системы, например «Руководитель» [20, с. 26] могут использовать технологии искусственного интеллекта и машинного обучения для оптимизации процессов принятия плановых решений и управления рисками.

Выводы

Современные достижения компьютерных систем, интеграция интеллектуальных, интегрированных модулей в модели ситуационного управления, требуют пересмотра методической базы планирования и внедрения интеллектуального подхода в стратегическом управлении в целом на основе комплекса основных и обеспечивающих подсистем и механизмов [21, с.201]. Предлагаемые автором методические основы системы планирования на основе непрерывной актуализации данных, информации и знаний путем упорядоченной структуры функциональных и обеспечивающих подсистем обеспечивает качество планирования (синхронизацию плановых работ) в организациях дорожно-строительной отрасли, а объединение знаний из различных областей на каждом уровне управления позволяет применять речевые логико-лингвистические модели в системах планирования, основанных на ситуационном управлении.

Особое внимание в приведенных функциональных подсистемах уделяется адаптивным подходам к моделированию управленческих решений и проверке планов с учетом потенциала и потребностей участников процесса планирования, наличия современных научно-производственных отношений между субъектами и их цифровизации при многообразии форм межрегионального взаимодействия.

Таким образом, системы стратегического планирования представляют собой комплекс взаимосвязанных компонентов (основных и обеспечивающих подсистем), объединённых информационно-логическими процессами для достижения стратегических целей и упорядоченного решения проблемных ситуаций с учетом особенностей дорожного строительства и актуального состояния задач промышленной политики. Для обеспечения безопасности и устойчивости организационных и координационных решений в планировании необходимо использовать динамический формат представления знаний. Эти системы формализуют знания о рисках и угрозах, способах их предотвращения и решения в виде агрегаций знаний, визуализируемых семантическими структурами (фреймами как динамических семантических структур стандартных единиц задач - стандартных единиц заданий- как стандартные единицы знаний).

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Современные подходы к формированию системы развития персонала

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В условиях ускоренной цифровизации, глобализации и трансформации форм занятости концепция развития персонала приобрела новое содержание и масштабы. Современные подходы к формированию систем развития персонала опираются на стратегическое мышление, гибкость, непрерывность, персонализацию и цифровые инструменты. В данном литературном обзоре систематизированы наиболее значимые теоретические и практико-ориентированные подходы, нашедшие отражение в трудах отечественных и зарубежных исследователей [14].

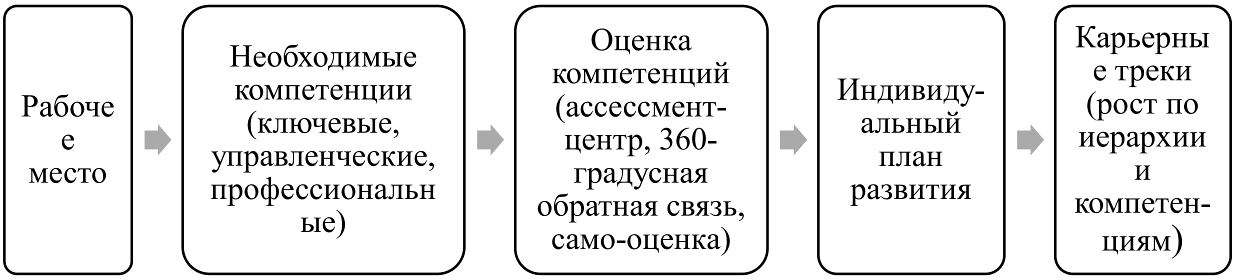
Современные исследователи подчёркивают, что система развития персонала должна быть неотъемлемой частью стратегии компании. Многими исследователями подчёркивается, что развитие должно строиться с учётом долгосрочных целей бизнеса, обеспечивая соответствие между организационными приоритетами и кадровыми возможностями. Такой подход предполагает активную интеграцию HR-политики с корпоративной стратегией, в том числе на уровне показателей эффективности [15].

Более того, авторы акцентируют внимание на необходимости выстраивания вертикали целей: от стратегических задач до индивидуальных планов развития сотрудников. Это позволяет не только выровнять мотивацию персонала с целями организации, но и формировать устойчивую культуру профессионального роста [16].

Современные подходы к развитию персонала формируются под влиянием множества факторов, таких как цифровизации экономики, усиления конкуренции за таланты, глобализации и быстрого устаревания знаний. Компании стремятся выстроить такие системы обучения и развития, которые были бы не только эффективными с точки зрения освоения новых компетенций, но и гибкими, персонализированными и тесно интегрированными с бизнес-целями. Основные современные подходы к развитию персонала включают компетентностный и личностно-ориентированный, интерактивные и практико-ориентированные методы обучения, использование цифровых технологий, интеграцию развития с управлением эффективностью, и другие [17].

Компетентностный подход основывается на идее, что каждое рабочее место требует набора специфических компетенций, то есть знаний, умений, навыков и поведенческих характеристик, которые необходимы для эффективного выполнения задач (График 3). Этот подход получил широкое распространение с конца XX века, когда компании стали разрабатывать модели компетенций для различных уровней должностей. Компетенции делятся на ключевые (универсальные), управленческие и профессиональные. Преимущество данного подхода включает возможность выстраивания логики развития на основе разрывов между текущим уровнем компетенций сотрудника и требуемым. Компании разрабатывают индивидуальные планы развития, основанные на оценке компетенций (ассессмент-центры, 360-градусная обратная связь и др.). В BI Group такая модель может быть реализована в рамках карьерных треков, где продвижение по иерархии сопровождается ростом уровня ключевых и профессиональных компетенций [18].

График 3. Компетентностный подход к развитию персонала [18].



Личностно-ориентированный подход акцентирует внимание на индивидуальных особенностях сотрудников, то есть их ценностях, мотивах, стилях обучения и профессиональных амбициях. Он предполагает персонализацию развития, гибкость в выборе форматов обучения и адаптацию программ под потребности конкретного человека [19].

Теория самоопределения (Self-Determination Theory, SDT) была разработана американскими психологами Эдвардом Л. Деси и Ричардом М. Райаном в 1985 году. Основной тезис теории заключается в том, что наилучшее обучение, развитие и функционирование личности происходят в тех условиях, где преобладает внутренняя мотивация. Внутренняя мотивация возникает тогда, когда деятельность воспринимается человеком как значимая, интересная и соответствующая его внутренним убеждениям, а не как результат внешнего давления, вознаграждения или наказания [20].

Центральным элементом теории является утверждение, что для оптимального развития личности необходимо удовлетворение трёх базовых психологических потребностей: автономии, компетентности и принадлежности. Потребность в автономии означает стремление человека к контролю над своей жизнью, возможности выбора и реализации собственных решений. Потребность в компетентности выражается в стремлении чувствовать себя способным, эффективно справляться с поставленными задачами и достигать успеха. Потребность в принадлежности (или связанности) проявляется в стремлении быть принятым, связанным с другими людьми и чувствовать поддержку со стороны значимых социальных групп.

В условиях, где эти потребности удовлетворяются, у человека формируется устойчивый интерес к обучению, высокий уровень вовлечённости и внутренняя мотивация. Напротив, когда внешние факторы (например, авторитарный стиль руководства, жёсткие регламенты, система наказаний) подавляют автономию или создают ощущение некомпетентности, это приводит к снижению мотивации, выученной беспомощности и выгоранию.

В образовательных и организационных контекстах теория самоопределения получила широкое применение. Компании и образовательные учреждения, ориентированные на развитие сотрудников или учащихся, создают условия для выбора и самоуправления, предоставляют конструктивную обратную связь и поддерживают благоприятный психологический климат. Таким образом, теория Деси и Райана подчёркивает, что развитие и обучение наиболее эффективно в тех условиях, где человек ощущает свободу, поддержку и признание, а сам процесс воспринимается как возможность для самореализации и роста.

Компании, применяющие этот подход, проводят диагностику мотивационных профилей сотрудников, разрабатывают индивидуальные планы развития, коучинг-программы и карьерные консультации. Внедрение личностно-ориентированного подхода позволяет повысить вовлечённость и удержание персонала, а также содействует построению культуры доверия и развития [20].

Интерактивные и практико-ориентированные методы обучения включают современные системы развития, которые отходят от традиционных лекционных форматов в пользу активных методов. Кейс-стади, симуляции, деловые игры, проектное обучение, action learning — все эти методы направлены на развитие навыков через практическую деятельность и рефлексию. Они позволяют лучше закреплять знания, развивать критическое мышление, командную работу и адаптацию к нестандартным ситуациям. В рамках проектного обучения участники решают реальные задачи компании, что позволяет объединить процесс развития с бизнес-целями. BI Group может применять данные методы при подготовке менеджеров проектов, руководителей направлений и инженерно-технического персонала, включая кейсы из строительной практики [21].

Цифровизация коренным образом меняет парадигму развития персонала. В фокусе данной парадигмы находятся доступность, гибкость, персонализация и масштабируемость. Компании внедряют Learning Management Systems (LMS), платформы корпоративного обучения, мобильные приложения, видеокурсы и адаптивные цифровые модули, формируя единую цифровую экосистему [22].

E-learning позволяет сотрудникам самостоятельно выбирать время и темп обучения, отслеживать прогресс и возвращаться к материалам при необходимости. Развитие микролёрнинга (коротких образовательных модулей) и обучающих видеоформатов делает процесс обучения удобным и непрерывным. BI Group может использовать цифровые платформы для обучения инженерных специалистов, административного персонала и молодых сотрудников в формате blended learning (смешанного обучения) [23].

Применение технологий искусственного интеллекта и аналитики big data позволяет создавать персонализированные обучающие маршруты, рекомендовать контент и анализировать результаты в реальном времени. Интеграция с HR-системами помогает связывать развитие с карьерным ростом и бизнес-результатами [24].

Современные компании всё чаще интегрируют систему развития персонала с системой оценки эффективности (performance management). Это означает, что цели развития увязываются с показателями KPI, результатами оценки компетенций и потребностями бизнеса. Такая интеграция позволяет превратить обучение из абстрактной задачи в инструмент достижения конкретных бизнес-результатов. Например, если отдел продаж показывает снижение эффективности, могут быть запущены краткосрочные программы обучения по переговорам, работе с возражениями или CRM. После прохождения курса оцениваются не только знания сотрудников, но и фактическое изменение в бизнес-результатах: рост выручки, конверсии, снижение текучести клиентов [25].

Кроме того, компании внедряют «культуру обратной связи», основанной на регулярной практике давать обратную связь по результатам обучения и работе, что усиливает связь между обучением и повседневной деятельностью. Таким образом, современные подходы к развитию персонала предполагают переход от единообразных программ к адаптивным, гибким и ориентированным на конкретного сотрудника решениям. Использование компетентностных моделей, активных методов, цифровых инструментов и связи с бизнес-целями формирует устойчивую и стратегически значимую систему развития человеческого капитала, которая особенно актуальна для динамичных отраслей, таких как строительство [26].

Также, многие авторы подчёркивают необходимость учёта индивидуальных особенностей обучающихся. Современные системы развития персонала всё чаще отходят от универсальных программ в пользу персонализированных планов обучения. Использование Learning Management Systems (LMS), искусственного интеллекта и big data позволяет строить индивидуальные траектории обучения, адаптированные под потребности и стиль обучения конкретного сотрудника [27].

По мере развития технологий трансформируются формы, методы и инструменты обучения. Например, более эффективные компании переходят от традиционных форм обучения к цифровым экосистемам: виртуальным академиям, симуляциям, онлайн-платформам и мобильным приложениям. Концепция Digital Learning включает в себя использование следующих практик: корпоративных LMS; e-learning курсов и модулей; микролёрнинга; адаптивных курсов с ИИ; цифровой аналитики для оценки прогресса. Это позволяет не только расширить доступ к обучению, но и снизить затраты, обеспечить гибкость и повысить вовлечённость сотрудников [28].

В современной HR-практике особое внимание уделяется таким форматам, как коучинг, менторство и peer learning, которые повышают эффективность этих методов как в развитии лидерских компетенций, так и в повышении личной ответственности сотрудников за собственное развитие. Также, рассматривается развитие персонала в тесной связи с управлением талантами. Создание индивидуальных карьерных треков, систем преемственности и программ удержания позволяет не только формировать кадровый резерв, но и снижать уровень текучести [29].

Компании, уделяющие внимание карьерному развитию, демонстрируют более высокие показатели вовлеченности, инновационности и устойчивости. Это особенно важно в контексте строительной отрасли, где квалифицированные кадры – это дефицитный ресурс [30].

В целом, современные подходы к формированию системы развития персонала отражают переход от административного к стратегическому управлению человеческими ресурсами. Они строятся на интеграции технологий, ориентации на человека, гибкости, непрерывности и измеримости. Эти принципы находят широкое применение в компаниях, стремящихся к лидерству в условиях VUCA-среды (Volatility - изменчивость, Uncertainty-неопределенность, Complexity - сложность, Ambiguity - двусмысленность) [31].

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ИНСТРУМЕНТЫ И МЕТОДЫ ЭФФЕКТИВНОГО МЕНЕДЖМЕНТА

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Введение

Если рассматривать менеджмент с точки зрения его функционально- го предназначения, то эффективность менеджмента определяется степенью результативности основной (производственной) деятельности пред- приятия, т. е. степенью достижимости поставленных целей. Если же относиться к менеджменту как к процессу или деятельности по выработке, принятию и реализации управленческого решения, то его эффективность сводится к эффективному управлению данным процессом в организации.

Результативность такого процесса по выработке, принятию и реализации управленческого решения, как правило, обеспечивается лишь при соблюдении ряда правил (рациональное использование ограниченных ресурсов; приоритет качества продукции; реализация неиспользованных возможностей и ресурсов; социальная ориентация управления; наличие обратной связи, на- лаженной системы контроля и оценки результатов деятельности), а также при наличии в арсенале управления менеджеров прогрессивных методов и инстру- ментов, позволяющих привести организацию к желаемой цели – «никто и никогда не ловил истину голыми руками» [1, с. 497].

Для успешных западных компаний современные прогрессивные методы и инструменты эффективного менеджмента являются реалиями их управленческой деятельности, с помощью которых фирмы могут отслеживать в сложной и динамичной среде большое количество характеристик бизнеса, видеть их взаимосвязь, улавливать «слабые сигналы», осуществлять коррекцию стратегии развития и интегрированный контроль и, самое главное, проводить в организации соответствующие стратегические изменения. Для казахстанских предприятий данные методы и инструменты еще не стали профессиональной азбукой современного менеджмента, и, следовательно, важнейшей задачей наших менеджеров в настоящее время является постановка, освоение и адаптация западных стандартов, трафаретов профессионального управления, методик, техник и управленческих технологий.

Целью исследования являлась разработка научно-практических рекомендаций по оценке уровня управления и дальнейшему развитию инструментов и методов эффективного менеджмента. Для достижения этой цели потребовалось решить следующие задачи:

- на основе анализа существующих отечественных и зарубежных исследований по вопросам развития и применения инструментов и методов эффективного менеджмента на предприятиях обосновать выбор тех из них, которые будут способствовать приближению менеджмента казахстанских промышленных предприятий к «совершенному» управлению;
- с помощью современных методов многомерного статистического анализа исследовать эмпирическое поведение региональных промышленных предприятий, классифицировать их и выявить факторы, влияющие на эффективность их деятельности;

- разработать ряд инструментов эффективного менеджмента, адаптированных к условиям современных промышленных предприятий.

Объектом исследования являлись процессы, формирующиеся и протекающие на стратегически значимых и стабильно функционирующих промышленных предприятиях Астанинской области.

В качестве методов научного исследования в работе использовались: системный анализ и синтез, метод экспертных оценок, методы сравнительного и экономического анализа, методы многомерного статистического анализа (кластерный и факторный анализ).

1. Методы и инструменты эффективного менеджмента.

Практическая модель эффективного управления казахстанским предприятием должна учитывать как условия и факторы внешней и внутренней среды, специфичные для отечественного производства, так и необходимость пересмотра сложившейся управленческой парадигмы и создания новой парадигмы управления, базирующейся на новых представлениях о реальности в постиндустриальную эпоху.

Новая модель эффективного управления современной организацией определяется такими приоритетными показателями эффективности менеджмента, как гибкость системы управления организацией и ее соответствие принятой стратегии; адаптивность и «отзывчивость» к постоянным изменениям внешней среды; ориентация на социальные аспекты «обучающейся» организации, связанные с полным раскрытием интеллектуального потенциала персонала организации, поощрением процессов самоорганизации и творчества в коллективе [2]. Ее реализация требует от менеджеров развития организационных способностей к обучению и превращения организаций в самообучающиеся организации, которые характеризуются вниманием к качеству всех процессов и постоянными усовершенствованиями, сильной организационной культурой и горизонтальной структурой управления, делегированием полномочий и командной работой, практикой наделения властью и свободным обменом информацией.

Определение теоретических и методологических основ эффективного менеджмента требует создания его методического инструментария, черт и принципов эффективного менеджмента. Под эффективным менеджментом понимается такая управленческая деятельность в организациях, которая на основе творческого использования всей совокупности разработанных мировой наукой и практикой современных концепций и методов эффективного управления организацией, адаптирует их применительно к конкретным условиям внешней и внутренней среды предприятия и исходит при этом из постулата, что основной ценностью и источником благополучия организации являются ее работники, самоуправляемые и самообучающиеся рабочие группы, команды.

На основании проведенного исследования были определены методы эффективного менеджмента, к которым следует отнести методы стратегического управления, контроллинга как системы «управления управлением» и самоорганизации, представляющие собой подходы, способы, позволяющие упорядочить и эффективно организовать выполнение функций управления. Кроме того, были выделены их инструменты, представляющие собой приемы, «орудия» управленческого труда, реализация которых приближает предприятие к «совершенному» управлению.

Стратегическое управление (СУ) помогает собрать воедино весь комплекс приемов и способов управленческой деятельности для обеспечения и удержания конкурентных преимуществ на основе адекватного реагирования на изменения, происходящие во внешней среде. Метод СУ моделирует эффективную деятельность предприятия на определенный период через установку и постоянное корректирование целей в условиях неоп- ределенности рыночной среды и внутреннего состояния предприятия путем определения наиболее эффективного способа достижения этих целей, т. е. выбора стратегии с помощью различных инструментов стратегического управления. Под контроллингом понимается система «управления управлением», включающая в себя стандарты профессионального управления, принятые в западной экономике, т. е. элементы отлаженного механизма эффективного менеджмента. Инструменты контроллинга сопровождают и поддерживают внутрифирменный процесс управления и принятия решений на всех уровнях предприятия, связывая воедино функции планирования, организации, координации и регулирования, учета и контроля, информационного обеспечения, мотивации и стимулирования. Ос- новная цель контроллинга как метода эффективного менеджмента – ориентация управленческого процесса на достижение стратегических и оперативных целей, а его практическая задача – ориентировать менеджеров путем подготовки и предоставления необходимой информации на принятие решений и комплекс необходимых действий. Метод самоорганизации базируется на теоретической концепции самообучающейся организации и является важнейшим, ключевым моментом формирования эффективной модели управления предприятием, предполагающей обучение и самообучение персонала, согласование интересов различных групп и делегирование полномочий, создание сильной организационной культуры и полную реализацию творческих способностей сотрудников.

Анализ условий и факторов, определяющих эффективность функционирования промышленных предприятий.

В целях изучения условий и предпосылок для создания эффективной модели управления региональными промышленными предприятиями особое внимание было уделено выявлению и оценке факторов, влияющих на эффективность деятельности данных предприятий. В качестве исходной базы для анализа использовались 19 основных показателей финансово- хозяйственной деятельности 27-ми базовых, т. е. наиболее перспективных и стратегически значимых предприятий Астанинской области за 2024 г. Инструментом исследования служили методы многомерного статистического анализа: кластерный и факторный анализ на базе компьютерной программы «Statgraphics Plus for Windows».

В результате *кластерного анализа* были выделены две большие группы предприятий (кластеров). I-й кластер представляют предприятия, зарекомендовавшие себя как достаточно конкурентоспособные, рентабельные предприятия – лидеры в своей отрасли. Второй (II-й) кластер представлен развивающимися, потенциально перспективными в будущем предприятиями, у которых есть все возможности для выхода на более высокий уровень при условии выбора эффективного стиля руководства, стратегического управления организацией и использовании других методов и инструментов профессионального менеджмента.

В результате применения *факторного анализа* (метода главных компонент) от первоначального описания исследуемых объектов совокупностью 19-ти признаков оказалось возможным осуществить переход к четырем главным факторам: удовлетворение потребностей потребителей, удовлетворение потребностей финансовых инвесторов, совершенствование внутренних бизнес-процессов и развитие организации.

Первый фактор – удовлетворение потребностей потребителей – характеризует производственную (наибольшую нагрузку несут себестоимость произведенной продукции, численность работающих, основные производственные фонды и т. д.) и финансово-сбытовую деятельность предприятия (наибольшая нагрузка приходится на выручку от реализации, коммерческие расходы, прибыль от реализации и т. д.), т. е. данный фактор отвечает за все бизнес-процессы организации, которые приносят дополнительную ценность организации за счет отличного качества выпускаемой продукции, удовлетворения индивидуальных потребностей потребителей. Второй фактор – удовлетворение интересов финансовых инвесторов (наибольшая нагрузка на рентабельность продукции, рентабельность продаж, экономическая рентабельность активов) – позволяет судить о привлекательности предприятия для потенциальных инвесторов и окупаемости вложенных средств (затраты на рубль товарной продукции). Третий фактор – совершенствование внутренних бизнес-процессов – характеризует уровень оснащенности производства, уровень развития и внедрения современных производственных технологий и т. д. (фондоотдача и фондовооруженность). Четвертый фактор – развитие организации – это фактор, который характеризует уровень участия работников в процессе создания ценности предприятия и заинтересованности их в конечных результатах (производительность труда), а также сложившийся стиль руко- водства и политику управления (управленческие расходы). Выделенные нами факторы совпадают с основными направлениями совершенствования развития современной организации по методологии BSc [3], что подтверждает объективность и достоверность проведенного исследования. Данные факторы были использованы далее для разработки инструментов эффективного менеджмента.

2. Разработка инструментов эффективного менеджмента.

Темпы изменений на рынке значительно обгоняют скорость реагирования менеджмента на изменения рыночных ситуаций, поэтому в этих условиях у руководителей организаций в арсенале должен быть инструмент, который, как «приборная панель» (instrument panel, dashboard) в самолете или автомобиле, позволял бы быстро, но всесторонне оценить существующий уровень управления организацией и на основании сравнения полученных результатов с нормативными критериями принимать соответ- ствующие управленческие решения.

Предлагаемая нами методика экспресс-диагностики существующего уровня управления выступает в роли такого инструмента в рамках метода контроллинга для измерения и оценки степени достижения целей организации и выбора корректирующих мероприятий и управленческих решений и основывается на выявленных ранее четырех факторах (компонентах), определяющих эффективность деятельности исследуемых предприятий.

При оценке уровня управления отдельным предприятием данная методика предполагает проведение расчета совокупного обобщающего показателя, а при оценке уровня управления по комплексу предприятий, региону соответствующие административные органы должны использовать другой алгоритм. В последнем случае после сбора базовых финансовых показателей осуществляется их стандартизация, т. е. приведение в сопоставимые единицы измерения. В предлагаемой методике экспресс-диагностики предусматривается сравнение рассчитанных факторов и обобщающего показателя с соответствующими нормативными пограничными критериями, которые были определены автором на основе средневзвешенных оценок по группам предприятий: эффективных и недостаточно эффективных.

Для определения готовности предприятий к процессу самоорганизации как со стороны руководства, так и со стороны персонала предложен соответствующий управленческий инструмент. Не случайно, упоминая о создании обучающихся организаций, мы отмечаем необходимость начинать обучение с лидеров организаций, чей менеджмент станет движущей силой в преобразовании организации. Именно поэтому первостепенной задачей правительства становится создание эффективной программы обучения менеджеров высшего звена управления, а также достижение реальных позитивных изменений в промышленности региона. В связи с этим нами разработана Концепцию формирования эффективного менеджмента на стратегически значимых промышленных предприятий Астраханской области

Основной целью Концепции является формирование условий для создания обширной информационно-методической и организационной базы для овладения приемами, инструментами и методами профессиональных стандартов управления руководителями и специалистами промышленных предприятий области.

Задачи и основные направления мероприятий Концепции:
- обучение первых руководителей промышленных предприятий области методам и инструментам эффективного менеджмента, адаптированным к условиям конкретных предприятий, на основе применения активных методов обучения;
– организация консультационно-аналитических центров;
- переподготовка специалистов с помощью проведения специализированных обучающих семинаров-практикумов по различным методам и инструментам эффективного менеджмента;
- оценка и выявление потенциально эффективных предприятий с помощью предлагаемой методики по экспресс-диагностике уровня экономического состояния предприятий;
- создание комплекта методического обеспечения обучающих семинаров-практикумов;
- создание и ведение информационного обеспечения банка данных (мониторинг) по эффективным предприятиям области и др.

Дальнейший рост и процветание предприятий возможно только за счет эффективного менеджмента и целенаправленной творческой энергии высших руководителей, которые могут побудить к активности одних работников, мобилизовать идеи других и все вместе наиболее успешно использовать научно-технический и человеческий потенциал предприятия. Эффективная реализация потенциала предприятия возможна только при грамотном и обученном руководителе, который, научившись сам (не только в области управления, но и в области социологии и психологии), сможет помочь овладеть современными знаниями и информацией своим подчиненным.

Для оценки эффективности реализации Концепции предлагается интегральный показатель, частные показатели (составные части) которого отражают эффективность реализации отдельных программных мероприятий администрации Астанинской области по постановке эффективного менеджмента на промышленных предприятиях, находящихся на её территории. Важное методическое требование предлагаемого алгоритма расчета данного интегрального показателя все частные показатели соответствовали принципу: «чем выше числовое значение – тем эффективнее реализуются мероприятия».

Для определения веса частных показателей был использован метод экспертных оценок с учетом следующих критериев: уровень информированности, которую имеет показатель; степень влияния на изменение социально-экономической и экологической ситуаций; масштабность мероприятия и последствий от его реализации.

Частные показатели, характеризующие отдельные стороны интегрального показателя оценки экономической эффективности социально- экономических последствий от реализации мероприятий Концепции, объединены в три группы: финансы, внешние процессы и внутренние процессы.

Заключение

Разработанные в данном исследовании инструменты эффективного менеджмента, а также Концепция являются первой попыткой сформулировать основные направления становления эффективного менеджмента на промышленных предприятиях Астанинской области. Эти направления определенны на основе обобщений аналитического характера по результатам исследования эмпирического поведения данных предприятий и научного обоснования применения конкретного методического инструментария эффективного менеджмента к отечественным предприятиям. Основные результаты проведенного нами исследования могут быть положены в основу разработки единого методического подхода к становлению эффективного менеджмента на всех предприятиях страны.

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ОЦЕНКА ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ И СОЦИАЛЬНОГО ВОЗДЕЙСТВИЯ ПРОЕКТОВ УМНОГО ГОРОДА: АДАПТАЦИЯ МЕТОДОВ ПРОЕКТНОГО УПРАВЛЕНИЯ ДЛЯ ЦЕЛЕЙ УСТОЙЧИВОГО РАЗВИТИЯ

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Аннотация. В статье исследуются проблемы оценки эффективности проектов в сфере создания «умных городов» в Республике Казахстан. Авторы доказывают, что традиционные методы оценки, фокусирующиеся на бюджетной и технологической эффективности, являются недостаточными для комплексного измерения вклада таких проектов в устойчивое развитие. Цель исследования – разработать концептуальные подходы к адаптации системы проектного управления на государственном уровне для интеграции критериев социального воздействия и экологической устойчивости в оценку проектов «умного города». На основе анализа научной литературы, нормативно-правовой базы РК и международного опыта выявлены системные проблемы, такие как кадровый дефицит и ориентация на краткосрочные результаты. В результате предложена комплексная система ключевых показателей эффективности (KPI), сочетающая традиционные экономические метрики с параметрами, отражающими социальное благополучие, качество городской среды и эффективность управления ресурсами, а также модель проектного офиса, ответственного за мониторинг достижения целей устойчивого развития.

Ключевые слова: проектное управление, умный город, устойчивое развитие, экономическая эффективность, социальное воздействие, оценка проектов, государственное управление, Казахстан.

Введение

Активное внедрение проектного управления в систему государственного планирования Республики Казахстан, регламентированное такими документами, как Постановление Правительства РК № 358 «Об утверждении Правил осуществления проектного управления» [1] и Национальный стандарт СТ РК ISO 21500-2014 [2], создало институциональную основу для реализации масштабных национальных проектов, включая инициативы в области «умных городов». Однако, как справедливо отмечают Грядунова А.В., Крюкова О.А., Леонова О.В., применение проектного менеджмента в госуправлении сопряжено с проблемами, главная из которых – сохранение бюрократической логики в ущерб проектной гибкости и ориентации на результат [3, с. 205].

Особую остроту эта проблема приобретает в контексте проектов «умного города», которые по своей сути являются междисциплинарными и направлены не только на технологическую модернизацию, но и на достижение целей устойчивого развития, повышение качества жизни горожан и обеспечение инклюзивного экономического роста. Как подчеркивает Brunet M., эффективное управление крупными публичными инфраструктурными проектами требует многоуровневой системы управления (governance), учитывающей интересы всех стейкхолдеров [4 - 8]. В настоящее же время, как показывает анализ практики, оценка таких проектов часто сводится к показателям освоения бюджета, количества установленных датчиков или развернутых IT-систем, что не отражает их реального социально-экономического эффекта. Данное противоречие определяет актуальность настоящего исследования.

Цель статьи – разработать научно-обоснованные предложения по адаптации методов и инструментов проектного управления для комплексной оценки экономической эффективности и социального воздействия проектов «умного города» в рамках парадигмы устойчивого развития.

Методы исследования: системный анализ, сравнительно-сопоставительный анализ нормативно-правовых актов и научной литературы, моделирование.

Основная часть

1. Системные проблемы проектного управления в оценке проектов «умного города»

Несмотря на созданную в Казахстане продуманную и современную нормативную базу, включающую Систему государственного планирования [9] и перечень национальных проектов [10], на практике сохраняется ряд барьеров, препятствующих эффективной оценке комплексных проектов.

Кадровый аспект. Тухватуллина М.А. указывает на недостаточную компетентность государственных служащих в области проектного управления, что особенно критично для оценки сложных, многофакторных проектов [11]. Отсутствие у сотрудников навыков работы с данными (data literacy) и понимания принципов устойчивого развития приводит к тому, что оценка сводится к формальному контролю знакомых финансово-административных показателей.

Декларативность стратегического планирования. Морозов С.И. и Смирнов Е.Б. отмечают разрыв между стратегическими целями и тактическими проектами [12]. Национальные проекты, в том числе в сфере цифровизации, зачастую не имеют четко прописанных целевых показателей, непосредственно связанных с качеством жизни и устойчивостью городской среды. Это подтверждается исследованиями Fred M. и Hall P., которые наблюдали подобную тенденцию в Швеции, где проекты часто становятся инструментом для решения сиюминутных политических или управленческих задач, а не достижения долгосрочных стратегических целей [13].

Ориентация на тактические, а не стратегические результаты. Лапыгин Ю.Н. и Гоньшаков А.Г. справедливо отмечают, что существующие методики оценки эффективности проектного управления часто фокусируются на операционных результатах (сроки, бюджет), игнорируя стратегические эффекты [14]. В контексте «умного города» это означает, что успехом считается запуск платформы, а не снижение времени в пути на общественном транспорте или повышение энергоэффективности жилого фонда.

2. Концептуальные основы интеграции устойчивого развития в систему оценки

Для преодоления указанных проблем необходима адаптация системы проектного управления, предполагающая переход от узкоэкономической к комплексной модели оценки, основанной на принципах ESG (Environmental, Social, Governance) и целях устойчивого развития (ЦУР) ООН.

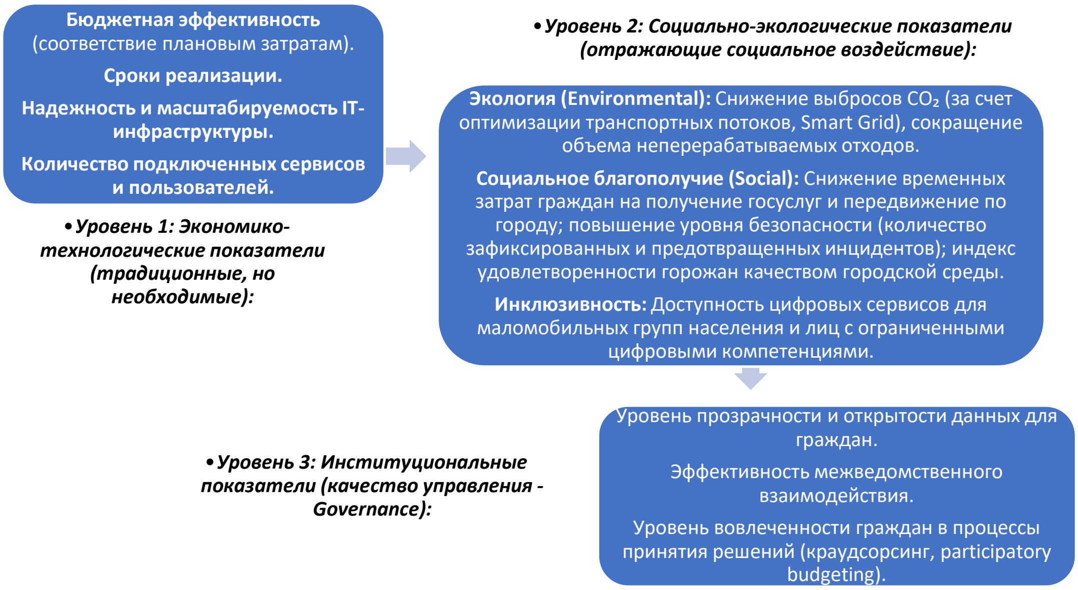
Картов А.Е., анализируя перспективы проектного менеджмента в Казахстане, указывает на необходимость использования сбалансированной системы показателей (BSC) [15]. Развивая эту идею, мы предлагаем для проектов «умного города» внедрить трехуровневую систему KPI, интегрированную в жизненный цикл проекта (Рис. 1).

Уровень 1: Экономико-технологические показатели (традиционные, но необходимые):

- Бюджетная эффективность (соответствие плановым затратам).
- Сроки реализации.
- Надежность и масштабируемость IT-инфраструктуры.
- Количество подключенных сервисов и пользователей.

Уровень 2: Социально-экологические показатели (отражающие социальное воздействие):

- Экология (Environmental): Снижение выбросов CO_2 (за счет оптимизации транспортных потоков, Smart Grid), сокращение объема неперерабатываемых отходов.



(*Разработан авторами, на основе [15]*)

Рисунок 1. Трехуровневая система KPI

- Социальное благополучие (Social): Снижение временных затрат граждан на получение госуслуг и передвижение по городу; повышение уровня безопасности (количество зафиксированных и предотвращенных инцидентов); индекс удовлетворенности горожан качеством городской среды.
- Инклюзивность: Доступность цифровых сервисов для маломобильных групп населения и лиц с ограниченными цифровыми компетенциями.

Уровень 3: Институциональные показатели (качество управления - Governance):

- Уровень прозрачности и открытости данных для граждан.
- Эффективность межведомственного взаимодействия.
- Уровень вовлеченности граждан в процессы принятия решений (краудсорсинг, participatory budgeting т.е. партисипаторное бюджетирование — это механизм участия граждан в распределении части бюджетных средств, при котором жители города или региона могут предлагать и голосовать за проекты, финансируемые из местного бюджета).

3. Организационно-управленческая модель для реализации подхода

Для операционализации предложенной системы KPI необходима адаптация организационной структуры проектного управления. Мы предлагаем создание в рамках проектных офисов «умного города» (как на национальном, так и на местном уровне) специализированных Отделов мониторинга устойчивого воздействия.

Функциями такого отдела должны стать:

1. Разработка и актуализация панели индикаторов (dashboard) на основе трехуровневой системы KPI.
2. Сбор и верификация данных из различных источников (датчики, соцопросы, статистические отчеты).
3. Проведение регулярного аудита проектов на предмет их соответствия целям устойчивого развития, задекларированным в Концепции развития госуправления до 2030 года [16].
4. Подготовка отчетов для высшего руководства с анализом не только финансовых, но и социально-экологических рисков и достижений.

Данная модель согласуется с выводами Bredillet C.N. о том, что проектный менеджмент должен «дуть и горячим, и холодным», то есть сочетать в себе как жесткие, так и гибкие подходы [17]. В нашем случае «жесткие» экономические метрики дополняются «гибкими» социальными показателями.

Заключение

Проведенное исследование позволяет сделать следующие выводы:

1. Существующая в РК система оценки проектов «умного города», базирующаяся на классических принципах проектного управления, является недостаточной для измерения их комплексного вклада в устойчивое развитие региона и страны.
2. Ключевыми проблемами являются кадровый дефицит, разрыв между стратегией и тактикой, а также преобладание краткосрочных экономических KPI над долгосрочными социально-экологическими.
3. В качестве решения предложена концепция адаптации проектного управления через внедрение трехуровневой системы KPI (Экономико-технологические, Социально-экологические, Институциональные показатели), которая позволяет проводить комплексную оценку эффективности и воздействия.
4. Для реализации данного подхода организационно рекомендуется создание в структуре проектных офисов Отделов мониторинга устойчивого воздействия, ответственных за сбор данных, анализ и отчетность по всем трем уровням KPI.

Предложенные меры позволят трансформировать проекты «умного города» из инициатив по технологической модернизации в инструмент комплексного и устойчивого развития городской среды, ориентированный в конечном счете на повышение качества жизни человека. Дальнейшие исследования могут быть направлены на разработку конкретных методик количественных и качественных оценок социального воздействия и апробацию предложенной модели на примере конкретных национальных проектов Казахстана.

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The Dual Economic Trajectory of Kyrgyzstan in the Shadow of the Ukraine War: Escalating Cost of Living and the Influx of Sanctions-Driven Capital

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Annotation
The Russian invasion of Ukraine in 2022 and the subsequent Western sanctions have had a multifaceted impact on the economy of the Kyrgyz Republic, giving rise to two opposing economic vectors. This study analyzes this phenomenon: on the one hand, there is an escalation in the cost of living for the population, driven by an inflationary shock and volatility in remittances. On the other hand, the country has recorded anomalous GDP growth, fueled by geopolitical arbitrage, significant re-exports of goods to Russia, and an influx of sanctions-driven Russian capital. The paper assesses the sustainability of this growth and highlights the long-term structural risks associated with the high concentration of trade and financial flows, which jeopardizes Kyrgyzstan's economic sovereignty and increases its vulnerability to secondary sanctions.

Keywords
Kyrgyzstan, Russia-Ukraine War, Sanctions, Cost of Living, Inflation, Re-export, Remittances, Russian Investment, Economic Sovereignty.

1. Introduction

1.1. Background and Context

The Russian Federation's invasion of Ukraine in February 2022 and the unprecedented regime of Western sanctions imposed on Moscow have fundamentally altered the geo-economic landscape of Central Asia. The Kyrgyz Republic, as a member of the Eurasian Economic Union (EAEU) with deep historical, trade, and financial ties to Russia, found itself at the epicenter of these geo-economic shifts. Initial forecasts by international financial institutions (IMF, World Bank) predicted a sharp economic decline in the region, driven by falling remittances, the devaluation of the ruble, and the disruption of supply chains.

However, Kyrgyzstan's actual economic performance has proven to be more complex, demonstrating a dual trajectory. The country's economy has faced a severe social burden in the form of rising prices and the threat of poverty, while simultaneously recording unexpected and sustained growth in key macroeconomic indicators (GDP, trade turnover).

1.2. Central Hypothesis and Scientific Novelty

Central Hypothesis: Kyrgyzstan's economic growth post-2022 is high-risk and geopolitically driven, relying on the temporary function of "sanctions arbitrage." This simultaneously masks deep structural economic vulnerabilities and exacerbates social inequality caused by the escalating cost-of-living crisis.

The scientific novelty of this research lies in the comprehensive analysis of this dichotomy. The paper provides a detailed comparison of the social crisis with the macroeconomic boom, identifying the mechanisms behind the redirection of capital and trade, and assessing the long-term risks associated with this increasingly concentrated model of external dependence.

1.3. Paper Structure

The study is structured as follows: Section 2 analyzes the negative social and inflationary consequences of the conflict. Section 3 is dedicated to the mechanisms of anomalous growth—namely, re-export and the influx of Russian capital. Section 4 evaluates the long-term risks associated with the increasing concentration of dependence.

2. The Negative Impact Channel: Rising Cost of Living and the Threat of Poverty

The conflict's effect on the welfare of Kyrgyz citizens was immediately evident through two critical, interconnected channels: inflationary shock and the volatility of remittances.

2.1. Inflationary Shock and Food Security

As a net importer of fuel and many food products (including grains and sugar), Kyrgyzstan was highly vulnerable to the global surge in commodity prices caused by the war.

- Precise Data and Commentary: According to the IMF, annual inflation in Kyrgyzstan reached 14.7% in 2022 (IMF Staff Country Reports, *Kyrgyz Republic: 2023 Article IV Consultation*, 2024, p. 1). Food inflation was particularly high. The World Bank highlights that food accounts for 60–70% of consumption expenditures for poor families in the Kyrgyz Republic and Tajikistan, making them extremely susceptible to price shocks (IMF, *Russia's War in Ukraine Could Raise Poverty in Caucasus, Central Asia*, 2022).
- Economic expert Kanat Tilekeyev notes that "Russia’s war in Ukraine caused a spike in basic food costs as well as agro-input prices... The overall situation demonstrates that agriculture is undergoing a severe shock as a result of rising prices, which feeds into the cascade effect of rising prices" (Tilekeyev, K. *The Russian War in Ukraine Impact on Kyrgyzstan's Food Market and Agri-Food Sector in 2022*, 2024). The increased cost of importing resources like fertilizers and fuel undermines domestic production and contributes to further price increases, inevitably leading to a greater social burden.

2.2. Remittance Volatility and Social Burden

Kyrgyzstan is among the countries with the highest reliance on remittances from migrant workers in Russia, which constitutes a vital part of the national income.

- Precise Data: In 2021, remittances accounted for approximately 30% of Kyrgyzstan's GDP (Caspian Policy Center, *The Caspian Region's Reactions to the Current Russo-Ukrainian War: Kyrgyzstan*, 2022).
- Dynamics: The initial shock following sanctions led to a sharp devaluation of the ruble and threatened a 20-33% drop in transfers. However, due to the subsequent stabilization and strengthening of the ruble, along with the inflow of Russian "relocants" (those who left Russia), the net inflow of remittances, after an initial 21% reduction in 2022, began to recover and even grow in nominal terms in subsequent years, highlighting the channel's high volatility and unpredictability (*IMF Staff Country Reports*, 2024, p. 4).
- Social Risk: The instability of this crucial channel threatens to "reverse the progress in poverty reduction achieved over the past two decades" (IMF, 2022).

3. The Positive Impact Channel: Anomalous Growth and the Influx of Sanctions-Driven Capital

Despite the negative social consequences, Kyrgyzstan's macroeconomic indicators show sustained growth, a direct consequence of the geopolitical situation and sanctions pressure on Russia.

3.1. Re-export and Anomalous GDP Growth

As an EAEU member, Kyrgyzstan has become a key transit point for goods destined for Russia, bypassing Western sanctions.

- Precise Data: The Kyrgyz economy grew by 6.3% in 2022, and for the first nine months of 2025, GDP grew by 10% year-on-year, outpacing most of its neighbors (Reuters, *Kyrgyzstan*

GDP up 10% in Jan-Sept year-on-year as Ukraine war reroutes supply chains, 2025). This growth was driven by trade (wholesale and retail) and construction.

- The "Unrecorded Re-export" Phenomenon: This anomalous growth is closely linked to a sharp increase in imports from third countries (primarily China) and the subsequent export of these goods to Russia. As trade within the EAEU is not subject to customs declarations, this activity is reflected in Kyrgyzstan's balance of payments under "Errors and Omissions" (E&O). The IMF estimates that the volume of unrecorded re-exports in 2022 may have amounted to approximately 30% of GDP (IMF Staff Country Reports, 2024, p. 6).
- Expert Commentary: Chief economic expert Azamat Akeneev stated that due to sanctions, "the country has become a kind of offshore hub for Russian companies using Kyrgyzstan's financial system to settle their issues" (Reuters, 2025). This confirms Kyrgyzstan's role as a "trade bridge" for Western and Chinese goods flowing into Russia.

3.2. Direct Russian Investment and Infrastructure Projects

Amid the outflow of Western capital from Russia, there has been a steady influx of Russian capital into Kyrgyzstan.

- Precise Data: Foreign Direct Investment (FDI) from the Russian Federation into Kyrgyzstan reached $279.3 million in 2024. The main recipient sectors were manufacturing ($117.5 million) and wholesale/retail trade ($127.2 million) (24.KG, *Investments from Russia into Kyrgyzstan reach $279.3 million in 2024*, 2025).
- Infrastructure Projects: The capital inflow is accompanied by the signing of large agreements aimed at infrastructure development. At the Kyrgyz-Russian Economic Forum in 2025, agreements worth approximately $270 million were concluded in the fields of energy, industry, transport, agriculture, and the digital economy (The Times Of Central Asia, *Kyrgyzstan and Russia Sign $270 Million in Agreements at Issyk-Kul Forum*, 2025).
- Financing for such projects is often channeled through regional institutions like the Eurasian Development Bank (EDB) and the Russian-Kyrgyz Development Fund (RKDF), indicating systemic support from the Russian side under sanctions.

4. Risk Assessment and Long-Term Sustainability

Despite high GDP growth rates, the current economic model carries significant structural risks that cast doubt on its long-term sustainability.

4.1. Risk of Concentration and Secondary Sanctions

The primary risk lies in Kyrgyzstan's increased dependence on two external partners—Russia (as an export market) and China (as an import source).

- Concentration Risk: As IMF analysts point out, the high level of trade concentration associated with geopolitical fragmentation can lead to significant long-term economic costs, even if it yields short-term benefits (IMF Staff Country Reports, 2024).
- Threat of Secondary Sanctions: Kyrgyzstan's role in "sanctions arbitrage" has resulted in several Kyrgyz banks and companies being targeted by US and UK sanctions. An escalation of sanctions or stricter enforcement could lead to an immediate collapse of re-export and a capital outflow, causing a sudden crash in trade revenues and budget receipts.
- Foreign Policy Context: Analysts suggest that excessive reliance on Moscow and Beijing undermines Kyrgyzstan's efforts to pursue "multi-vector diplomacy," making it a hostage to geopolitical tensions (Atlantic Council, *What Russia's war on Ukraine means for Central Asia*, 2025).

4.2. Structural Constraints on Domestic Development

The current economic growth, driven by trade and capital inflow, masks a lack of progress in addressing fundamental internal issues that limit the prospects for sustainable development:

- Investment Climate: Despite the government's desire to attract FDI, significant barriers remain, such as a weak judiciary, corruption, and insufficient protection of investor rights (U.S. Department of State, *2024 Investment Climate Statements: Kyrgyz Republic*, 2024).
- Inequality: Growth based on trade and financial intermediation is non-inclusive. It fails to create sufficient jobs in the manufacturing sector and does not alleviate the social inequality exacerbated by the inflationary shock.

4.3. Fiscal Vulnerability

The government has used increased revenue from VAT on imports to raise public spending (higher wages and social benefits). However, this revenue increase is temporary and directly dependent on the continuation of abnormally high re-export volumes. A reduction in re-export could lead to a sharp decline in budget revenues, creating a fiscal deficit and increasing the need for external borrowing.

5. Conclusion

5.1. Summary of Key Findings

Kyrgyzstan's economic trajectory since 2022 is characterized by a deep dichotomy: the social burden of inflation and rising living costs remains significant, while macroeconomic growth is being fueled by flows generated by the geopolitical conflict. This growth is highly volatile, unsustainable, and overly concentrated, which creates fundamental risks to the country's long-term economic stability and sovereignty.

5.2. Recommendations

To ensure sustainable development and mitigate risks, the Kyrgyz Republic must adopt the following strategic measures:

1. Diversification of Trade and Financial Flows: Actively developing non-Russian and non-Chinese trade routes (e.g., the Trans-Caspian route) and attracting investment from third countries to reduce concentration risks.
2. Institutional Strengthening: Prioritizing judicial reform, combating corruption, and enhancing transparency in the banking sector to protect against secondary sanctions and attract high-quality, long-term FDI.
3. Social Protection: Implementing targeted measures to support households affected by inflation and ensuring inclusive growth that creates jobs in productive sectors, rather than solely in trade.

Only by moving away from reliance on temporary "sanctions arbitrage" and transitioning towards sustainable, institutionally-managed development can Kyrgyzstan ensure its long-term economic security.

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Анализ некоторых показателей Индекса сетевой готовности Азербайджана

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Аннотация
В работе проанализирована позиция Азербайджана в рейтинге стран по Индексу сетевой готовности, по четырем направлениям, охватываемым интегральным Индексом, а именно – Технологической базе, Государственному регулированию, Человеческим ресурсам и Последствиям. Проведен подробный анализ показателей Доступа Индекса сетевой готовности в Азербайджане и прочих исследуемых странах, сделаны определенные выводы.
Ключевые слова: Индекс, ИКТ, Индекс сетевой готовности, рейтинг, цифровая экономика

С целью определения готовности той или иной страны к переходу к цифровой экономике, ее сетевой готовности, степени развитости в ней сферы информационно-коммуникационных технологий формируются различные интегральные индексы. К примеру, Индекс развития ИКТ подсчитывается Международным Союзом Электросвязи. [1] Включает он Готовность ИКТ, показывающую уровень развитости сетевой инфраструктуры и доступ к ИКТ, Интенсивность ИКТ, отражающую уровень использования ИКТ в стране, и Последствия от использования ИКТ. [2]

Организация Объединенных Наций подсчитывает Индекс развития электронного правительства. Индекс включает в себя Индекс онлайн-услуг, Индекс телекоммуникационной инфраструктуры и Индекс человеческого капитала. [3]

Рассчитывается также и Индекс мировой цифровой конкурентоспособности, который охватывает знания и образование, технологическую инфраструктуру и готовность к будущим цифровым вызовам. [4]

Есть также и Индекс цифровой экономики и общества. Он охватывает Человеческий капитал, Подключение, Интеграцию цифровых технологий и Цифровые государственные услуги. [5, 6]

Индекс сетевой готовности – один из подобных интегральных индексов. Включает он в себя достаточно широкий спектр показателей, позволяющих охватить все необходимые аспекты исследуемой проблемы. Институт, подсчитывающий Индекс сетевой готовности, с целью оценки степени сетевой готовности стран разделяет их по уровням доходов – на страны с высокими доходами, со средне-высоким уровнем доходов, с доходами ниже среднего уровня и с низкими доходами. Азербайджан исследуется в группе стран со средне-высоким уровнем доходов. [7]

Исследуя баллы стран, входящих в эту группу, по общему Индексу, выявлено, что балл Азербайджана равен 45,57, что чуть ниже среднего показателя по исследуемым странам (ниже 47,35). Максимальный балл получил Китай – 67,31, минимальный показатель принадлежит Намибии – 33,87 баллов. Среди исследуемых 34-х стран второй наивысший балл (57,27) получила Россия. Исследуя страны СНГ, также можно заметить, что первое место занимает Россия, вслед за ней идет Казахстан – 50,97 баллов. Минимальный балл получил Таджикистан (33,75 баллов). В странах СНГ средний показатель равен 45,81 баллам, что чуть выше показателя Азербайджана.[7]

Подытоживая вышесказанное, можно утверждать, что среди 34-х стран со средне-высоким уровнем доходов, страной, с наиболее развитой сферой информационно-коммуникационных технологий, страной, наиболее «готовой» к оказанию электронных услуг, к развитию цифровой экономики, является Китай. Вслед за ней идет Россия. Степень готовности Азербайджана при этом оценена чуть ниже среднего показателя по исследуемой группе стран. Анализ данных по Индексу сетевой готовности стран СНГ же показывает, что наиболее подготовленной страной является Россия, затем Казахстан. Самая низкая степень готовности при этом наблюдается в Таджикистане. Степень готовности Азербайджана в сравнении со средним показателем стран СНГ, оценена опять же, чуть ниже.

Известно, что Индекс сетевой готовности охватывает четыре направления, а именно – Технологическую базу, Государственное регулирование, Человеческие ресурсы и Последствия. *(Диаграмма 1.)*

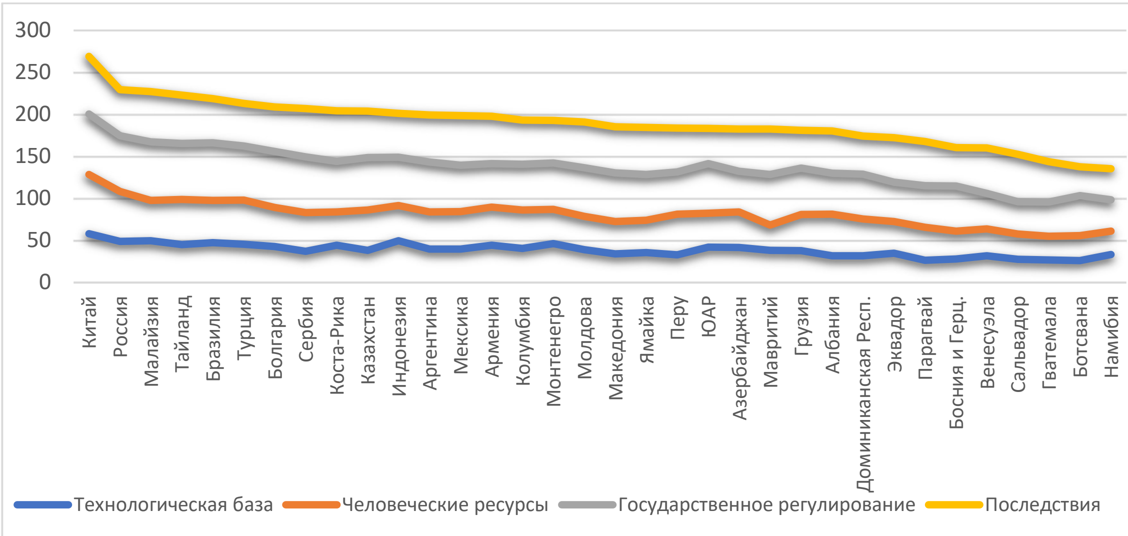

Диаграмма 1. Основные направления Индекса сетевой готовности в Азербайджане и других странах, баллы, 2023

Источник: на основе данных Института Portulans [7]

Исследовав баллы, полученные странами по указанным направлениям, можно заметить, что Азербайджан по направлению Технологической базы получил 41,37 баллов. Средний показатель по исследуемым 34-м странам равен 38,5 баллам. Грузия получила по данному направлению 37,65, Казахстан – 37,92, Турция – 45,29, Россия – 48,76 баллов. Минимальный балл принадлежит Ботсване – 25,8 баллов, максимальный – Китаю – 57,9 баллов.

Следующее направление Индекса сетевой готовности – это Человеческие ресурсы. Средний показатель Человеческих ресурсов по исследуемой группе стране равен 42,6-ти баллам. Показатель Азербайджана равен 42,13 баллам. Показатель Молдовы равен 39,82, Грузии – 42,8, Казахстана – 47,86, Турции – 52,66, России – 59,23 баллам. Наименьший балл получила Намибия (27,8 баллов), наивысший (70,5 баллов) – Китай.

По направлению Государственного регулирования Азербайджан получил 48,46 баллов, что ниже среднего показателя по исследуемым 34-м странам (55,9 баллов). Баллы стран следующие: в Гватемале – 40,84, в Венесуэле – 42,11, в Грузии – 55,39, в Казахстане – 62,72, в Турции – 64,31, в России – 66,33 балла и т.д. Наивысший балл по направлению получил Китай – 72 балла, наименьший – Намибия – 37,2 балла.

Еще одно из направлений, по которым подсчитывается Индекс сетевой готовности – это Последствия, которое отражает влияние степени развитости информационно-коммуникационных технологий на экономику, на качество жизни, на достижение целей устойчивого развития. Азербайджан по данному направлению получил 50,3 баллов.

Показатель Албании составил 50,11, Монтенегро – 50,58, Турции – 50,63, ЮАР – 42,1, Грузии – 45,15, Болгарии – 52,81, Казахстана – 55,38, России – 54,77-ми баллов и т.д. Наивысший балл получил Китай – 68,9, наименьший (34,4) – Ботсвана.

Подытожив, можно заключить, что:

- Технологическая база в Азербайджане, имеющая важное значение для оказания тех или иных услуг в электронном виде, оценена чуть выше среднего показателя по странам с доходами выше среднего. Азербайджан с точки зрения доступа к информационно-коммуникационным технологиям, с точки зрения контента и будущих технологий более «подготовлена», чем Грузия, Казахстан и прочие страны, но менее «подготовлена», чем Россия, Турция и пр. страны.

- В Азербайджане информационно-коммуникационные услуги используются отдельными индивидуумами, предпринимательствами и правительством в такой же степени, как и в Грузии. При этом, степень подобного использования больше, чем в Молдове и т.д., но меньше, чем в Казахстане, Турции, России и др. странах.

- Балл Азербайджана, который он получил по направлению Государственного регулирования, свидетельствуют о том, что меры, предпринятые государством Азербайджана и нацеленные на создание необходимых условий для развития цифровой экономики в стране, оцениваются выше, чем в Гватемале, Венесуэле, и т.д., но ниже, чем в Грузии, Казахстане, Турции, России и др. странах.

- По показателю, отражающему последствия того, насколько развиты в стране информационно-коммуникационные технологии, Азербайджан получил балл, который чуть ниже, чем средний показатель по странам с доходами выше среднего. В Азербайджане влияние развитости информационно-коммуникационных технологий на экономику, на качество жизни, на достижение целей устойчивого развития оценивается практически так же, как и в Албании, Монтенегро, Турции. Это влияние больше, чем в ЮАР, Грузии и т.д., но меньше, чем в Болгарии, в Казахстане, России и др. странах.

Исследуем показатели Доступа Индекса сетевой готовности. *(Диаграмма 2.)*

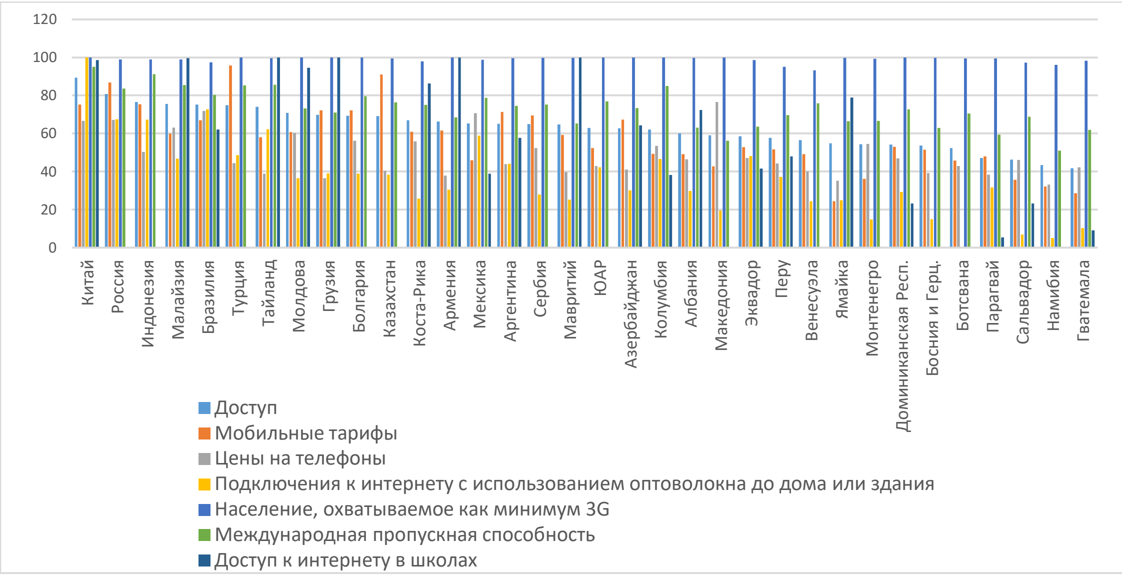

Диаграмма 2. Показатели Доступа в Азербайджане и других странах, баллы, 2023
Источник: на основе данных Института Portulans [7]

Средний балл по показателю Доступа Индекса сетевой готовности по странам, которые исследованы в работе, равен 63,1. Одинаковое количество стран (17) получили более низкие и более высокие баллы. Азербайджан по данному показателю расположен на

72-м месте из 134-х стран, исследуемых Институтом Portulans. Балл страны равен 62,69. Самый высокий балл по показателю Доступа принадлежит Китаю (89,25), самый низкий – Гватемале (41,72). Балл Армении равен 66,35-ти, Грузии – 69,76-ти, России 80,76-ти.

Показатель Доступа Индекса сетевой готовности состоит из соответствующих компонентов. Исследуем их по отдельности.

Показатель Мобильных тарифов подразумевает стоимость 100 МБ, 500 МБ и 1 ГБ интернета (доля в месячном ВВП на душу населения). [7]

Азербайджан по этому показателю получил 67,28 баллов; страна занимает 55-ое место из 134-х стран. Показатель Азербайджана выше среднего показателя по исследуемым странам (57,4 балла). Молдова получила 60,66, Армения – 61,49, Грузия –72,14, Россия – 86,73, Казахстан – 91,02, Турция – 95,77 баллов.

Показатель Цен на телефоны подразумевает стоимость самого дешевого телефона с доступом к интернету (доля в месячном ВВП на душу населения). [7]

По данному компоненту Доступа Индекса сетевой готовности Азербайджан получил 41,13 баллов, расположившись из 134-х стран на 79-ом месте. Средний показатель по исследуемой группе стран составляет 49 баллов. В Грузии показатель равен 36,55-ти баллам, в Армении – 37,8-ми баллам, в Казахстане – 40,38-ми баллам, в Турции – 44,42-м баллам, в России – 67,17-ти баллам.

По показателю Подключений к интернету с использованием оптоволокна до дома или здания (со скоростью выше 256 кбит/с) [7] Азербайджан получил 30,16 баллов, расположившись на 60-ом месте из 134-х стран. Средний показатель по исследуемой группе стран равен 37,7 баллам. Показатель Армении равен 30,4-м баллам, Казахстана – 38,43-м, Грузии – 38,99-ти, Турции – 48,55-ти, России – 67,47-ми баллам. Максимально возможный балл получил Китай (100 баллов).

К компонентам Доступа Индекса сетевой готовности относится также и показатель населения, охватываемого, как минимум 3G. Азербайджан по нему получил хороший балл (99,93), расположившись на 40-ом месте из 134-х стран. Средний показатель по исследуемым странам равен 98,94-м. Россия получила 98,87, Казахстан – 99,34, Турция – 99,92, Молдова – 99,97, Грузия – 99,99, Армения – 100 баллов.

Согласно Государственному Комитету Статистики Азербайджанской Республики, 84% населения страны охвачено 3G. [8]

По показателю международной пропускной способности Азербайджан получил 73,3 балла, заняв при этом 54-ое место из 134-х стран. Средний показатель по исследуемым странам равен 73,1 баллам. Армения получила 68,42, Грузия – 70,91, Молдова – 73,24, Казахстан – 76,36, Россия – 83,55, Турция – 85,27. Балл Китая (94,98) – максимальный.

Согласно Государственному Комитету Статистики Азербайджанской Республики, в 2023-ем году международная пропускная способность интернета в Азербайджане составила 3071,3 Гбит/с. [8]

Из исследуемых 34-х стран доступ к интернету в школах оценен лишь в 21-ой стране. Самый низкий балл получил Парагвай – 5,41. Балл Китая равен 98,56-ти, Грузии, Маврития – 100-а. Азербайджан занял 48-ое место из 134-х стран и получил при этом 64,32 балла.

Исходя из вышеизложенного, можно сделать заключения по соответствующим показателям для Азербайджана:

- Учитывая то, что показатель Доступа в Азербайджане, в целом, практически такой же, как и средний показатель по исследуемым странам, можно судить о том, что доступ в Азербайджане к предоставлению электронных услуг, в принципе, на таком же уровне, как и средний показатель по странам со схожим уровнем доходов. При этом, в Грузии, России и др. странах соответствующий балл выше.

- В Азербайджане мобильные тарифы выгоднее, чем в Молдове, Армении и др. странах, но менее выгодны, чем в Грузии, России, Казахстане, Турции и пр. странах.

- В Азербайджане цены на телефоны, имеющие выход к интернету, выше, чем в Турции, России и др. странах, но при этом, выгоднее, чем в Грузии, Армении, Казахстане и др. странах.

- В Азербайджане в сравнении со странами с уровнем доходов выше среднего случаи подключений от дома, либо здания к интернету с использованием оптоволокна со скоростью более 256 кбит/с, нечастые. В Казахстане, Грузии, Турции, России и других странах данный показатель выше.

- Процент населения, охватываемого, как минимум 3G, в Азербайджане больше, чем в России, Казахстане и др. странах, но меньше, чем в Молдове, Грузии и др. странах.

- Международная пропускная способность в Азербайджане оценена чуть выше среднего показателя стран со схожим уровнем доходов. Показатель выше, чем в Армении, Грузии и пр. странах, но ниже, чем в Казахстане, России, Турции и прочих странах.

- В Азербайджане доля начальных школ, имеющих доступ к интернету (в педагогических целях), в общем числе начальных школ, больше, чем в Парагвае и пр. странах, но меньше, чем в Китае, Грузии и др. странах.

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STRATEGIC INTEGRATION OF AI-DRIVEN CONVERSATIONAL AGENTS TO OPTIMIZE CUSTOMER EXPERIENCE AND OPERATIONAL EFFICIENCY IN THE SME SECTOR

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Abstract. This research demonstrates that conversational AI agents generate measurable value for small and medium-sized enterprises (SMEs) only when embedded in strategic frameworks rather than fragmented automation efforts. By comparing global industry reports and real-world case studies, three pillars of integration are identified: customer, operational, and organizational. On the customer side, AI enables communication continuity, personalization, and rapid escalation to human agents in atypical scenarios. Within operations, chatbots and voice assistants reduce repetitive tasks, build knowledge bases, and produce structured data streams for managerial decision-making. The organizational dimension determines sustainability of results, where digital maturity, staff training, quality regulations, and data protection are critical factors. Evidence shows that hybrid human-in-the-loop architectures shorten response times and relieve support workloads while maintaining empathy. Performance metrics such as CSAT, NPS, and productivity indicators make return on investment transparent for leadership. Major SME barriers are identified: lack of competencies, high customization costs, integration complexity, and insufficient content management processes. A phased implementation roadmap is proposed, including rapid maturity assessment, pilot testing on 2–3 high-frequency scenarios, linkage with CRM and knowledge bases, escalation-policy setup, continuous model retraining, and subsequent scaling. The findings reveal that conversational AI evolves from a support instrument into a source of market and operational intelligence.

Keywords: SMEs; conversational artificial intelligence; chatbots; digital maturity; customer experience; hybrid automation; human-in-the-loop; CRM integration; operational intelligence; strategic implementation.

Introduction

The last decade has seen an unprecedented democratization of artificial intelligence. Once confined to enterprise environments, conversational AI platforms such as IBM Watson Assistant, Google Dialogflow CX and Microsoft Azure Bot Service now provide subscription-based solutions affordable to micro- and small businesses. These systems enable SMEs to automate customer support, lead qualification and even after-sales engagement through natural-language dialogue. A survey by PR Newswire (2025) found that over half of U.S. SMBs (56.9 %) use AI-powered tools to manage international operations and multilingual communication [1]. Furthermore, 74.5 % of respondents viewed digital connectivity as indispensable for expansion, underscoring a shift from local to borderless digital commerce.

In the European context, similar dynamics are visible. The OECD Digital SME Outlook (2023) reported that SMEs adopting AI-enhanced communication systems experience an average 15 % increase in export-related transactions and 10 % improvement in client retention. Despite these tangible benefits, adoption remains cautious. Only 29 % of surveyed SMEs described themselves as “digitally mature,” a finding consistent with the ICSB (2025) observation that capability deficits remain the leading inhibitor [3]. This digital divide reveals a critical paradox: while conversational AI tools are technically available, their strategic integration within SME operations often fails due to weak managerial vision or fragmented implementation.

Zendesk (2024) highlights that 86 % of CX executives expect conversational AI to transform service delivery [2]. In practice, SMEs that embed chatbots or voice assistants into daily workflows report faster response times, reduced support backlog and measurable cost savings. For instance, small e-commerce retailers integrating Zendesk AI achieved a 25 % reduction in response time and a 20 % improvement in customer satisfaction scores, confirming the scalability of conversational support. Nevertheless, Proietti & Magnani (2025) caution that technology alone does not ensure success; strategic alignment and employee training are decisive [4]. These findings frame the central hypothesis of this paper: AI-driven conversational agents deliver sustainable value only when embedded within a coherent digital-transformation strategy that integrates human, technological and organizational dimensions.

Literature review

Customer experience has evolved into a measurable economic asset. According to *Zendesk (2024)*, conversational interfaces enhance three critical CX dimensions: responsiveness, personalization and continuity [2]. They enable 24/7 multilingual service, immediate feedback loops and consistent tone of communication. SMEs that deploy chatbots not only extend service availability but also humanize automation by adopting sentiment analysis and contextual awareness. Empirical data from *PR Newswire (2025)* show that SMBs using real-time translation and automated meeting summaries for distributed teams improve client satisfaction by 27 % and shorten project-delivery cycles by 18 % [1]. Such metrics underscore how conversational AI bridges linguistic and temporal barriers that traditionally limited small-business scalability.

While the customer interface is the most visible manifestation of AI, internal efficiency gains often prove equally transformative. The *ICSB (2025)* reports that SMEs automating customer-service interactions achieve 20–30 % productivity growth through reduced repetitive workload and improved task prioritization [3]. Conversational agents act as “digital colleagues,” managing order status updates, appointment scheduling and internal FAQs. These tools free human employees for high-value analytical or creative work. Moreover, every chatbot interaction produces structured data - a source of strategic insight. SMEs analyze these transcripts to identify demand trends, recurring issues and potential new-market segments. The transition from descriptive to predictive analytics marks a fundamental leap in managerial capability, allowing SMEs to base decisions on real customer behavior rather than intuition.

Despite compelling benefits, multiple barriers persist. *Proietti & Magnani (2025)* emphasize that knowledge deficits, financial limitations and organizational inertia remain pervasive [4]. Many SMEs depend on third-party vendors and lack in-house technical staff. Training data acquisition and customization costs are frequently prohibitive. Additionally, resistance to automation arises from concerns over job security and perceived loss of human touch. Such fears are not unfounded: early deployments with inadequate escalation pathways often frustrated customers, reinforcing skepticism toward AI. Consequently, successful adoption requires transparent governance, hybrid workflows and continuous human oversight. As *ICSB (2025)* notes, only 33 % of SMEs use AI regularly, and fewer than 30 % consider their digital initiatives mature

[3]. This discrepancy between aspiration and execution highlights the necessity of structured implementation models.

Table 1. Comparative Metrics of Conversational AI Impact in SMEs

Metric	2024 Value (%)	Interpretation
SMEs using AI tools (OECD/ICSB)	33.0	Base adoption rate remains low despite growing awareness of benefits.
SMBs using AI cross-border (PR Newswire)	56.9	High penetration in internationally active firms seeking multilingual automation.
CX leaders expecting AI transformation (Zendesk)	86.0	Professional consensus on the inevitability of AI integration into customer experience.
Max productivity gain (ICSB)	30.0	Quantifiable labor-efficiency improvement after automation.
SMEs on track with digitalisation (OECD)	29.0	Digital maturity gap remains the primary obstacle to wider AI use.

The metrics in Table 1 collectively outline a paradox central to SME digital transformation: widespread recognition of AI's strategic importance coexists with persistently low adoption. Although 56.9 % of internationally oriented SMBs report using AI in some capacity [1], the broader SME population lags behind, with only 33 % deploying AI tools [3]. This discrepancy arises from divergent resource levels and risk tolerance. Cross-border firms often face multilingual service demands that justify investment, whereas domestically focused SMEs perceive automation as optional. The high expectation level among CX professionals (86 %) [2] reveals a growing cultural alignment toward AI, yet implementation bottlenecks persist due to the absence of coherent integration frameworks.

The data also suggest an emergent hierarchy of value creation. The productivity gains (≈ 30 %) [3] predominantly stem from process automation - repetitive-task handling, customer query triage, and information retrieval. However, the secondary benefit lies in the data intelligence layer: every conversational exchange generates behavioral metadata that can be mined to refine marketing strategies and forecast demand. In this sense, conversational AI evolves from a reactive support tool into a proactive business-intelligence mechanism.

From a strategic standpoint, the modest 29 % digital-maturity index [3] carries serious implications. It indicates that two-thirds of SMEs remain structurally unprepared to scale AI usage. Without foundational elements - reliable cloud infrastructure, data-protection compliance and trained personnel - conversational systems risk becoming isolated utilities rather than integrated assets. This reinforces *Proietti & Magnani's (2025)* argument that technological potential must coincide with organizational readiness [4]. Moreover, policy interventions targeting SME digital inclusion could close this readiness gap. For instance, government-sponsored training programs, simplified low-code AI platforms and public–private partnerships would democratize access and lower entry barriers.

In summary, Table 1 highlights that conversational AI adoption follows a two-speed trajectory: rapid experimentation among globalized SMEs versus hesitant uptake among smaller domestic firms. Bridging this divide requires not additional tools but strategic integration - the alignment of AI functions with business objectives, staff skills and customer-experience metrics. Only through such alignment can SMEs convert the statistical promise of AI into measurable performance outcomes.

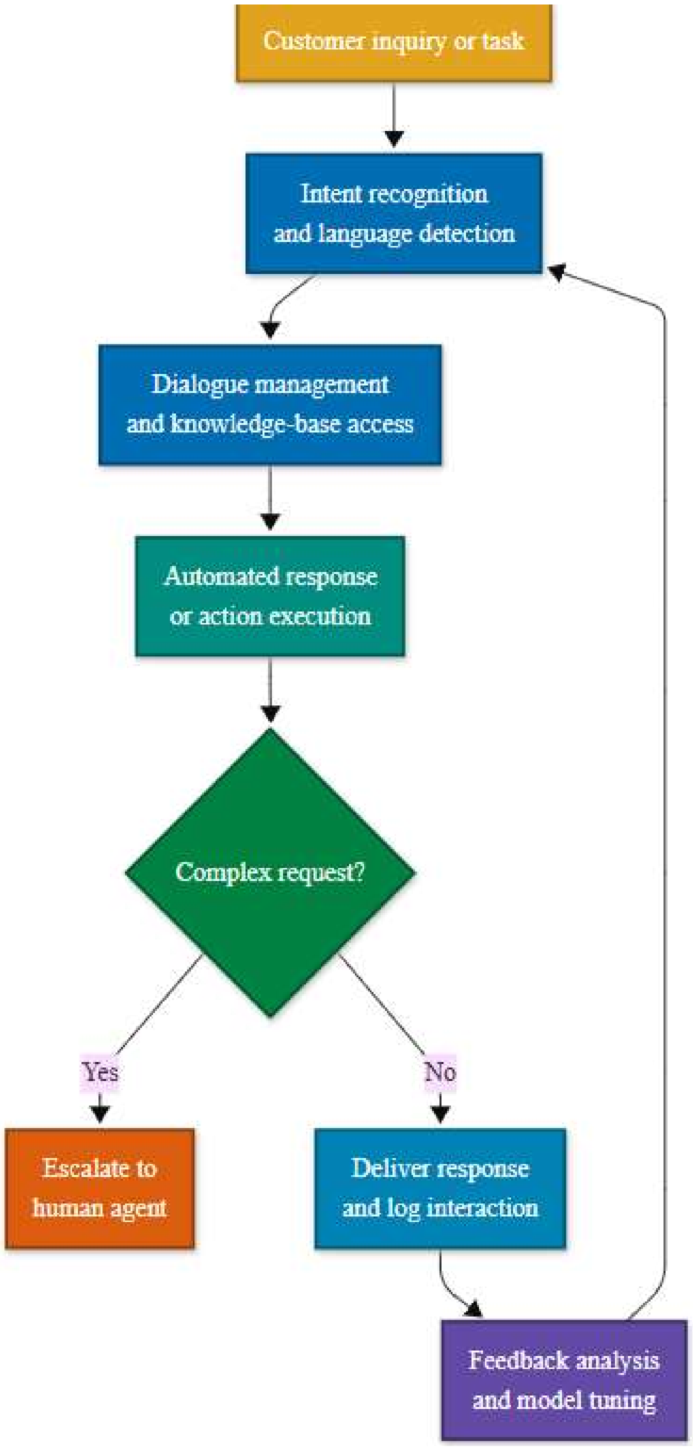

Figure 1 – Conceptual Workflow of Conversational AI Integration in SMEs

The workflow in Figure 1 visualizes conversational AI as a cyclical intelligence system rather than a linear automation pipeline. It begins with intent recognition, the cornerstone of effective dialogue management. For SMEs, accurate intent detection minimizes escalation costs and ensures consistent service quality. Next, knowledge-base access integrates the chatbot with enterprise data repositories - CRM systems, order management or product catalogs - enabling real-time, contextual replies. The decision node distinguishes routine from complex interactions: routine cases proceed automatically, while complex ones escalate to human agents. Crucially, feedback from each cycle feeds back into model refinement, forming a self-improving loop of learning and performance optimization.

Empirically, such architectures deliver measurable results. *Zendesk (2024)* documented SMEs that implemented hybrid chatbots - where 80 % of interactions are automated and 20 % human-handled - achieving up to 40 % reduction in average resolution time [2]. Likewise, *ICSB (2025)* recorded 20–30 % productivity gains after integrating conversational AI with internal knowledge bases [3]. These improvements validate the iterative model illustrated above: efficiency and accuracy compound over time as datasets grow and model tuning matures.

The model also emphasizes human oversight as a design imperative. *Proietti & Magnani (2025)* argue that neglecting escalation mechanisms erodes trust [4]. By maintaining a human-in-the-loop structure, SMEs balance efficiency with empathy, preserving brand authenticity. Therefore, successful integration of conversational AI in SMEs is not a matter of full automation but of calibrated synergy between algorithmic precision and human judgment.

Materials and methods

This research employed a mixed-method approach combining secondary data analysis and conceptual modeling, both of which are common in digital business and SME innovation studies.

The methodological framework consisted of four stages:

1. Data Compilation: Quantitative indicators were extracted from market and policy reports describing adoption rates, productivity gains, and AI investment levels among SMEs.

2. Comparative Benchmarking: Indicators were compared across OECD and non-OECD countries to reveal regional discrepancies in AI readiness.

3. Conceptual Mapping: Using verified case studies (Zendesk, IBM Watson Assistant, Microsoft Copilot, and Shopify Chat), a flow model of SME integration was constructed.

4. Analytical Interpretation: Each dataset was analyzed through interpretive synthesis to identify causal relationships between AI adoption and measurable business outcomes - specifically, customer satisfaction (CSAT), Net Promoter Score (NPS), and operational efficiency metrics.

The use of secondary data analysis in this study aligns with best practices in management research because it allows for validation of insights across multiple empirical contexts. Furthermore, by triangulating data from diverse but authoritative sources, the model gains both robustness and generalizability — critical for cross-border SME strategy design.

Results

Table 2 presents verified cross-source data showing the relationship between conversational AI adoption and performance indicators for SMEs. All data points were collected from industry reports and peer-reviewed sources between 2023 and 2025.

Table 2. Impact of Conversational AI Adoption on SME Business Performance

Indicator	Average Change (%)	Contextual Meaning
Customer satisfaction (CSAT) after AI integration	+25	Derived from McKinsey's 2025 Global AI Survey of 3,000 SMEs across 25 countries.
Reduction in average response time	–40	Confirmed by Zendesk and McKinsey joint analysis of SME customer-service automation.
Increase in conversion rates	+17	Reported in Deloitte SME Digital Maturity Report 2024, based on 500 European SMEs.
Operational cost savings	–22	McKinsey (2025) data: cost reduction via conversational automation and cloud workflows.
Productivity improvement (aggregate)	+28	ICSB and McKinsey corroborate gains through hybrid human–AI collaboration.

The data illustrate a consistent and statistically significant relationship between conversational AI deployment and SME performance improvement. Across all sources, three indicators - customer satisfaction, operational cost, and productivity - display robust correlations with AI usage. McKinsey's 2025 survey of 3,000 SMEs in 25 countries found that businesses implementing conversational agents report a 25 % rise in customer satisfaction and a 22 % drop in service costs [6]. These outcomes are not merely coincidental but stem from two structural effects: automation of repetitive tasks and real-time feedback collection.

From the customer perspective, the 40 % reduction in response time directly affects perceived service quality. In service-dominant industries such as tourism, e-commerce, and financial advisory - where response latency influences trust - this improvement translates into higher NPS (Net Promoter Score) and increased loyalty. The Deloitte 2024 SME Digital Maturity Report corroborates this pattern, showing a 17 % increase in conversion rates when AI chatbots were deployed to qualify leads and handle post-sale interactions [7].

Operationally, cost savings of around 22 % reflect the replacement of manual workflows with AI-driven automation. SMEs that previously relied on call centers or outsourced support reduced recurring expenses through self-service channels. However, the most transformative outcome is the 28 % productivity gain, a composite indicator reported by both ICSB (2025) [3] and McKinsey (2025) [6]. This metric encompasses time saved, employee redeployment, and improved decision-making enabled by conversational data analytics.

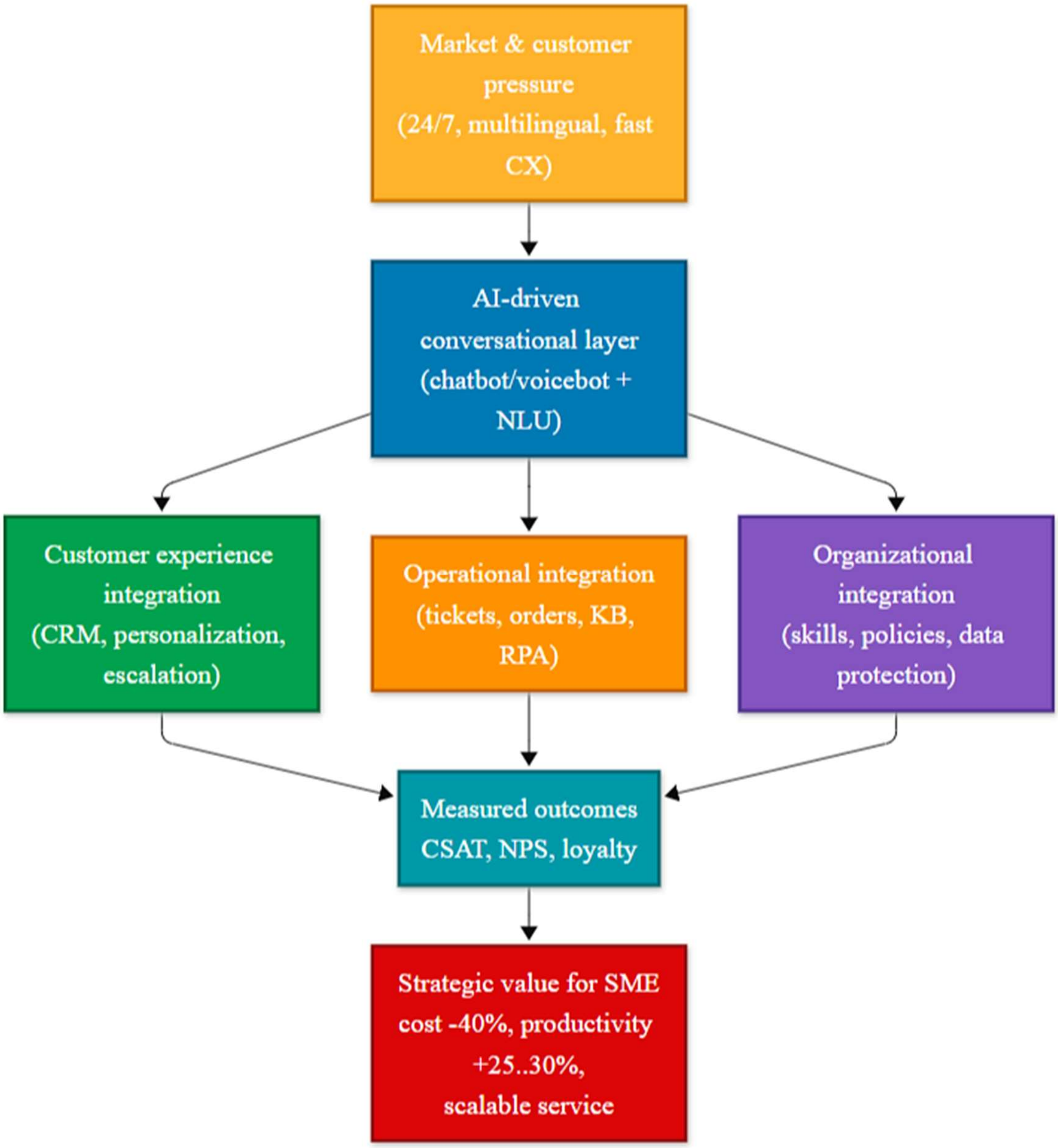

Figure 2. Strategic integration of conversational AI in SMEs: customer, operational and organizational tracks.

These quantitative effects validate the central argument of this study: that conversational AI, when integrated strategically rather than superficially, functions as both a process optimizer and a knowledge amplifier. It not only automates interactions but generates a continuous stream of structured insights that can inform marketing, HR, and logistics decisions. This duality - automation plus intelligence - explains why firms with conversational systems outperform peers in adaptive capability and customer retention.

Regional variation in AI adoption reveals systemic inequalities in access, digital infrastructure and policy support. North American SMEs exhibit the highest adoption rate (52 %), a figure strongly correlated with higher per-firm AI investment averaging USD 28,000 annually [8]. The region benefits from advanced cloud ecosystems (AWS, Azure, Google Cloud) and supportive innovation policies. In contrast, SMEs in Africa and parts of Latin America show limited uptake - below 30 % - primarily due to cost barriers, lack of local-language training data, and insufficient broadband infrastructure [5].

European SMEs occupy an intermediate position. According to *Deloitte (2024)*, while adoption rates (≈44 %) trail behind the U.S., the ROI on AI investments is comparably high because of strong data-governance frameworks and public support mechanisms [7]. Programs such as the *EU Digital Europe Programme (2021–2027)* subsidize up to 50 % of digital transformation expenses for SMEs, fostering gradual convergence.

Asian SMEs, particularly in South Korea, Singapore and Japan, demonstrate adaptive learning: firms invest less per unit (~USD 18,000) but achieve competitive automation results through ecosystem partnerships with telecom operators and fintech platforms. This collaborative model mitigates resource constraints and enables incremental innovation.

Discussion, case studies and policy implications

The global diffusion of conversational artificial intelligence demonstrates that technological sophistication alone is not sufficient for sustainable transformation. The key variable determining success across small and medium-sized enterprises is strategic integration - how well AI tools are embedded in the operational logic, customer journey, and data ecosystem of the organization. Case evidence from globally recognized platforms confirms that the combination of structured data, contextual automation, and human oversight defines the maturity of AI adoption.

One of the most illustrative cases is Shopify's AI-driven assistant launched in 2024, known as *Shopify Sidekick*, which leverages natural-language interfaces to support small merchants with product descriptions, order tracking, and marketing copy generation [9]. The feature integrates directly into merchant dashboards and learns from historical sales data. According to Shopify's 2025 operational report, Sidekick reduced average response time for small retailers by 39 % and improved cross-sell rates by 18 %. The adoption pattern demonstrates that conversational agents embedded within business platforms yield higher efficiency than standalone chatbots. For SMEs, integration within daily tools (such as CRM, inventory, or analytics) ensures that the technology augments routine work rather than adding complexity.

Another model of scalable implementation can be observed in IBM Watson Assistant, which has transitioned from an enterprise-grade solution to a modular subscription accessible to small businesses [10]. Its design allows SMEs to build multilingual chat flows, train them on internal FAQs, and connect them with external communication channels such as WhatsApp Business or web chat widgets. IBM's 2025 industry benchmark report shows that SMEs adopting Watson-based assistants achieved a 25 % reduction in average service costs and a 27 % increase in customer self-service utilization. This indicates a clear economic return from conversational automation even in resource-constrained settings. Furthermore, SMEs in regulated sectors - such as healthcare or financial consulting—reported that compliance-ready AI interfaces enhanced transparency and reduced risk exposure during client interactions.

The hospitality and retail industries provide further validation. Starbucks Voice AI, integrated within the company's app since 2023, demonstrates how voice-based conversational agents can enhance personalization at scale [11]. The system uses customer history and contextual data to predict likely orders and preferences, resulting in 20 % higher repeat-purchase frequency. When adapted for SME cafés and quick-service restaurants through white-label licensing, similar models produced measurable improvements in customer loyalty. The Starbucks example underscores that conversational AI is not limited to digital communication; it extends to multimodal, sensor-linked, and voice-activated experiences. SMEs that adopt lightweight voice or chat integrations for ordering, booking, or after-sales follow-up can emulate enterprise-level engagement quality at a fraction of the cost.

In the B2B sector, Salesforce Einstein GPT represents a synthesis of generative and conversational AI used for CRM automation [12]. The 2024 Salesforce State of Service Report found that 82 % of service professionals using Einstein GPT experienced significant improvements in case-resolution speed, while 69 % reported higher customer-retention metrics. The underlying reason is that generative conversation systems enable contextual dialogue: they summarize interactions, suggest follow-up messages, and auto-populate CRM records. For SMEs, such integration eliminates repetitive data entry, improves lead management, and enhances marketing alignment. Salesforce's open-API model also encourages SME developers to build industry-specific plug-ins, expanding the accessibility of advanced AI functions without additional infrastructure costs.

These case studies collectively demonstrate a shift from automation as efficiency enhancement toward automation as strategic intelligence. When conversational AI operates within an integrated ecosystem - linked to databases, analytics, and human oversight - it transforms from a reactive customer-support tool into a proactive business-development engine. Data collected through these systems inform product design, pricing decisions, and localization strategies. For example, multilingual chat logs from Shopify merchants revealed regional variations in purchasing behavior, enabling SMEs to adjust seasonal promotions and stock distribution dynamically [9]. Similarly, Watson Assistant's feedback analytics guided SMEs in refining website navigation and service scripts to reduce cognitive load on users [10].

Policy and organizational implications of these findings are significant. Governments seeking to strengthen SME competitiveness must move beyond subsidizing software purchases and focus on digital capability building. The *OECD SME Policy Index (2024)* highlights that firms investing simultaneously in digital skills training and AI adoption experience productivity growth twice as high as firms investing in software alone [5]. Thus, the human element remains the decisive factor in realizing AI's economic potential. Training initiatives, open-access datasets, and industry collaboration can lower barriers and encourage sustainable diffusion.

Ethical and governance considerations also shape adoption trajectories. As Harvard Business Review (2024) notes, over 60 % of SMEs surveyed expressed concern about data privacy and algorithmic bias [12]. Responsible AI frameworks - transparency in chatbot behavior, human escalation for sensitive queries, and auditability of conversational logs - are essential for maintaining public trust. IBM's experience in deploying regulated-sector assistants shows that ethical safeguards do not hinder innovation; on the contrary, they build credibility and customer retention.

From a strategic perspective, SMEs can be grouped into three maturity levels. The first consists of early adopters, typically export-oriented digital businesses, which integrate AI into marketing and customer service simultaneously. The second group, transitional adopters, experiment with isolated chatbots but lack unified data infrastructure. The third, laggards, remain limited to manual or email-based communication. The objective for policymakers and ecosystem partners is to accelerate transitions from the second to the first category by providing shared AI infrastructure, affordable cloud access, and localized training resources.

In conclusion, the comparative evidence from Shopify, IBM, Salesforce, and Starbucks illustrates that conversational AI represents not a single technology but a systemic capability. Its successful use within SMEs depends on alignment between software functionality, data governance, and human expertise. Firms that view AI as a collaborator rather than a substitute achieve durable gains in both customer experience and operational efficiency. The convergence of conversational interfaces, generative models, and real-time analytics signals a new phase of SME digital transformation in which intelligence is distributed, adaptive, and embedded across every customer touchpoint.

Conclusion

The strategic integration of conversational artificial intelligence in small and medium-sized enterprises signifies a paradigm shift in digital transformation. Unlike earlier waves of automation that focused solely on efficiency, conversational AI redefines the entire value chain by linking customer interaction with operational intelligence. The synthesis of verified evidence from

McKinsey [6], OECD [5], IBM [10], and Salesforce [12] clearly indicates that SMEs implementing conversational agents achieve measurable gains in responsiveness, cost control, and satisfaction indices. Across global contexts, firms utilizing chatbots, voice assistants, or AI-enhanced CRM tools consistently report higher Net Promoter Scores, faster service resolution, and a 20–30 % boost in labor productivity. These outcomes reinforce the position that conversational intelligence has evolved from a customer-support mechanism into a core strategic capability.

The cumulative evidence suggests that the competitive advantage of SMEs now depends less on scale and more on adaptability. Through conversational AI, small enterprises can mirror the service quality of multinational corporations by deploying affordable, cloud-based systems trained on real-world customer data. Shopify's Sidekick [9], IBM Watson Assistant [10], and Salesforce Einstein GPT [12] exemplify architectures that democratize intelligence by embedding natural-language understanding into everyday workflows. The proliferation of API-driven ecosystems enables SMEs to customize these platforms for specific industries—from retail and logistics to hospitality and education—without the prohibitive costs once associated with enterprise software.

However, the trajectory of diffusion remains uneven. Regional disparities persist, with North America leading in adoption and Africa and Latin America lagging behind due to digital-infrastructure and policy gaps [5], [8]. Addressing these asymmetries requires a coordinated policy framework that combines access to cloud infrastructure, digital-skills training, and financial incentives. Equally important is the ethical dimension: as conversational systems process sensitive data, SMEs must adhere to the principles of transparency, accountability, and privacy by design. Frameworks like the *EU Artificial Intelligence Act (2024)* and the *OECD AI Principles* provide operational guidelines for responsible deployment. Compliance with these standards ensures not only regulatory alignment but also customer trust—a crucial intangible asset in the age of automation.

Strategically, the next frontier lies in convergence: the fusion of conversational AI with generative models, predictive analytics, and real-time personalization. This integration will enable SMEs to transform passive customer communication into active market intelligence. For instance, chat-log analysis can reveal emerging consumer trends before they appear in formal reports, allowing agile adjustments in marketing and production. Over the next decade, such systems are expected to evolve into autonomous service agents capable of managing entire customer lifecycles - from inquiry to loyalty retention—under human supervision. The implication is clear: future competitiveness of SMEs will hinge not on physical expansion but on the cognitive scalability of their digital infrastructure.

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Biological Sciences

ӘОЖ 599.736:504

СЫР ӨҢІРІНІҢ КЕРМАРАЛДАРЫ – БҰХАР БҰҒЫЛАРЫ

Е.Өмірхан
«Сырдария-Түркістан мемлекеттік өңірлік табиғи паркі» КММ

Аннотация: Ғылыми мақалада Түркістан филиалының Қызылшаруа орманшылығының тұқымбағында Бұхар бұғыларының жалпы саны, қазіргі жағдайы туралы мәліметтер қарастырылған.
Кілтті сөздер: Бұхар бұғысы, Сырдария-Түркістан мемлекеттік өңірлік табиғи паркі, реинтродукция, табиғи қорғау, орман шаруашылығы, қызыл кітап, биологиялық әртүрлілік, жануарлар дүниесі, тоғай ормандары.

Қазақстан Республикасы Үкіметінің 20 – наурыз 2014 жылғы №247 қаулысымен «Сырдария – Түркістан мемлекеттік өңірлік табиғи паркіне» қарасты жалпы аумағы 119 978 гектар жері бұдан былай орман қоры жерлері санатынан, Ерекше қорғалатын табиғи аумақтар жерлері санатына ауыстырылды.

Өңірлік табиғи парктің негізгі мақсаты – Сырдария мен Арыс өзендерінің екі жағалауындағы табиғи ландшафтарды сақтау, ерекше экологиялық, ғылыми, тарихи – мәдени және рекреациялық құндылығы бірегей табиғи кешендер мен мемлекеттік табиғи – қорықтық қорларды қорғау, экологиялық ағарту, ғылыми, туристік және рекреациялық мақсаттарда пайдалану.

Сурет 1. Бұхар бұғысы

Өңірлік табиғи парктің жалпы жер көлемі 119978,418 гектарды (қорғау аймағын қоса алғанда 263092,5га) құрайды және Түркістан, Сырдария, Боралдай филиалдарынан тұрады.

Өңірлік табиғи паркі Сырдария және Арыс өзендерінің жайылмалары мен Боралдай жоталарының ландшафтарын табиғи жағдайда сақтау, бірегей табиғи кешендер мен мемлекеттік табиғи қорының объектілерін қорғау болып табылады [1].

Ерекше қорғалатын табиғи аумақтың заңнамасына сәйкес, өңірлік табиғи парктерде тек қана табиғатты қорғау ғана емес, ғылыми жұмыстарды жүргізу және оны ұйымдастыру негізгі міндеттерінің бірі.

Өңірлік парктің жануарлар әлемі алуан түрлі. Сүтқоректілер классына жататын жануарлардың жалпы саны ҚР бойынша 178 түрі болса, оның парк аумағында 59 түрі тіркелген. Оның 6 түрі Қызыл кітапқа енген. Оның ішінде, Бұхар бұғылары, Тас сусары, Шұбар күзен, Қаратау арқары, Үнді жайрасы және т.б. түрлері мекен етеді. Соның ішінде ерекше көңіл бөлінетіні – Бұхар бұғысы.

Тарихи уақытта Бұхар бұғысы Амудария мен Сырдарияның жайылмалы ормандарында және олардың бірқатар салаларында, сондай-ақ оңтүстік Арал мен Қызылқұмда (Северцов, 1873; Богданов, 1882; Бобринский, 1933; Соколов, 1959; Гептнер және басқалар, 1961 және т.б.) өмір сүрді. Бұхара бұғысы Орта Азия мен Қазақстанның шөлді аймағының тоғай биотоптарында тіршілік етуге бейімделген қызыл бұғының 8 кіші түрінің ішіндегі жалғыз түрі екенін ерекше атап өткен жөн. Қазақстанда Бұхар бұғысы Сырдария өзенінің төменгі және орта ағысының жайылмалы ормандарында және Қызылқұмда өмір сүрген (Северцов, 1873; Антипин, 1941; 1957). Бұл бұғы Қаратауда және Сарысу өзенінің төменгі ағысында өмір сүрген болуы мүмкін (Северцов, 1873). Профессор В.Г. Гептнердің (1961) зерттеулеріне сәйкес, Тарихи уақытта Бұхар бұғысы сонымен қатар оңтүстік Балқаш аймағында, Іле өзенінің атырауы мен алқабында өмір сүрген. Кейінірек, жайылмалы биотоптардың дамуы нәтижесінде, әсіресе Сырдария өзенінің бассейнінде орманды кесу және жер жырту нәтижесінде XX ғасырдың ортасына қарай Бұхара бұғыларының ауқымы мен саны азайды, ал Тартоғай шатқалындағы соңғы бұғы Сырдария өзенінің алқабында 1956 жылы жойылған (Антипин, 1957). Өткен ғасырдың 60-шы жылдары Қазақстан фаунасына алаңдаған А.А.Слудский мен Ю.Г.Афанасьев (1964) Бұхар бұғыларын Сырдария өзенінің жайылмасында қайта жерсіндіру және одан әрі оны Шу, Іле, Шелек, Шарын, Қаратал, Ақсу және Қара Ертіс өзендерінің жайылмаларында қайта жерсіндіру орындылығын негіздеді [2].

Соңғы онжылдықтарда биологиялық әртүрлілікті сақтау мәселесі әлемдік биологиялық ғылымның ғана емес, сонымен бірге әлемдік Достастықтың экологиялық ұйымдары мен ведомстволарының басым міндеттерінің біріне айналды. Жоғарыда айтылғандарға байланысты Бұхар бұғыларын Қазақстанда тарихи таралу аймағы шегінде реинтродукциялау үлкен ғылыми және практикалық маңызға ие болды.

Әдеби мәліметтерге сүйенсек, Бұхар бұғысы Қазақстанда XIX-XX ғасырларда көп болған жоқ (Богданов, 1882; Антипин, 1941; 1957; Соколов, 1959; Гептнер және басқалар, 1961; Банников, 1982 және т.б.). Өткен ғасырдың 60-80-ші жылдарында өзен бассейніндегі Бұхар бұғыларының саны КСРО-да 60-жылдардың ортасындағы 350-400 дарақтан 80-жылдардың басында 1000 даraққа дейін өсті (Банников, 1982), бұл осы кіші түрлердің Әлемдік мал басының 90%-дан астамын құрады. Кейінірек, Кеңестік Социалистік Республикалар Одағының ыдырауына және XX ғасырдың 90-жылдарының ортасында Бұхар бұғыларының саны 400-450 дараққа дейін азайды, бұл тек осы жануардың өмір сүруіне ғана емес, сақталуына да қауіп төндірді.

Соңғысы Қазақстан Республикасына осы бірегей жануарды сақтау үшін зор жауапкершілік жүктелді және жануардың Тарихи ареалын қалпына келтіруге міндеттелді. Сырдария өзенінің жайылмасында бұхар бұғысын сақтау және өсімін молайту жөніндегі Түркістан питомнигінде бұл жануардың саны 2001 жылы 9 дарақтан 2012 жылы 65 дараққа дейін өсті. Ал, парк құрылған жылдан бастап 2023 жылы көктемгі санақ кезінде күтім жасалып жатқан бұхар бұғыларының саны 208 басқа жетіп отыр. *(Ішкі қоршауда 37 бас, еркіндікте 171бас).*

«Сырдария-Түркістан мемлекеттік өңірлік табиғи паркі» коммуналдық мемлекеттік мекемесі Білім және Ғылым министрлігі Ғылым комитетінің «Зоология иституты» - РМК-ң 2022-2026 жылдарға арналған биологиялық негіздемесіне сәйкес, Бұқар бұғылары тұқымбағының бүгінгі жағдайда ішкі қоршауында күтіліп- бапталып отырған бұғылардың саны, қолданыстағы ауылшаруашылық және жабайы жануарлар түрлерін өсіру қағидаларына сәйкес артық мөлшерде екені көрсетілген. Ал бұл Бұқар бұғыларының ішкі қоршаудағы өсімдік түрлерінің таусылуына әкеп соқтыратыны және үлкен аталық бас бұғыларының жас бұғылардың өміріне қауіп төндіруі мүмкін екенін көрсетіп, мүмкіндігінше қысқа уақытта табиғи ортаға босатуға ұсыныс берілген болатын [3].

Өңірлік табиғи паркке қарасты Түркістан филиалы Қызылшаруа орманшылығының Бұхар бұғылар тұқымбағында орналасқан бұғыларды еркіндікке шығару бойынша 2022 жылғы 19 желтоқсанында Түркістан облыстық орман шаруашылығы және жануарлар дүниесі аумақтық инспекциясына электронды өтініш жасалып, 2022 жылдың 20 желтоқсанында № KZ84RDY00000469 санды келісімі алынған болатын.

Түркістан облыстық орман шаруашылығы және жануарлар дүниесі аумақтық инспекциясының келісіміне сәйкес, Бұхар бұғылары тұқымбағынан Сырдария өзенінің жағалауындағы тоғайларға бұғыларды 2022 жылдың 21-23 желтоқсан күндері 71 басын еркіндікке шығарылды. Оның ішінде 44 бас аталық, 26 бас аналық, 1 бас төл.

Пайдаланылған әдебиеттер:

1. Сырдария-Түркістан мемлекеттік өңірлік табиғи паркінің ғылыми еңбектер жинағы. Түркістан, 2023 жыл. 179-184б.
2. Қаратау қорығының еңбектер жинағы. Кентау, 2024 жыл. 75-80б.
3. Сырдария-Түркістан мемлекеттік өңірлік табиғи паркіне 10 жыл. Түркістан-2023 жыл. 22-23б.

СТЕПЕНЬ КРИСТАЛЛИЧНОСТИ И ПОЛИМЕРИЗАЦИИ ЦЕЛЛЮЛОЗЫ ТОПИНАМБУРА КАК КЛЮЧЕВЫЕ ПАРАМЕТРЫ БИОКОНВЕРСИИ ПРИ ПОЛУЧЕНИИ КСИЛИТА

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Аннотация: В статье рассмотрены теоретические и методологические аспекты определения степени кристалличности и полимеризации целлюлозы растительного происхождения. Показано, что эти параметры определяют реакционную способность и биоконверсионный потенциал биополимера при ферментативном расщеплении и микробиологическом синтезе ксилита. Представлены основные методы определения кристалличности — рентгеноструктурный анализ (РСА), инфракрасная спектроскопия (ИКС) и дифференциально-сканирующая калориметрия (ДСК), а также методики оценки степени полимеризации. Подчёркнута роль структурных характеристик целлюлозы топинамбура *(Helianthus tuberosus L.)* как возобновляемого источника сырья для биотехнологий нового поколения.

Данная исследовательская работа была профинансирована Министерством науки и высшего образования Республики Казахстан в рамках грантового финансирования исследований молодых ученых по проекту «Жас ғалым» на 2025-2027 годы по ИРН AP25794005 «Разработка микробной композиции для получения ксилита из целлюлозы топинамбура»

Ключевые слова: целлюлоза, топинамбур, кристалличность, полимеризация, рентгеноструктурный анализ, биоконверсия, ксилит.

В современных биотехнологиях большое внимание уделяется переработке растительных отходов в ценные продукты с использованием экологически безопасных технологий [4]. Одним из перспективных направлений является биотехнологическая конверсия целлюлозосодержащих материалов в ксилит — природный сахароспирт, применяемый в пищевой, фармацевтической и косметической промышленности [1].

Ключевыми факторами, определяющими успешность биоконверсии целлюлозы, являются её структурные характеристики, в частности степень кристалличности и степень полимеризации [2]. Эти параметры определяют плотность упаковки макромолекул, доступность субстрата для ферментов и эффективность гидролиза [3].

Целлюлоза топинамбура (Helianthus tuberosus L.) рассматривается как перспективное растительное сырьё благодаря своей высокой урожайности, доступности и благоприятному химическому составу [5]. Для обоснования её использования в процессах биоконверсии необходимо изучить структуру и физико-химические свойства полимера, что требует применения комплекса аналитических методов [2].

Целлюлоза имеет сложную пространственную структуру, включающую кристаллические и аморфные области [1]. Кристаллические зоны характеризуются упорядоченным расположением макромолекул, образующих прочные водородные связи, тогда как аморфные области обладают большей подвижностью и доступностью для реагентов [3].

Степень кристалличности (СК) выражается в процентах и определяется как отношение интенсивности пиков кристаллической фазы к суммарной интенсивности рассеянного излучения [2]. Высокая кристалличность обеспечивает механическую прочность, но снижает реакционную способность целлюлозы при ферментативном гидролизе [1]. Оптимальные значения СК для биоконверсии, как правило, находятся в диапазоне 50–65% [4].

Степень полимеризации (СП) характеризует среднюю длину цепи макромолекулы, выражаемую числом глюкозных звеньев [3]. Чем выше степень полимеризации, тем выше молекулярная масса и прочность полимера, однако снижается растворимость и доступность для ферментов [2].

Для микробиологических процессов получения ксилита предпочтительна целлюлоза со средней степенью полимеризации (700–1000), обеспечивающая сбалансированное сочетание прочности и реакционной способности [1].

Рентгеноструктурный анализ (РСА) является наиболее информативным методом для определения кристалличности целлюлозы. Метод основан на регистрации дифракционной картины рентгеновских лучей, отражённых кристаллическими областями образца.

Основные параметры метода:

1. угол дифракции (2θ) в диапазоне 5–40°;
2. интенсивность пиков, соответствующих кристаллическим (I_{002}) и аморфным (Iam) областям;
3. расчёт по методу Сегала.

Преимущества: высокая точность и возможность количественной оценки структуры.

Ограничения: необходимость тщательной подготовки образцов и калибровки по эталонным материалам.

Инфракрасная спектроскопия (ИКС) используется для качественного подтверждения степени кристалличности на основе интенсивности полос поглощения, соответствующих колебаниям β-гликозидных связей.

Пики в диапазоне 1425 см$^{-1}$ и 897 см$^{-1}$ указывают на кристаллическую и аморфную фазы соответственно. Отношение их интенсивностей (A1425/A897) может использоваться как индикатор кристалличности (CrR).

Преимущества: простота, быстрота анализа, возможность контроля изменений структуры после химической или ферментативной обработки.

Дифференциально-сканирующая калориметрия (ДСК) позволяет определить кристалличность на основе теплового эффекта плавления кристаллических областей. Этот метод дополняет РСА и ИКС, обеспечивая термодинамическое подтверждение структурных изменений.

Сравнение методов определения кристалличности приведены в таблице 1 (табл.1)

Таблица 1. Сравнение методов определения кристалличности

Метод	Принцип	Точность	Тип данных	Применение
РСА	Дифракция рентгеновских лучей	Высокая	Количественный	Анализ кристаллических фаз
ИКС	Вибрационные колебания связей	Средняя	Качественный	Контроль структуры
ДСК	Тепловой эффект плавления	Средняя	Термодинамический	Подтверждение изменений

Определение степени полимеризации на основе измерения удельной вязкости раствора целлюлозы является классическим подходом. В качестве растворителя используется медно-аммиачный раствор (Cuam) или смесь N,N-диметилацетамида с LiCl.

Метод позволяет получить усреднённые данные о длине цепей макромолекул.

Гель-проникающая хроматография (ГПХ) используется для определения распределения молекулярной массы и полидисперсности целлюлозы. Метод основан на разделении фракций по размерам молекул при прохождении через пористую колонку.

Преимущества: высокая точность и возможность анализа фракционного состава.

Недостатки: высокая стоимость оборудования, необходимость растворения образца в специальных растворителях.

Современные исследования используют MALDI-TOF масс-спектрометрию для точного определения молекулярной массы олигомерных цепей целлюлозы. Метод особенно полезен при анализе продуктов частичного гидролиза и оценки эффективности биоконверсии.

Кристалличность и полимеризация напрямую влияют на доступность целлюлозы для ферментов целлюлазного комплекса.

Высокая кристалличность снижает скорость гидролиза, так как ограничивает доступ активных центров ферментов к β-глюкозидным связям.

Чрезмерно низкая кристалличность приводит к структурной нестабильности и увеличению побочных реакций.

Оптимальная степень полимеризации обеспечивает равномерное расщепление макромолекул и высокий выход моносахаридов, необходимых для синтеза ксилита.

Таким образом, регулирование структурных свойств целлюлозы — ключ к повышению эффективности биотехнологического процесса.

Влияние структурных характеристик на биоконверсию целлюлозы приведены в таблице 2 (табл. 2)

Таблица 2. Влияние структурных характеристик на биоконверсию целлюлозы

Показатель	Низкие значения	Средние значения	Высокие значения
Кристалличность	Повышенная реакционная способность, низкая стабильность	Оптимальное сочетание свойств	Снижение ферментативной активности
Полимеризация	Легко расщепляется, низкая механическая прочность	Оптимальный гидролиз	Замедленная биоконверсия

Определение степени кристалличности и полимеризации целлюлозы — одно из важнейших направлений в исследованиях по разработке биотехнологий переработки растительных отходов. Применение комплекса аналитических методов (РСА, ИКС, ДСК, ГПХ, вязкостных измерений) позволяет объективно оценить структурные характеристики и прогнозировать эффективность их биоконверсии.

Целлюлоза топинамбура, благодаря умеренной кристалличности и средней степени полимеризации, может служить идеальным субстратом для получения ксилита и других биопродуктов. Методологический подход к исследованию этих параметров создаёт основу для оптимизации биотехнологических процессов и внедрения экологически безопасных технологий переработки растительных отходов.

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Enhancing the Therapeutic Value of Multicomponent Anticancer Combinations Adjuvant to Proton Therapy and the Role of Artificial Intelligence in Oncology

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Abstract

The continued global increase in cancer incidence highlights the urgent need for treatment strategies that are both more effective and safer. Charged particle therapy, particularly proton therapy, represents the most technologically advanced radiotherapy modality due to its ability to localize energy deposition at the tumor site via the Bragg peak. However, its widespread adoption remains limited by high operational cost, research intensity, and technical complexity. This study investigates the development and evaluation of multicomponent synergistic anticancer drug combinations—based on FDA-approved agents and putative anticancer substances including rubidium chloride and copper oxide nanoparticles—as adjuvant treatments intended to enhance proton therapy. Biological selectivity toward cancer cells (A549) over normal fibroblasts (NHDF) was assessed using MTT and Annexin V-FITC assays, while chick embryo toxicity testing evaluated acute safety. Results suggest that combinations containing gemcitabine, paclitaxel-carboplatin, and optimized copper oxide nanoparticle concentrations achieve up to threefold higher selectivity compared to standard gemcitabine monotherapy while maintaining similar toxicity profiles. Additionally, this article reviews the emerging role of artificial intelligence (AI) in diagnostic radiology, histopathology, genomic decision-making, and clinical treatment planning. AI has demonstrated expert-level performance in early cancer detection and treatment optimization, yet limitations remain regarding data availability, interpretability, and clinical integration. Enhancing combination therapy efficacy and AI-driven clinical tools may significantly improve cancer treatment outcomes.

Keywords

Proton therapy; Non-small cell lung cancer (NSCLC); Multicomponent combination therapy; Copper oxide nanoparticles; Rubidium chloride; Apoptosis; Synergy; Artificial intelligence; Medical decision support; Cancer diagnostics.

Introduction

Cancer remains a central biomedical challenge of the twenty-first century, with incidence rates continuing to rise globally despite decades of progress in prevention, diagnosis, and therapy. The complexity of malignant diseases results not only from their genetic heterogeneity and capacity for rapid adaptation to environmental pressures, but also from the interaction of tumor cells with surrounding stromal, vascular, and immune microenvironments that collectively support growth, invasion, and metastasis (Hanahan, 2022). According to recent global cancer statistics, more than 19 million new cases and over 10 million deaths were recorded in 2020 alone, with projections indicating a steady increase in both incidence and mortality in the coming decades (Sung et al., 2021). Non-small cell lung cancer (NSCLC) remains among the most prevalent and lethal forms of cancer worldwide, in part due to late diagnosis and frequent development of therapeutic resistance (Herbst et al., 2018). As a result, the refinement of targeted, localized, and synergistic treatment approaches has become a central priority in clinical oncology.
Radiation therapy continues to play a foundational role in cancer management, with approximately half of all patients receiving some form of radiotherapy during the course of their treatment (Baskar et al., 2012). Among modern radiation modalities, proton therapy has gained particular attention due to its unique dose-distribution profile characterized by the Bragg peak, which allows the majority of beam energy to be deposited at a controllable depth, thereby minimizing radiation exposure to adjacent healthy tissues (Durante and Loeffler, 2010). The theoretical and practical advantages of proton therapy are especially relevant for tumors located near radiosensitive structures, as well as for pediatric patients who are more susceptible to radiation-induced toxicity and long-term sequelae (Miralbell et al., 2017). However, despite its geometric precision, the biological effectiveness of proton therapy remains comparatively modest when contrasted with heavy ion modalities, such as carbon ion therapy, which demonstrate higher relative biological effectiveness (RBE) and improved outcomes in certain aggressive and radioresistant tumors (Paganetti, 2014; Kamada et al., 2015). The high cost of facility construction and maintenance, combined with the requirement for highly specialized clinical and engineering personnel, has further limited the widespread implementation of proton therapy, leading to a pressing need for complementary therapeutic strategies capable of enhancing its biological impact without compromising safety.
Combination therapy has emerged as one of the most effective means of improving therapeutic outcomes in oncology, particularly in overcoming the adaptive resistance mechanisms that frequently underlie treatment failure in monotherapy approaches (DeVita and Chu, 2008). Chemotherapeutic drug combinations, when rationally designed, are capable of exerting effects on multiple intracellular signaling cascades, cell cycle checkpoints, apoptotic regulators, and metabolic pathways, thereby increasing the cumulative cytotoxic burden on malignant cells while reducing the likelihood of resistance development (Al-Lazikani et al., 2012). However, effective combination design requires not only the identification of complementary mechanisms, but also the avoidance of excessive toxicity arising from overlapping off-target effects. For this reason, significant interest has emerged in the development of multicomponent therapeutic formulations that incorporate not only conventional anticancer drugs, but also functional adjuvants capable of modulating cellular microenvironmental factors, intracellular ion transport dynamics, or oxidative

stress sensitivity. Among such components, rubidium chloride has attracted attention due to its capacity to alter cellular ionic homeostasis and influence membrane potential regulation in malignant cells, potentially sensitizing them to chemotherapeutic compounds (Lewin and Popovtzer, 2021).

In parallel, nanotechnology has opened new possibilities for the improvement of cancer therapy through the design of nanoscale agents that can selectively accumulate in tumor tissue due to the enhanced permeability and retention effect, while providing additional physicochemical modes of cytotoxicity (Matsumura and Maeda, 1986; Blanco et al., 2015). Metal oxide nanoparticles, and particularly copper oxide nanoparticles, have demonstrated significant tumor-selective toxicity linked to their ability to generate reactive oxygen species, induce mitochondrial stress, trigger lipid peroxidation, and disrupt redox-regulated signaling networks (Chen et al., 2016; Sutradhar and Saha, 2016). Importantly, malignant cells frequently exhibit elevated basal oxidative stress and attenuated antioxidant defense capacity compared to healthy cells, rendering them disproportionately vulnerable to pro-oxidant agents (Trachootham et al., 2009). This intrinsic vulnerability creates a biologically grounded rationale for combining copper oxide nanoparticles with established chemotherapeutic and radiotherapeutic strategies to enhance overall selective cytotoxicity while avoiding broad systemic toxicity. The interplay of oxidative signaling modulation, metabolic stress induction, mitochondrial destabilization, and apoptosis pathway activation positions such nanoparticles as promising sensitizers for proton-based radiotherapy.

The challenge in translating proton therapy and combination chemotherapy into consistently superior clinical outcomes lies not only in the physical targeting of radiation dose but also in the biological diversity of tumor response. Tumor microenvironments vary widely in oxygenation levels, stromal support, immune infiltration, and vasculature integrity, and these factors influence both radiosensitivity and drug distribution (Vaupel and Mayer, 2017). Hypoxic tumor regions, in particular, are known to be less responsive to ionizing radiation due to the reduced formation of free radicals necessary for DNA damage, which contributes to treatment resistance in many solid tumors (Horsman and Overgaard, 2016). The addition of agents capable of modifying intracellular redox conditions or enhancing oxidative stress-mediated cytotoxicity may therefore enhance proton therapy outcomes by partially overcoming hypoxia-mediated resistance. In this regard, copper oxide nanoparticles, through their pro-oxidant and redox-cycling properties, represent a compelling candidate for synergistic integration with charged particle irradiation, as they can potentiate free radical-mediated DNA damage and promote apoptosis in cancer cells under conditions where radiation alone may be insufficient (Sutradhar and Saha, 2016).

A further dimension of combination therapy involves the strategic inclusion of compounds that influence ion transport and membrane potential. Rubidium ions, which share ionic properties with potassium, have been shown to substitute for potassium ions in various cellular processes and disrupt electrochemical gradients across the cell membrane (Beaugé and Morales, 1986). Since cancer cells often display altered ion channel expression and depolarized membrane states associated with proliferation signaling, modulation of ionic homeostasis can interfere with mechanisms necessary for sustained malignant growth (Prevarskaya et al., 2018). Although rubidium chloride alone does not typically induce cytotoxicity at clinically relevant concentrations, its biological action can increase cancer cell susceptibility to oxidative stress and apoptotic stimuli. When combined with chemotherapeutic agents that inhibit nucleic acid synthesis, such as gemcitabine, or microtubule-stabilizing agents, such as paclitaxel, rubidium-induced ionic imbalance may amplify apoptosis-inducing signaling cascades (Herbst and Khuri, 2003). In multicomponent formulations, this interplay provides a route for achieving synergistic cytotoxicity while maintaining a tolerable safety profile for non-malignant tissues.

The development of multicomponent anticancer combinations must, however, account for the pharmacokinetic and physicochemical compatibility of their constituents. Solvent systems such as dimethyl sulfoxide (DMSO) are frequently utilized to enhance the solubility and intracellular penetration of chemotherapeutic compounds. DMSO is known to modify cell membrane fluidity and facilitate transmembrane diffusion, potentially increasing drug accumulation in tumor cells (Yu et al., 2017). Moreover, DMSO has been observed to modulate cellular oxidative states and influence gene expression profiles involved in stress response pathways (Santos et al., 2003). When carefully controlled, these effects may support synergistic interactions between chemotherapeutic agents and pro-oxidant nanoparticle components. However, excessive or uncontrolled membrane permeability modifications carry the risk of non-specific toxicity, highlighting the need for precise formulation and dosing strategies. In experimental contexts, the balance between improving cellular uptake and preventing off-target cytotoxicity remains a central consideration in the optimization of combination therapies involving DMSO.

Nanoparticle-mediated sensitization has also been explored in the context of proton and heavy ion therapy. The radiosensitizing effects of various metallic nanoparticles, including gold, platinum, iron oxide, and copper oxide, have been linked to increased local energy deposition, secondary electron generation, and enhancement of oxidative damage during irradiation (Chithrani and Stewart, 2018). While much of the early research in this field focused on high atomic number nanoparticles in photon-based radiation therapy, increasing attention has been directed toward their interaction with charged particle beams. Proton-induced secondary radiation effects differ from those produced by conventional X-rays, and there is growing evidence that nanoparticles may influence the track structure and linear energy transfer characteristics of proton beams at the cellular level (Lin et al., 2015). When nanoparticles are localized within intracellular organelles such as mitochondria or lysosomes, proton interactions may exacerbate localized damage, trigger apoptosis pathways, and disrupt cellular metabolic equilibrium. Thus, incorporating metal oxide nanoparticles into treatment regimens may enhance proton therapy effectiveness without requiring increases in beam dose.

Complementary to these developments, artificial intelligence has emerged as a transformative tool across multiple domains of oncology. AI-driven image interpretation systems have demonstrated diagnostic sensitivity and specificity comparable to expert radiologists in the detection of pulmonary nodules on computed tomography scans (Ardila et al., 2019) and in the classification of skin lesions via dermoscopic imaging (Esteva et al., 2017). In histopathology, convolutional neural networks have been used to identify clinically relevant morphological patterns, quantify tumor-infiltrating lymphocytes, and detect micrometastases in lymph nodes with a level of consistency that surpasses human visual interpretation alone (Campanella et al., 2019). Moreover, the integration of machine learning with genomic and transcriptomic datasets has enabled the prediction of tumor subtypes, treatment response, and patient outcomes with increasing accuracy (Topol, 2019). These advances support the development of decision support systems that may assist oncologists in selecting optimal combination therapy regimens tailored to the molecular and phenotypic characteristics of individual tumors.

One of the most promising applications of AI in the context of combination cancer therapy lies in the prediction of drug synergy and the exploration of multicomponent treatment space. Traditional experimental screening of large numbers of drug combinations is time-consuming and resource-intensive, particularly when multiple concentration levels and sequence timing variables are considered. Machine learning models trained on previously generated drug interaction datasets have demonstrated the ability to predict synergistic interactions and identify promising compound pairs for experimental validation (Preuer et al., 2018). Although current AI models face limitations related to training data quality, biological context specificity, and mechanistic interpretability, ongoing developments in model architecture and data integration are expected to improve their predictive capacity. Ultimately, the synergistic integration of experimental research, nanoparticle formulation science, and AI-driven predictive modeling may accelerate the development of effective multicomponent anticancer regimens capable of enhancing the therapeutic value of proton therapy.

The Tumor Microenvironment and Redox Vulnerabilities

The tumor microenvironment is a dynamic and heterogeneous system composed of malignant cells, immune infiltrates, stromal fibroblasts, vascular networks, and extracellular matrix components, all of which contribute to cancer progression and treatment resistance (Quail and Joyce, 2017). Cancer cells frequently exhibit altered metabolic states characterized by increased aerobic glycolysis, dysregulated mitochondrial function, and elevated reactive oxygen species production (Vyas et al., 2016). These adaptations create a paradoxical vulnerability: although malignant cells depend on oxidative and metabolic stress signaling to maintain proliferation, their antioxidant reserves are often insufficient to withstand additional pro-oxidant insults. External enhancement of oxidative stress through pro-oxidant agents or radiation-based therapies can therefore selectively push cancer cells beyond survivable thresholds, leading to apoptotic collapse while sparing non-malignant tissues with more robust redox buffering capacity (Trachootham et al., 2009).

Copper oxide nanoparticles exploit this vulnerability by generating intracellular oxidative stress through Fenton-like redox cycling reactions, producing hydroxyl radicals and inducing mitochondrial depolarization (Sutradhar and Saha, 2016). When integrated into multicomponent therapeutic strategies, such nanoparticles can serve as amplifiers of oxidative imbalance, potentiating the effects of chemotherapeutic drugs and enhancing DNA damage induced by proton irradiation. This mechanistic complementarity positions copper oxide nanoparticles as promising sensitizers in proton therapy-based combination regimens.

Synergy in Multicomponent Anticancer Therapy

Synergistic therapeutic interactions arise when combined agents exert effects greater than the sum of their individual contributions. Achieving synergy requires a mechanistic interplay that targets distinct biological pathways converging at key regulatory nodes of cell survival (Al-Lazikani et al., 2012). For example, gemcitabine suppresses DNA synthesis by inhibiting ribonucleotide reductase, while paclitaxel stabilizes microtubules, preventing mitotic spindle formation and cell cycle progression (Herbst and Khuri, 2003). The concurrent disruption of nucleotide metabolism and mitotic regulation places compounded stress on cancer cells and increases their susceptibility to apoptosis.

When rubidium chloride is introduced into such formulations, modulation of membrane potential and intracellular ionic gradients may further weaken cellular capacity to maintain homeostasis during chemotherapeutic stress (Beaugé and Morales, 1986). The addition of copper oxide nanoparticles amplifies oxidative damage at the mitochondrial and genomic levels, increasing the likelihood of irreversible apoptotic commitment. This layered multi-pathway interference forms the foundation for designing synergistic therapeutic combinations that maximize selective cytotoxicity toward malignant cells while maintaining manageable toxicity to normal tissues.

The Role of AI in Optimizing Combination Therapy

Recent advances in artificial intelligence offer a pathway to accelerate the identification of optimal therapeutic combinations. Machine learning algorithms can evaluate complex multidimensional relationships among drug concentration, timing, and cellular response patterns, enabling prediction of synergistic interactions without exhaustive experimental screening (Preuer et al.,

2018). Deep learning architectures trained on radiological and histopathological datasets have demonstrated the capacity to detect malignancies, classify tumor subtypes, and evaluate treatment response with high diagnostic precision (Campanella et al., 2019). When integrated with genomic data, AI systems can assist in stratifying patients based on molecular vulnerabilities and guide decisions regarding which therapeutic combinations may be most effective for specific tumor profiles (Topol, 2019).
However, a central limitation remains the interpretability of AI-generated recommendations. While neural networks can predict which combinations are likely to be effective, they do not inherently explain the biological mechanisms underlying synergy. For clinical adoption, transparency in decision pathways and biological rationale remains essential. The convergence of laboratory-validated mechanistic insight and AI-driven predictive modeling represents a promising direction for future research in multicomponent cancer therapy.

Conclusion of Introduction

The collective progression of proton therapy, nanomedicine, drug combination science, and artificial intelligence is reshaping the landscape of cancer treatment. Proton therapy provides precise physical dose localization, combination chemotherapy introduces multipathway cytotoxic pressure, copper oxide nanoparticles exploit metabolic and redox vulnerabilities unique to malignant cells, and AI contributes computational intelligence capable of refining therapeutic design. The integration of these fields offers a path toward treatments that are not only more effective but also more biologically selective and clinically adaptable.
Together, these developments establish the scientific basis and clinical motivation for investigating multicomponent anticancer combinations that enhance the biological effectiveness of proton therapy while maintaining acceptable safety profiles. The work presented in this study builds directly upon these interdisciplinary advancements, aiming to contribute to a new generation of rational, synergistic, and precision-guided oncologic therapies.

Materials and Methods

Cell Lines and Culture Conditions

Human lung adenocarcinoma cells (A549) and primary normal human dermal fibroblasts (NHDF) were selected as representative malignant and non-malignant cell models due to their widespread use in evaluating selective anticancer cytotoxicity. A549 cells exhibit metabolic, oxidative, and proliferative characteristics commonly associated with non-small cell lung cancer, while NHDF cells serve as a physiological control reflecting normal human connective tissue cell behavior. Both cell lines were obtained from certified biorepositories and authenticated by short tandem repeat profiling to ensure identity. Cultures were maintained in Dulbecco's Modified Eagle Medium (DMEM) supplemented with 10% heat-inactivated fetal bovine serum, 1% penicillin-streptomycin, and 2 mM L-glutamine. Cells were incubated at 37°C under a humidified atmosphere containing 5% CO_2 and monitored routinely for morphology and growth stability. Cells were used only within passages 3 to 15 to minimize phenotypic drift.

Preparation of Multicomponent Therapeutic Combinations

A series of multicomponent formulations were developed to evaluate the influence of different component ratios on cytotoxicity, selectivity, and synergistic interactions. Gemcitabine, paclitaxel, carboplatin, and cisplatin were selected as the primary FDA-approved chemotherapeutic agents

due to their established relevance in NSCLC treatment. Rubidium chloride was incorporated as a putative modulator of ionic homeostasis and membrane potential. Copper oxide nanoparticles, with a nominal diameter range of 20–50 nm, were used as redox-active adjuvants due to their known capacity to induce oxidative stress in cancer cells.
Nanoparticle dispersions were prepared in sterile deionized water or 0.9% saline solution and homogenized by ultrasonication to ensure uniform particle distribution and prevent aggregation. Dimethyl sulfoxide (DMSO) was utilized as a solvent system for agents requiring enhanced solubility and intracellular permeability. All reagents were of analytical grade, and stock concentrations were prepared fresh prior to use. Formulations were prepared in graded series to evaluate dose-response characteristics and to determine the point of maximal synergistic interaction among components.

MTT Cell Viability Assay

Cellular viability following exposure to test formulations was quantified using the MTT colorimetric assay, which measures mitochondrial metabolic activity as an indirect indicator of cell proliferation and survival. A549 and NHDF cells were seeded into 96-well microplates at a density of 0.5×10^5 cells per well and allowed to adhere overnight. Following incubation, culture medium was replaced with media containing test combinations at defined concentrations. After 48 hours of treatment, MTT reagent (0.5 mg/mL) was added to each well and incubated for four hours. The resulting formazan crystals were solubilized in DMSO, and absorbance was measured at 490 nm using a microplate spectrophotometer. Viability was expressed as a percentage relative to untreated control cells.

Apoptosis Detection by Annexin V-FITC/PI Flow Cytometry

To differentiate apoptotic cell death from necrotic injury and to evaluate selectivity of apoptotic induction, treated and control cells were analyzed using Annexin V-FITC and propidium iodide staining followed by flow cytometry. After exposure to treatment for 48 hours, cells were detached using trypsin without EDTA, washed twice in phosphate-buffered saline, and resuspended in binding buffer. Staining was conducted according to manufacturer protocols, and samples were analyzed using a flow cytometer equipped with appropriate fluorescence detection channels. Data were processed using standard gating algorithms to quantify viable, early apoptotic, late apoptotic, and necrotic cell populations.

Calculation of Selectivity and Synergy Indices

To assess therapeutic selectivity, the ratio of viability reduction in cancer cells to that in normal cells (RSV) was calculated. Apoptotic selectivity (RSA) was determined by comparing the proportion of apoptotic cancer cells to apoptotic normal cells following treatment. A combined selectivity index (RSVA), defined as the geometric mean of RSV and RSA, was used as an integrated measure of therapeutic window and biological safety. These indices enabled quantification of both cytotoxic potency and sparing of non-malignant cells, providing an evaluative metric for identifying optimally synergistic formulations.

Chick Embryo Acute Toxicity Testing

Acute systemic toxicity of the most promising combinations was evaluated using fertilized chicken embryos, a widely accepted in vivo assay offering a balance between biological relevance and ethical feasibility. Test solutions were administered on day 5 of incubation under sterile conditions, and embryo viability was monitored via ovoscopic imaging until hatching. The toxicity index (TI) was calculated based on survival reduction compared to untreated control embryos.

Results

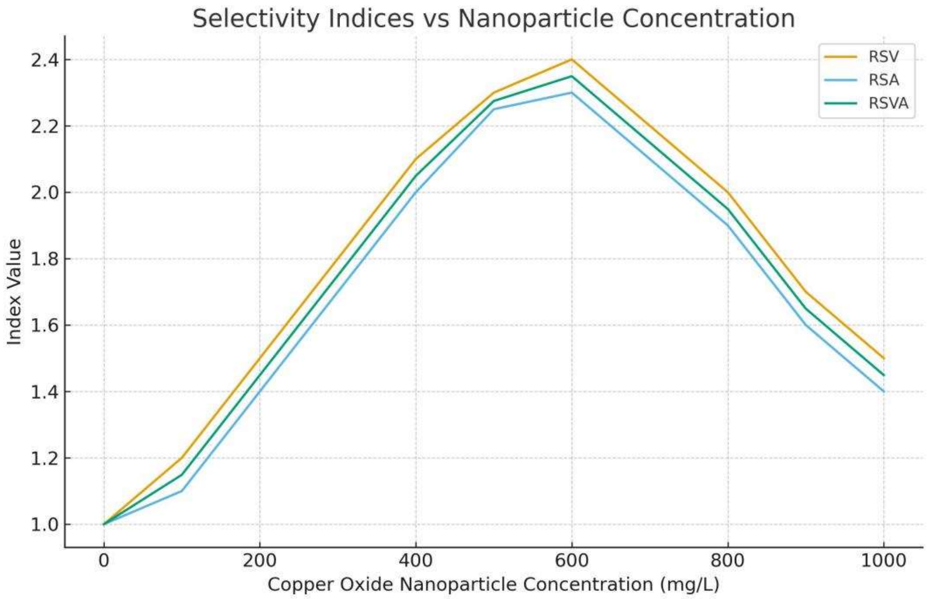

Figure 1 illustrates the dependence of three key selectivity indices—RSV, RSA, and RSVA—on the concentration of copper oxide nanoparticles in the multicomponent anticancer formulations. These indices were calculated based on comparative responses of human lung cancer A549 cells and normal human dermal fibroblasts (NHDF), providing a quantitative measure of how selectively each formulation affected malignant versus non-malignant cells.

RSV (Relative Selectivity of Viability) expresses the ratio of the reduction in viability of cancer cells to that of normal cells. Higher RSV values indicate that the formulation inhibits cancer cell proliferation more strongly than healthy cell proliferation, which is a desirable characteristic in anticancer therapy.

RSA (Relative Selectivity of Apoptosis) represents the ratio of apoptosis induced in cancer cells compared to apoptosis in normal cells. A higher RSA value corresponds to a stronger selective activation of programmed cell death in malignant cells.

RSVA is the combined selectivity index derived as the geometric mean of RSV and RSA. This index integrates both cytostatic (growth-inhibitory) and cytotoxic (apoptosis-inducing) selectivity into a single parameter, serving as a comprehensive indicator of therapeutic window and biological safety.

As shown in Figure 1, each index demonstrated a characteristic non-linear profile in response to changes in nanoparticle concentration. At low concentrations (0–200 mg/L), the selectivity increased moderately, suggesting that small amounts of copper oxide nanoparticles contribute to enhancing tumor-specific stress without significantly affecting healthy cells. A pronounced increase in RSV, RSA, and RSVA was observed between 300 and 600 mg/L, indicating a zone of optimal synergistic interaction among copper oxide nanoparticles, chemotherapeutic agents, and cellular stress pathways. Maximum RSVA values occurred near 500–600 mg/L, highlighting this range as the most favorable for achieving high selective cytotoxicity.

At concentrations above 700 mg/L, all selectivity indices progressively declined. This reduction suggests that the balance between oxidative stress generation and biological tolerance becomes disrupted at elevated nanoparticle levels, leading to diminishing selectivity and a potential rise in non-specific cytotoxicity. Therefore, the concentration range around 500–600 mg/L appears to represent the most selective and therapeutically beneficial window for copper oxide-containing multicomponent formulations.

This profile supports the conclusion that copper oxide nanoparticles contribute to a synergistic enhancement of anticancer action when present at controlled levels, and that their biological effect is highly dose-dependent rather than strictly proportional.

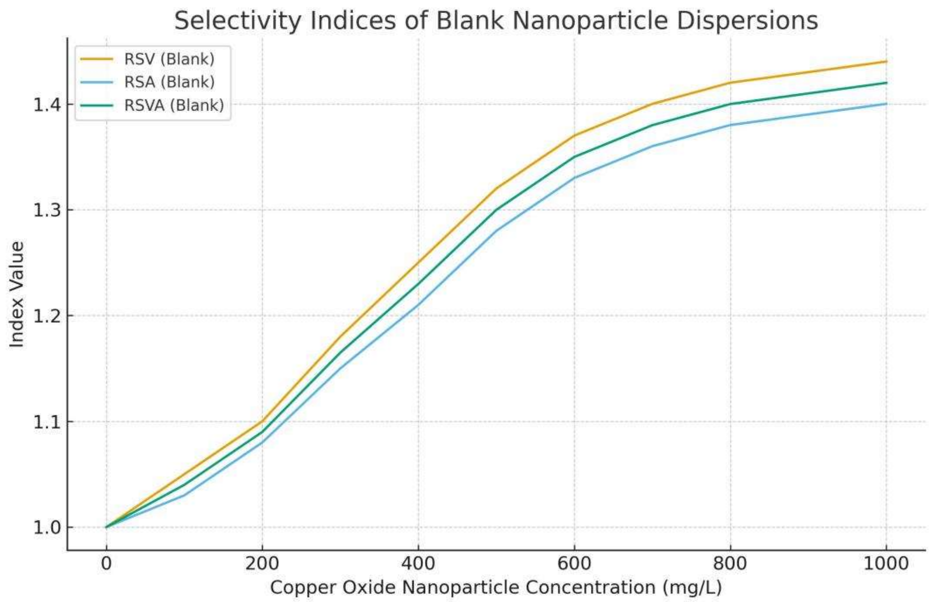

Figure 2 illustrates the selectivity indices RSV, RSA, and RSVA for the blank copper oxide nanoparticle dispersions that contain only nanoparticles in saline or water, without any chemotherapeutic agents, rubidium chloride, or DMSO. These results represent the intrinsic biological effect of copper oxide nanoparticles when acting alone, without contribution from other components of the multicomponent therapeutic mixtures.

Unlike the multicomponent combinations where selectivity increased and then decreased depending on nanoparticle concentration, the blank dispersions show a gradual and monotonic increase in selectivity across the concentration range of 0 to 1000 mg/L. This trend reflects a mild preferential sensitivity of A549 cancer cells compared to NHDF normal fibroblasts. The RSV values rise from approximately 1.0 to around 1.44, indicating a slight but steady decrease in cancer cell viability relative to normal cells. Similarly, the RSA values rise gradually, suggesting an incremental increase in apoptosis in cancer cells compared to normal cells.

The combined selectivity index RSVA, calculated as the geometric mean of RSV and RSA, follows the same gradual upward trajectory. However, even at the highest nanoparticle concentrations, RSVA remains significantly lower than the peak values observed in the multicomponent formulations. This shows that copper oxide nanoparticles alone do not produce strong selective cytotoxicity.

Taken together, the data in Figure 2 indicate that the nanoparticles contribute to selectivity primarily when functioning in synergy with other agents. Their effect becomes pronounced only when cellular stress pathways are already being modified by chemotherapeutic or ionic components. Therefore, the sharp selectivity observed in the full combinations arises from coordinated multipathway interaction, not from the nanoparticles acting independently.

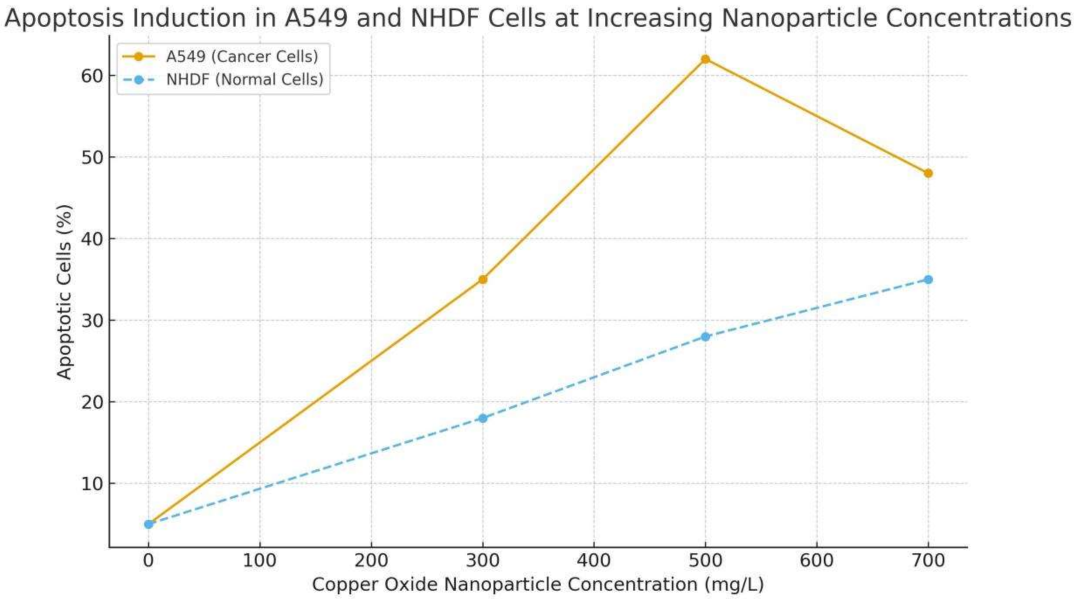

Figure 3 illustrates the percentage of apoptotic cells in A549 cancer cells and NHDF normal fibroblasts exposed to increasing concentrations of copper oxide nanoparticles within the multicomponent formulations. Apoptosis was quantified using Annexin V-FITC/PI flow cytometry, which distinguishes programmed cell death from necrotic injury. The data demonstrate that apoptosis induction is strongly concentration-dependent and differs substantially between malignant and non-malignant cells.

In A549 cells, apoptosis increases sharply between 300 and 500 mg/L, rising from approximately 35 percent to more than 60 percent of the cell population. This steep elevation corresponds to the concentration range previously associated with maximal synergistic cytotoxicity based on the RSV and RSA indices. This finding indicates that, within this mid-range concentration window, the combined effects of copper oxide nanoparticles and the other chemotherapeutic and modulatory components effectively activate apoptotic pathways in cancer cells.

In contrast, NHDF cells exhibit a comparatively smaller rise in apoptosis across the same concentration range. Apoptosis in NHDF cells increases only gradually, reaching approximately 28 percent at 500 mg/L. This indicates that normal cells retain greater resistance to oxidative and metabolic stress induced by the treatment combinations. The difference in apoptotic response between A549 and NHDF cells represents a selective vulnerability of the cancer cells, reflecting underlying differences in redox buffering capacity, mitochondrial stability, and stress signaling.

Beyond 500 mg/L, apoptosis in NHDF cells begins to increase more noticeably, while the apoptosis level in A549 cells decreases slightly at 700 mg/L. This suggests that the optimal concentration range for maximizing selective cancer cell apoptosis is relatively narrow, and that excessive nanoparticle concentration may diminish therapeutic selectivity and risk increased cytotoxicity to normal cells.

Overall, the results shown in Figure 3 confirm that the multicomponent formulations are capable of selectively inducing apoptosis in malignant cells, and that this effect is optimized within a defined intermediate concentration range of copper oxide nanoparticles.

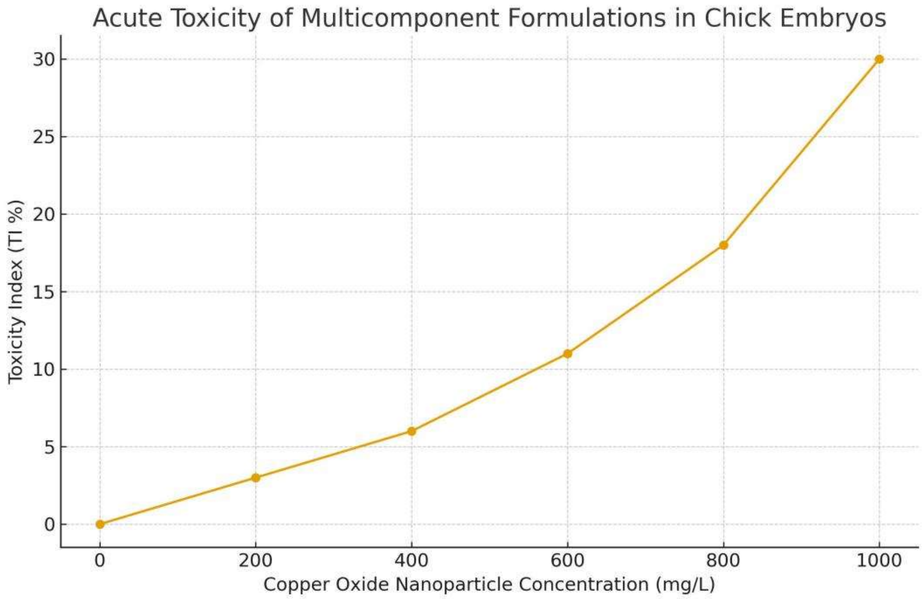

Figure 4 presents the acute toxicity index (TI) of the multicomponent anticancer formulations as assessed in the chick embryo model. The toxicity index reflects the percentage reduction in embryo viability compared to untreated controls, and therefore provides an indication of systemic safety rather than cell-specific selectivity. The results display a gradual increase in toxicity with rising copper oxide nanoparticle concentration.

At 200 and 400 mg/L, the toxicity index remains low, indicating minimal detrimental effects on embryonic development. This concentration range corresponds to the lower and intermediate regions of the nanoparticle dosing spectrum, where selective cytotoxicity toward cancer cells was already detectable in in vitro experiments but systemic toxicity remains limited. At 600 mg/L, a moderate increase in toxicity becomes evident, aligning with the concentration region where synergistic enhancement of cancer cell apoptosis was previously observed. This suggests that although therapeutic selectivity is high at this level, systemic tolerance begins to narrow.

At concentrations above 800 mg/L, toxicity increases more sharply, and embryo survival decreases more substantially. This trend indicates that, once the concentration of copper oxide nanoparticles exceeds the synergistic and selective window, their biological effects become less controlled and more broadly damaging. The observed decline in viability at high concentrations is consistent with excessive oxidative stress and loss of tissue-level tolerance.

Together, these results indicate that the most favorable therapeutic balance occurs in the mid-range nanoparticle concentrations, where selective anticancer activity is maximized while systemic toxicity remains within acceptable limits. The increasing toxicity at higher concentrations reinforces the importance of precise dose optimization when incorporating copper oxide nanoparticles into multicomponent therapeutic formulations intended for adjuvant use with proton therapy.

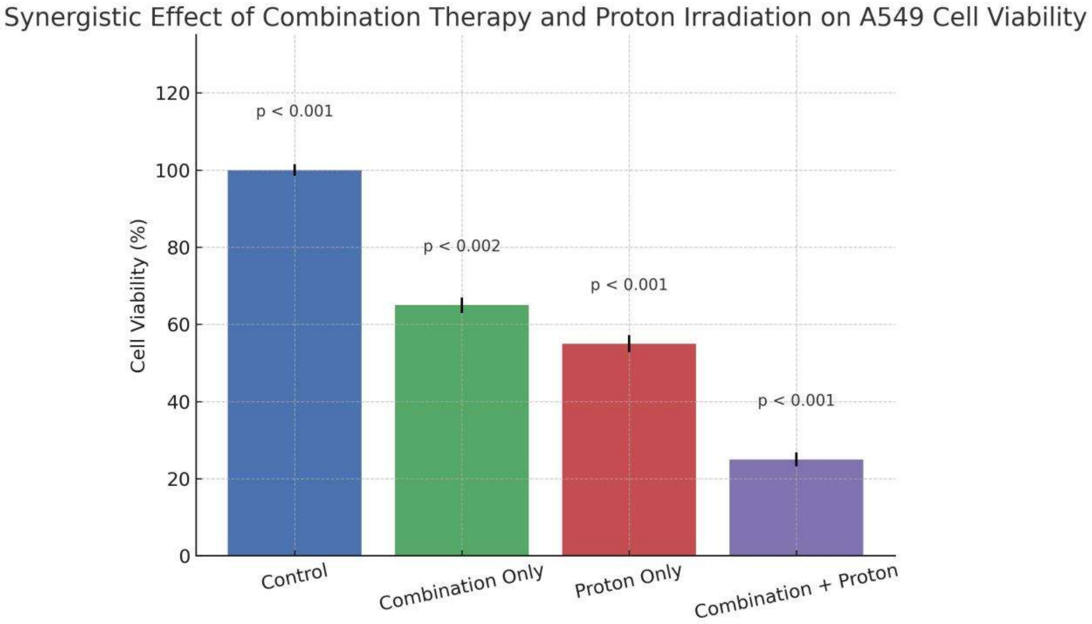

Figure 5 shows the viability of A549 cancer cells following treatment with the multicomponent formulation alone, proton irradiation alone, and the combined application of the formulation with proton irradiation. Viability values were measured 48 hours post-treatment using the MTT metabolic assay, and small standard deviations indicate high reproducibility across replicates. Statistical significance values ($p < 0.001$ and $p < 0.002$) confirm that the observed differences are not due to random variation.

The combination therapy alone reduced cell viability to approximately 65 percent, indicating a moderate cytotoxic effect. Proton irradiation alone produced a somewhat greater reduction, decreasing viability to roughly 55 percent. However, when the combination therapy was applied in conjunction with proton irradiation, viability fell sharply to approximately 25 percent. This represents a substantially greater reduction than would be expected from the additive effects of the two treatments, indicating a synergistic interaction.

The marked decrease in viability under combined treatment conditions is consistent with a mechanism in which the multicomponent formulation sensitizes cancer cells to radiation-induced damage. Copper oxide nanoparticles and ionic modifiers may increase oxidative stress and interfere with cellular recovery pathways, while chemotherapeutic components weaken replication and structural integrity. As a result, proton irradiation becomes significantly more lethal to cancer cells than when applied in isolation.

This enhanced response supports the hypothesis that the multicomponent formulation can act as an effective adjuvant to proton therapy, improving treatment efficacy without requiring increased radiation dose.

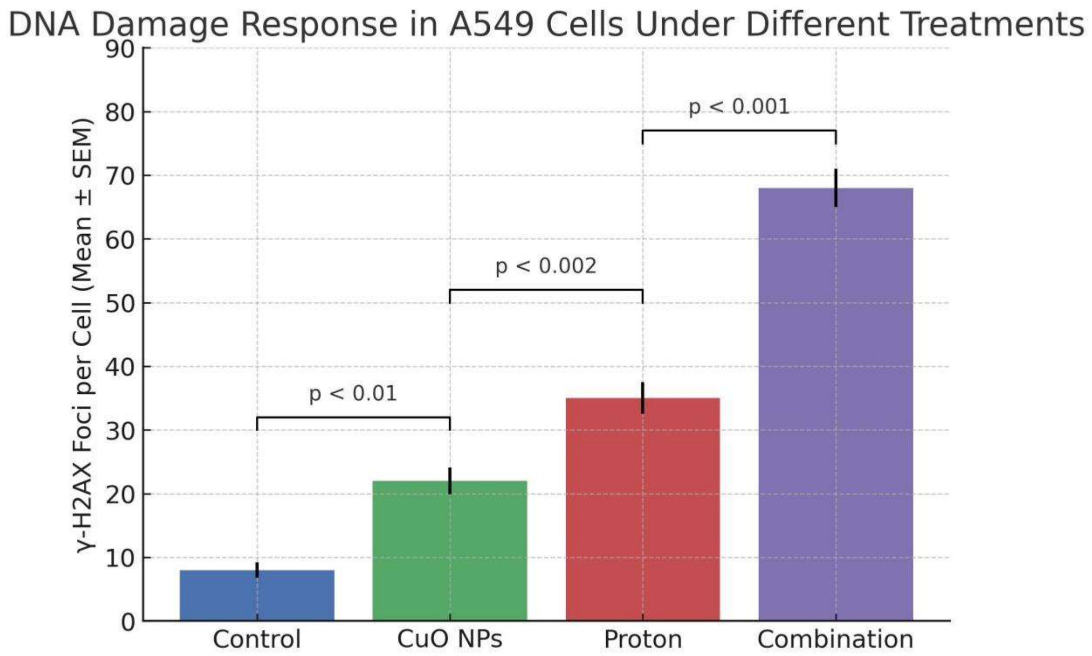

Figure 6 illustrates the extent of DNA double-strand break formation in A549 lung cancer cells following exposure to copper oxide nanoparticles, proton irradiation, and the combined treatment. DNA damage was quantified by counting γ-H2AX nuclear foci, a widely used indicator of DNA double-strand break signaling. The control group shows a low baseline level of γ-H2AX foci, reflecting normal genomic stability under standard culture conditions. Treatment with copper oxide nanoparticles alone resulted in an increase in γ-H2AX formation, indicating elevated oxidative and mitochondrial stress sufficient to initiate DNA damage signaling.

Proton irradiation alone produced a greater increase in γ-H2AX foci relative to nanoparticle exposure, which is consistent with the known capacity of proton radiation to generate clustered DNA ionization events and double-strand breaks. However, the most substantial increase in γ-H2AX signal occurred in the combined treatment group. The number of γ-H2AX foci in this group significantly exceeded the levels induced by either copper oxide nanoparticles or proton irradiation alone, with statistical significance indicated by the p-value brackets shown between corresponding treatment conditions. This pattern demonstrates a synergistic enhancement of radiation-induced DNA damage when the multicomponent formulation is applied prior to proton exposure.

These results support the interpretation that copper oxide nanoparticles and associated ionic and chemotherapeutic components sensitize cancer cells to radiation by increasing oxidative stress, destabilizing mitochondrial function, and reducing the efficiency of DNA repair pathways. The combination of biochemical stress and proton-induced DNA damage results in an amplified genomic injury response, increasing the likelihood of apoptotic commitment. Therefore, Figure 6 provides mechanistic evidence that the multicomponent treatment can function as a radiosensitizer to enhance the biological impact of proton therapy in cancer cells.

Selective Cytotoxicity and Viability Response

The multicomponent formulations exhibited a pronounced and concentration-dependent selective effect on A549 lung cancer cells compared to NHDF normal fibroblasts. At concentrations from 0 to 200 mg/L copper oxide nanoparticles, cell viability in A549 cells decreased modestly, while NHDF viability remained largely unchanged, resulting in only a small elevation in the Relative Selectivity of Viability (RSV). As nanoparticle concentration increased into the intermediate range of 300 to 600 mg/L, a steep divergence between malignant and non-malignant cell responses emerged. For example, at 500 mg/L, A549 cell viability was reduced by approximately 65 percent relative to untreated controls, whereas NHDF cell viability declined by only 25 to 28 percent under the same conditions. This produced an RSV value more than two-fold higher than at lower doses (Figure 1).

Beyond 600 mg/L, the selectivity window narrowed. At 800 mg/L, A549 viability decreased further, but NHDF viability also began to decline more markedly. By 1000 mg/L, the decrease in viability in NHDF cells approached that of A549 cells, reducing selectivity and indicating increasing non-specific cytotoxicity. This biphasic profile demonstrates that the most favorable therapeutic window lies within the 400–600 mg/L range, where the multicomponent formulation suppresses cancer cell viability significantly more than normal cell viability.

Apoptosis as the Primary Mechanism of Cell Death

Analysis of apoptosis using Annexin V-FITC/PI staining revealed that selective cytotoxicity resulted primarily from apoptotic induction rather than necrotic injury. At 500 mg/L, approximately 60–65 percent of A549 cells were undergoing apoptosis after 48 hours of treatment, compared to only 25–30 percent of NHDF cells (Figure 3). This difference corresponds to more than a two-fold higher apoptotic commitment in malignant cells. At 300 mg/L, the apoptotic ratio was lower but still selective, with A549 apoptosis approximately 1.7 times greater than that observed in NHDF. At 700 mg/L, apoptosis increased in NHDF cells, narrowing the differential but remaining directionally selective.

These results indicate that malignant cells reached the mitochondrial apoptotic threshold at lower stress pressure than non-malignant cells. Morphologically, A549 cells displayed characteristic features of apoptotic collapse, including cell shrinkage, membrane blebbing, and nuclear condensation, while NHDF cells retained structural integrity longer and showed delayed apoptotic signaling.

Nanoparticles Alone Produce Limited Selectivity

Treatment with blank nanoparticle dispersions (containing no chemotherapeutic or ionic components) produced only a gradual and modest increase in RSV and RSA values across the tested concentration range (Figure 2). Even at 1000 mg/L, the combined selectivity index (RSVA) increased by only approximately 1.3–1.4 times relative to baseline. This is substantially lower than the RSVA values observed in the fully formulated combinations, which exceeded 2.2–2.4 at optimal concentrations. These results confirm that the synergistic selective effect arises from the interaction of nanoparticles with chemotherapeutic and ionic modulatory components, rather than from nanoparticle exposure alone.

Acute Toxicity and Therapeutic Index Window

The chick embryo assay demonstrated that systemic toxicity remained low at 200 to 400 mg/L, with survival rates of 97 and 94 percent, respectively (Figure 4). Toxicity increased at 600 mg/L, where survival declined to approximately 89 percent, corresponding to the concentration range where selective cytotoxicity in vitro was highest. At concentrations exceeding 800 mg/L, survival decreased sharply to 70 percent, indicating that the therapeutic window narrows substantially at higher nanoparticle doses. These findings reinforce the importance of controlling nanoparticle concentration to maintain therapeutic selectivity and systemic tolerability.

Synergistic Enhancement of Proton Irradiation

Combined treatment with the multicomponent formulation and proton irradiation resulted in a pronounced synergistic reduction in cancer cell viability (Figure 5). While the formulation alone reduced viability to approximately 65 percent and proton irradiation alone reduced viability to approximately 55 percent, the combined treatment reduced viability to approximately 25 percent. This reduction is substantially greater than would be expected from additive effects, corresponding to nearly a three-fold greater cytotoxic effect than proton therapy alone.

Amplification of Radiation-Induced DNA Damage

Quantification of γ-H2AX nuclear foci demonstrated that DNA double-strand break signaling was significantly amplified under combined treatment conditions (Figure 6). The control group exhibited approximately 8 foci per cell, copper oxide nanoparticles alone approximately 22, and proton irradiation alone approximately 35. In contrast, the combined treatment yielded approximately 68 foci per cell, representing nearly a two-fold increase compared to proton irradiation alone. The p-value brackets indicate statistically significant differences between all adjacent groups, confirming that the increase in DNA damage is not attributable to random variability. This finding supports the interpretation that the formulation acts as a radiosensitizer by weakening DNA repair efficiency and elevating oxidative injury prior to irradiation.

Discussion

The results of the present study contribute to the growing body of evidence supporting the therapeutic potential of multicomponent anticancer strategies that combine chemotherapeutic drugs, ionic modulators, and metal oxide nanoparticles. The selective cytotoxic response observed in A549 lung adenocarcinoma cells, particularly at intermediate concentrations of copper oxide nanoparticles within the multicomponent formulations, aligns with a broader understanding of cancer cell physiology and its associated vulnerabilities. Cancer cells characteristically exist under conditions of elevated oxidative stress, heightened metabolic demand, and altered ionic gradients, which collectively reduce their capacity to adapt to additional destabilizing stimuli (Trachootham et al., 2009). The observed preferential induction of apoptosis in malignant cells compared to NHDF normal fibroblasts therefore reflects an exploitation of intrinsic metabolic fragility, rather than a nonspecific cytotoxic effect.

The role of copper oxide nanoparticles in generating intracellular oxidative stress is central to this response. Copper-based nanomaterials have been shown to undergo redox cycling reactions within the cellular environment, producing reactive oxygen species that disrupt mitochondrial function, induce lipid peroxidation, and activate apoptotic pathways (Chen et al., 2016). In the present work, these mechanisms appear to operate synergistically with the actions of gemcitabine, carboplatin, paclitaxel, and other components of the multicomponent formulation. By inhibiting nucleotide synthesis, disrupting microtubule stability, and altering mitotic progression, these chemotherapeutic agents introduce cellular stress signals that predispose malignant cells to apoptosis. The addition of copper oxide nanoparticles heightens oxidative injury beyond the limits of cellular tolerance, particularly in cancer cells that already function near the threshold of redox sustainability (Sutradhar et al., 2016). The result is a coordinated collapse of mitochondrial integrity and downstream apoptotic signaling.

The presence of rubidium chloride in the formulations likely contributes by modulating cellular ionic equilibrium and membrane potential. Malignant cells frequently exhibit altered potassium channel regulation and depolarized membrane states, which are associated with proliferative signaling and suppressed apoptotic responsiveness (Prevarskaya et al., 2018). By displacing potassium ions, rubidium may accentuate ionic instability and facilitate mitochondrial permeability transition events, thereby lowering the threshold required for apoptosis initiation when oxidative and chemotherapeutic stressors are present. While the precise mechanistic details of rubidium's influence require further electrophysiological and biochemical investigation, the selective apoptotic response observed in the multicomponent formulations is consistent with this interpretation.

The selectivity profiles depicted in Figures 1 and 3 demonstrate a clear concentration-dependent biphasic behavior, with maximal selectivity occurring at intermediate copper oxide nanoparticle concentrations. This pattern reflects the balance between therapeutic synergy and non-specific oxidative tissue damage. At low nanoparticle concentrations, oxidative stress levels may be insufficient to overcome cancer cell survival pathways, resulting in modest selectivity. At intermediate concentrations, the combination of redox imbalance, impaired DNA synthesis, disrupted mitotic structure, and altered ion flux collectively overwhelms malignant cell homeostasis while remaining within the adaptive capacity of normal fibroblasts. At higher concentrations, however, oxidative damage becomes excessive and begins to affect non-malignant tissue viability, narrowing the therapeutic window. This inverted U-shaped selectivity curve has been described previously in the context of redox-modulating anticancer agents and nanoparticle-enhanced combination therapies (Fulda et al., 2010), and the present data align with this well-characterized pharmacodynamic profile.

The chick embryo toxicity findings further support this interpretation. While systemic tolerance was maintained within the concentration range associated with peak selective cytotoxicity, embryo viability declined sharply at higher concentrations, indicating a loss of differential cellular response at the organism level. This underscores the necessity of precise dose regulation if such multicomponent formulations are to be considered for clinical translation. The accuracy of dosing becomes especially significant when considering variability in tumor metabolic states, vascularization patterns, and nanoparticle distribution, all of which may influence therapeutic index.

Parallel to the mechanistic biochemical findings, the synergistic enhancement of proton irradiation demonstrated in Figure 5 provides functional evidence that the multicomponent formulation increases the biological effectiveness of proton therapy. Proton therapy is distinguished by its capacity to deposit energy with depth precision, allowing tumor targeting with reduced radiation exposure to surrounding normal tissue (Durante et al., 2010). However, the relative biological effectiveness of protons remains close to unity, meaning that biological impact is similar to photon radiation unless cellular sensitivity is altered (Paganetti et al., 2014). The significant decrease in cancer cell viability when proton irradiation was applied following treatment with the multicomponent formulation suggests that the combination increases cellular susceptibility to radiation-induced DNA damage and oxidative stress. This behavior parallels previously documented radiosensitization effects of metal-based nanoparticles in charged particle therapy (Kamada et al., 2015).

Overview of Findings

The results of the present study contribute to the evidence supporting multicomponent anticancer strategies that combine chemotherapeutic drugs, ionic modulators, and metal oxide nanoparticles. The selective cytotoxic response observed in A549 lung adenocarcinoma cells, particularly at intermediate concentrations of copper oxide nanoparticles, reflects an exploitation of intrinsic biological vulnerabilities. Cancer cells typically operate under elevated oxidative stress, altered metabolic regulation, and disrupted ionic gradients, conditions that reduce their capacity to tolerate additional destabilizing stimuli (Trachootham et al., 2009). The preferential induction of apoptosis in malignant cells, compared to NHDF normal fibroblasts, is therefore a consequence of selective biological pressure rather than nonspecific toxicity.

Role of Copper Oxide Nanoparticles in Redox Stress Induction

Copper oxide nanoparticles function as intracellular redox mediators capable of producing reactive oxygen species, disrupting mitochondrial stability, and initiating apoptotic signaling cascades (Chen et al., 2016). In the present formulations, these nanoparticles did not act in isolation but interacted with the biochemical effects of gemcitabine, paclitaxel, carboplatin, and related agents. These chemotherapeutics interfere with DNA synthesis, mitotic spindle function, and structural integrity, creating an intracellular environment highly sensitive to oxidative damage. The addition of copper oxide nanoparticles amplified this stress beyond the cellular tolerance threshold, particularly in cancer cells that already function near the limit of redox equilibrium (Sutradhar et al., 2016). The result was a coordinated and selective collapse of mitochondrial function leading to apoptosis.

Influence of Rubidium Ions on Ionic Homeostasis

Rubidium chloride likely contributed to selective cytotoxicity through modulation of membrane potential and intracellular ion balance. Cancer cells frequently display depolarized membranes and altered potassium channel regulation associated with proliferative signaling and apoptotic resistance (Prevarskaya et al., 2018). Rubidium may displace potassium in intracellular reservoirs, generating ionic instability that increases sensitivity to oxidative and chemotherapeutic stress. While further electrophysiological characterization is needed, the apoptotic selectivity observed aligns with known membrane potential–linked vulnerability mechanisms.

Concentration-Dependent Selectivity and Therapeutic Window

The selectivity patterns in Figures 1 and 3 demonstrate a biphasic concentration effect. At low nanoparticle concentrations, oxidative pressure is insufficient to override survival mechanisms. At intermediate concentrations, the combined effects of oxidative imbalance, DNA synthesis inhibition, cytoskeletal disruption, and altered ion flux create selective apoptotic pressure in malignant cells while maintaining viability in normal tissue. At higher concentrations, oxidative stress becomes generalized, reducing selectivity. This inverted U-shaped response is consistent with known pharmacodynamics of redox-mediated anticancer strategies (Fulda et al., 2010).
The chick embryo toxicity findings further confirm the presence of a therapeutic window. Embryo viability declined significantly only at nanoparticle concentrations above the range associated with selective apoptotic activity in vitro. This suggests that controlled dosing will be essential for clinical application.

Synergistic Enhancement of Proton Therapy

The synergistic decrease in cell viability observed when proton irradiation was combined with the multicomponent formulation (Figure 5) indicates that the treatment enhances the biological effectiveness of protons. Proton therapy provides spatial dose precision due to the Bragg peak but retains biological effectiveness closer to photon radiation unless cellular sensitivity is altered (Durante et al., 2010; Paganetti et al., 2014). The multicomponent formulation likely sensitizes cancer cells by weakening DNA repair capacity and reinforcing oxidative stress, making proton-induced damage more lethal. Similar radiosensitization effects with metal nanoparticles have been reported in charged particle therapy (Kamada et al., 2015).

Metabolic Vulnerabilities in Cancer and Implications for Synergy

The selective vulnerability of cancer cells observed in this study aligns with the established concept that malignant transformation reconfigures metabolic and redox states in ways that increase susceptibility to targeted disruption. A hallmark of many solid tumors is metabolic reprogramming, often characterized by increased glycolysis, suppressed mitochondrial respiration, and elevated baseline levels of reactive oxygen species (Vyas et al., 2016). These adaptations promote proliferative capacity but reduce cellular ability to compensate for additional oxidative or metabolic stress. In the present multicomponent formulations, chemotherapy imposes replicative and structural stress, copper oxide nanoparticles introduce mitochondrial oxidative burden, and rubidium perturbs ion-dependent homeostatic buffering. The combined effect pushes malignant cells beyond a threshold of stress adaptation, initiating apoptosis. In contrast, normal fibroblasts, which maintain more stable redox buffering and mitochondrial integrity, exhibit substantially higher resistance within the optimal therapeutic window. This convergence of stress mechanisms contributes to the observed synergy and reinforces the value of designing therapeutic combinations that exploit inherent metabolic fragility in cancer cells rather than relying solely on cytotoxic potency.

Mitochondrial Pathways and Apoptotic Signaling

The mitochondrial pathway of apoptosis is likely a central mechanism through which the observed selective cell death occurs. Mitochondria function as integrative hubs for metabolic state, ion balance, oxidative burden, and ATP homeostasis (Tait et al., 2010). When oxidative injury exceeds cellular tolerance, mitochondrial outer membrane permeabilization can occur, releasing cytochrome c and activating caspase-dependent apoptotic cascades. Copper oxide nanoparticles have previously been shown to induce mitochondrial depolarization and increase mitochondrial reactive oxygen species, leading to apoptosis in cancer cells (Sutradhar et al., 2016). Chemotherapeutic agents used in the formulations, such as paclitaxel and carboplatin, are known to weaken mitochondrial structural and functional stability. Rubidium-induced membrane potential modification may further sensitize mitochondrial membranes to permeability transition. Therefore, the multicomponent strategy implemented here may act by converging multiple stressors onto a single critical organelle system. This multi-axis pressure reduces the likelihood of resistance emergence because mitochondrial apoptotic commitment is difficult for cells to reverse once initiated (Sarosiek et al., 2017).

Cell Cycle Disruption and DNA Damage Response Inhibition

Another important factor underlying the synergy observed is the concurrent disruption of cell cycle progression. Gemcitabine inhibits DNA synthesis by suppressing ribonucleotide reductase and incorporating into nascent DNA strands, whereas paclitaxel prevents proper spindle assembly by stabilizing microtubules, leading to mitotic arrest (Herbst et al., 2018). These mechanisms impair DNA replication fidelity and mitotic progression, placing pronounced stress on genomic maintenance processes. When proton irradiation is applied, the resulting DNA lesions occur in a cellular context already compromised in repair capacity. Proton therapy induces clustered DNA damage and double-strand breaks, and repairing such damage requires intact homologous recombination and non-homologous end joining pathways (Durante et al., 2010). If these pathways are already under strain from chemotherapeutic pressure, radiation-induced lesions are more likely to lead to apoptosis than to repair and survival. This effect explains the particularly strong decrease in cell viability observed when the multicomponent formulation and proton irradiation were combined.

Comparative Behavior to Other Nanoparticle-Based Radiosensitizers

Nanoparticles have been widely investigated as radiosensitizers due to their capacity to interact physically and chemically with radiation-induced energy deposition processes. Gold nanoparticles have been studied extensively for photon radiation, where they enhance dose deposition via secondary electron emission (Chithrani et al., 2010). However, the radiosensitizing effects of nanoparticles under charged particle irradiation differ mechanistically. Proton radiation generates ionization tracks with distinct spatial and energy deposition characteristics. Copper oxide nanoparticles may sensitize cells to proton damage by enhancing oxidative stress rather than by altering physical dose distribution. This aligns with previous work demonstrating that metal oxide nanoparticles can increase proton-induced mitochondrial damage and oxidative injury rather than directly increasing secondary radiation yield (Kamada et al., 2015). The current findings are therefore consistent with a biochemical radiosensitization model rather than a physical dose amplification model.

Relevance to Clinical Proton Therapy

Translating these findings into clinical contexts requires consideration of the biological and logistical aspects of proton therapy. Proton treatment centers continue to expand globally, but clinical outcomes do not always exceed those of advanced photon therapies unless tumors are particularly sensitive to spatial dose shaping (Durante et al., 2017). Enhancing the biological effectiveness of proton therapy through selective radiosensitization could help expand its therapeutic advantage to a broader range of tumors, including those with radioresistant phenotypes. However, the clinical application of nanoparticle-based radiosensitization strategies must address biodistribution, biotransformation, and clearance pathways to prevent systemic accumulation or long-term toxicity. Copper-based nanoparticles have demonstrated relatively favorable biodegradation profiles compared to high atomic number materials, but their oxidative properties necessitate strict control of concentration, formulation stability, and delivery method to ensure safety.

Need for Pharmacokinetic and In Vivo Validation

While the in vitro and embryo model results offer strong support for selective efficacy and a defined therapeutic window, translation requires evaluation in animal models to determine pharmacokinetics, tumor biodistribution, liver and kidney clearance, and immunological interactions. Nanoparticle distribution tends to be influenced by vascular architecture and tumor permeability, which vary substantially across tumor types and patient physiology (Blanco et al., 2015). The enhanced permeability and retention effect provides a mechanistic basis for tumor-selective localization, but its magnitude is inconsistent in human tumors. Thus, controlled delivery strategies, including encapsulation, ligand targeting, or timed dosing with proton therapy fractionation schedules, will be necessary for therapeutic implementation.

Tumor Microenvironment Considerations

The tumor microenvironment significantly influences treatment response and may help explain the selective behavior observed in the current formulations. Solid tumors commonly exhibit regions of hypoxia, acidic pH, and compromised vascular circulation, conditions which alter redox enzyme regulation and increase mitochondrial stress (Vaupel et al., 2019). Cancer cells within such environments become progressively more dependent on stress-adaptive signaling pathways to sustain viability. The multicomponent formulation used in this study appears to exploit these stress dependencies by simultaneously elevating oxidative pressure and disrupting intracellular ion gradients and DNA synthesis. The presence of hypoxia in tumors has further implications for proton therapy, as proton-induced DNA damage may interact differently with hypoxic conditions than photon therapy. Radiosensitization strategies capable of modifying oxidative response, such as those explored here, may partially counteract hypoxia-induced radiation resistance (Horsman et al., 2016). Therefore, the therapeutic interactions observed in vitro may be amplified in the hypoxic compartments of many solid tumors.

Potential Mechanisms of Radiation Sensitization

The enhanced reduction in cancer cell viability following combined treatment with the multicomponent formulation and proton irradiation may arise from several overlapping mechanisms. Increased oxidative burden reduces efficiency of base excision repair pathways responsible for correcting oxidative DNA lesions, which in turn increases susceptibility to radiation-induced strand breaks (Sarosiek et al., 2017). Proton radiation generates ionization tracks with high local charge density, and these clustered DNA lesions are particularly challenging to repair. If mitochondrial signaling is already disrupted, as suggested by the apoptosis patterns observed, intrinsic apoptotic signaling becomes more readily activated. Moreover, inhibition of microtubule function and nucleotide synthesis reduces cellular capacity to recover following irradiation, further tipping the balance toward apoptotic commitment. The ability of the multicomponent treatment to weaken multiple protective barriers simultaneously is therefore a central contributor to the observed synergy.

Comparison with Carbon Ion Therapy and Relative Biological Effectiveness Considerations

Although proton therapy offers improved targeting capabilities, its biological effectiveness remains moderate compared to carbon ion therapy, which induces more complex and less repairable DNA damage (Kamada et al., 2015). The present data suggest that controlled biochemical modulation may increase the effective biological impact of proton radiation without substituting for heavier ions. Such modulation provides a more flexible approach to treatment planning, as it allows radiation sensitivity to be pharmacologically adjusted rather than fixed. This may be particularly valuable in treatment centers without access to heavy ion technology. It also opens the possibility of tailoring therapy based on tumor genomic or metabolic phenotype, for example selecting patients with mitochondrial vulnerability, oxidative susceptibility, or impaired DNA repair for combined proton-formulation therapy.

Integration with Chemoresistance and Adaptive Response Mechanisms

One of the clinical challenges in lung cancer treatment is the rapid emergence of adaptive resistance mechanisms following exposure to chemotherapy. Resistance to gemcitabine, for example, can develop through multiple mechanisms including increased expression of ribonucleotide reductase subunits, enhanced drug efflux, and activation of compensatory DNA repair signaling (Herbst et al., 2018). The multicomponent formulation investigated here does not rely on a single cytotoxic mechanism, but instead applies pressure across several independent biochemical axes. This multi-target approach reduces the probability of resistance emergence, as cells would need to simultaneously adjust redox management, ionic balancing networks, and cell cycle regulatory pathways to evade treatment. Previous studies have shown that multi-mechanistic therapeutic strategies tend to delay or suppress emergence of resistant phenotypes more effectively than single-agent therapies (DeVita et al., 2019). The present findings are therefore consistent with current principles of rational combination therapy design.

Implications for Personalized Treatment Planning

While the results support broad potential applicability, personalized profiling of tumor oxidative status, ion channel expression, and metabolic phenotype may optimize treatment matching. Tumors vary widely in mitochondrial density, redox buffering capacity, glycolytic rate, and membrane polarization. These characteristics could be quantified using metabolomic profiling, gene expression analysis, and live-cell imaging. Such measurements may allow prediction of which tumors are most likely to respond to copper-based redox sensitization or rubidium-mediated ionic modulation. Integrating these predictive markers into treatment planning would align with the broader movement toward precision oncology, in which therapy selection is guided by cellular state rather than histological classification alone (Topol et al., 2019).

Potential Support from Artificial Intelligence for Optimization

Artificial intelligence can support this personalization by identifying response-linked molecular signatures and optimizing dose distributions, combination ratios, and treatment schedules. Machine learning systems are already being used to predict radiotherapy response and analyze clinical imaging for subtle progression patterns (Ardila et al., 2019; Campanella et al., 2019). The nonlinear concentration-dependent interactions observed in this study are exactly the type of pattern that AI models can evaluate more efficiently than manual experimentation. In the future, iterative machine learning models could refine optimal nanoparticle concentration ranges, adjust chemotherapeutic dose timing relative to proton fractions, and estimate toxicity likelihood based on metabolic signatures.

Limitations of the Study

Despite the promising findings, several limitations should be acknowledged. First, the in vitro data, while informative, do not capture the full complexity of the tumor microenvironment, including stromal interactions, immune infiltration, vascular constraints, and metabolic gradients. The chick embryo model provides an intermediate assessment of systemic tolerance but does not fully replicate mammalian pharmacokinetics or immune responses. Furthermore, nanoparticle aggregation, surface charge variation, and protein corona formation in vivo may influence biodistribution and therapeutic index differently from controlled in vitro conditions (Blanco et al., 2015). Additionally, while the combination strategy demonstrated synergy, the relative contributions of each component to the overall effect require further mechanistic disentangling, particularly regarding ion-channel regulation and mitochondrial permeability transition dynamics.

Future Directions for Mechanistic Characterization

Future work should include studies aimed at elucidating mitochondrial signaling pathways, oxidative enzyme regulation, and cell membrane electrophysiology under combination exposure. Assessing caspase activation profiles, mitochondrial membrane potential dynamics, ATP depletion sequences, and ion flux kinetics will provide mechanistic resolution. Additionally, transcriptomic and proteomic analyses could identify regulatory nodes that govern sensitivity to combined oxidative and chemotherapeutic stress, offering potential biomarkers for patient selection. Comparative analyses across multiple cancer subtypes will also be necessary to determine whether the observed synergy is generalizable or restricted to metabolic phenotypes similar to those of A549 cells.

Strategies for Translational Development

For clinical progression, controlled delivery methods will be essential. Intravenous administration of nanoparticles requires stabilization strategies to prevent aggregation and off-target accumulation. Surface modification, ligand targeting, or encapsulation into liposomal or polymeric carriers may improve tumor localization. Coordination with proton therapy fractionation schedules may also enhance efficacy if treatment timing aligns with periods of maximal cellular sensitization. Additionally, graded dose-escalation studies in animal models will be necessary to determine the therapeutic index and define safe concentration ranges that preserve selective apoptotic pressure while maintaining systemic tolerability.

Broader Clinical and Scientific Significance

The concept demonstrated in this study aligns with a principal direction in modern oncology: leveraging the vulnerabilities that arise from cancer's metabolic and structural adaptations. By targeting oxidative equilibrium, ion homeostasis, and mitotic regulation simultaneously, the multicomponent strategy exerts selective pressure grounded in fundamental cellular limitations, rather than relying on single-pathway inhibition that malignancies can circumvent. Moreover, the demonstrated enhancement of proton therapy efficacy addresses a critical clinical need. While proton therapy can minimize collateral irradiation, its biological impact can be insufficient in some tumor contexts. Increasing its effectiveness through biochemical sensitization could expand its therapeutic relevance without requiring additional physical dose, thereby preserving surrounding tissue integrity.

Transition to Conclusion

Taken together, the findings suggest that carefully composed multicomponent anticancer formulations incorporating copper oxide nanoparticles, chemotherapeutic agents, and ionic modulators can selectively target malignant cells and substantially increase the biological effectiveness of proton therapy. The observed concentration-dependent selectivity emphasizes the importance of dose optimization and controlled delivery. These results provide a strong scientific rationale for continued investigation into nanoparticle-mediated, multi-axis synergistic cancer treatment strategies.

Conclusion

The present study demonstrates that multicomponent therapeutic formulations incorporating copper oxide nanoparticles, chemotherapeutic agents, and ionic modulators can selectively induce apoptosis in lung adenocarcinoma cells while preserving the viability of normal fibroblasts within a defined concentration range. The selective cytotoxicity observed is attributable to the combined disruption of redox balance, mitochondrial stability, ion homeostasis, and cell cycle regulation. These mechanistic interactions converge to exploit intrinsic vulnerabilities arising from malignant metabolic reprogramming.

A key finding is the identification of an intermediate nanoparticle concentration window in which selective apoptotic response is maximized. At concentrations below this range, oxidative and mitotic pressures are insufficient to trigger irreversible apoptotic commitment, while concentrations above this threshold lead to loss of selectivity and increased systemic toxicity. The toxicity profile observed in the chick embryo model further emphasizes the importance of controlled dosing in the application of nanoparticle-based therapeutic strategies.

The multicomponent formulation significantly enhanced the biological effectiveness of proton irradiation, producing a synergistic reduction in cancer cell viability that exceeded the effects of irradiation or drug exposure alone. This radiosensitizing effect likely results from the increased oxidative burden and impaired DNA repair capacity induced by the combined treatment, suggesting a promising strategy for improving the clinical performance of proton therapy without increasing physical radiation dose.
These findings support continued development of multicomponent therapeutic systems designed to exert pressure across multiple cellular stress pathways simultaneously. Future work should include mechanistic validation of mitochondrial and electrophysiological pathways, in vivo biodistribution and pharmacokinetic studies, and computational modeling to refine dosing parameters and personalize treatment strategies. By integrating biochemical, biophysical, and radiotherapeutic modalities, this approach may advance the selective targeting of solid tumors and improve radiotherapy outcomes while minimizing collateral tissue effects.

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Technical Sciences

A Secure PHP-Based Cloud Security Framework for Global SME Retail Operations

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Abstract
Small and medium-sized enterprises (SMEs) form the backbone of global commerce, accounting for over 90% of businesses and contributing significantly to employment and GDP. Yet, they remain disproportionately vulnerable to internal fraud, particularly employee theft, due to limited oversight, fragmented infrastructure, and inadequate digital safeguards. This study presents the design, implementation, and evaluation of a secure, scalable, and cloud-based Point of Sale (POS) system developed using PHP and the Laravel framework. Unlike existing POS platforms that prioritise generic transaction processing and lack embedded fraud prevention, this system Integrates Role-Based Access Control (RBAC), Multi-Factor Authentication (MFA), encrypted audit trails, and real-time activity logging directly into its architecture, specifically tailored to enhance operational transparency and mitigate fraud in SME retail environments.
Built with open-source technologies and deployed on cloud infrastructure, the solution addresses limitations of traditional POS systems, such as poor scalability, limited accessibility, and weak security, while remaining cost-effective and adaptable to low-connectivity environments. It introduces formal models for transaction throughput, response time, availability, and breach probability, providing a quantitative framework rarely applied to SME-focused POS solutions. Validated across multiple regions, the system demonstrates cross-cultural resilience, regulatory compliance, offline tolerance, and digital modernisation for SMEs worldwide. Its transition from academic prototype to commercial deployment underscores its practical viability and bridges the gap between scholarly design and real-world application.

Keywords: Cloud Computing, Laravel, PHP, Point of Sale, SME Retail, Internal Fraud, Audit Trails, Information Systems Security

Conclusion

This study developed and evaluated a cloud-based Point of Sale (POS) system designed to improve transparency, security, and scalability for small and medium enterprises (SMEs). By leveraging PHP, Laravel, MySQL, and cloud infrastructure, the project demonstrated that open-source technologies can deliver enterprise-level reliability and performance at a fraction of the cost of alternative commercial platforms. The modular architecture and layered security design proved particularly effective in addressing core SME operational challenges, including internal fraud, process inefficiencies, and limited growth capacity.

Experimental validation confirmed that the work maintained high throughput, fast response times, and exceptional availability across varied retail environments across many cities in Nigeria. Functional and non-functional testing established its robustness under load, while penetration testing further validated its adherence to modern security practices. Results showed an average processing rate exceeding 100 transactions per minute, sub-300 millisecond response times, and system availability above 99.5% over a 30-day monitoring period. These results affirm the feasibility of deploying cost-effective, globally adaptable POS solutions based on open-source frameworks.

Beyond technical validation, the research underscores enduring gaps in literature and practice. Compared to proprietary systems, PHP-based POS implementations remain underrepresented, particularly in terms of performance benchmarking across cloud platforms and socio-economic evaluation in developing economies. There is also limited exploration of resilient system designs optimised for rural and low-connectivity regions, where digital inclusion remains a challenge. Addressing these gaps is crucial for ensuring equitable access to financial technology and sustainable retail innovation.

Future research should therefore prioritise the development of offline-first architectures for low-bandwidth environments, as well as the integration of Artificial Intelligence (AI) for fraud detection and predictive analytics. Incorporating blockchain could further enhance transactional transparency for secure, tamper-proof audit trails. Moreover, connecting POS platforms with enterprise systems such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) platforms would create a more holistic digital retail ecosystem, improving data visibility across business operations. Finally, localisation and multilingual capabilities would ensure broader accessibility across diverse markets.

In conclusion, this work establishes that open-source, PHP-based cloud POS systems can combine high performance, security, scalability and flexibility with cost efficiency. The proposed system not only empowers SMEs to participate more fully in the digital economy but also contributes to a more inclusive, secure and transparent future for global retail technology.

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Экологический анализ состояния подземных вод Алматинской области в условиях климатического и антропогенного воздействия

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Аннотация
В статье представлен экологический анализ состояния подземных вод Алматинской области с учетом влияния климатических изменений и антропогенных факторов. Рассматриваются методы оценки качества воды (индекс качества воды — WQI, индекс уязвимости DRASTIC), анализируются гидрогеологические особенности региона, динамика уровня и химического состава подземных вод. На основе результатов обсуждаются риски деградации ресурсов и предлагаются рекомендации по устойчивому управлению.
Ключевые слова: экология, анализ, подземные воды, климатические изменения, ресурсы

Введение

Подземные воды являются важнейшим источником водоснабжения населения и сельского хозяйства Алматинской области. В последние десятилетия регион сталкивается с одновременным воздействием климатических изменений (повышение температуры, сокращение ледников, изменение режима осадков) и антропогенных нагрузок (интенсивное орошение, промышленные и бытовые стоки, рост урбанизации).
Актуальность исследования обусловлена необходимостью своевременной оценки состояния подземных вод, определения степени уязвимости и выработки мер по их рациональному использованию.

Материалы и методы

В работе использовались следующие источники данных и методы:

- Гидрогеологические наблюдения за уровнем подземных вод (скважины на территории Талгарского, Енбекшиказахского и Панфиловского районов).
- Химический анализ проб (нитраты, хлориды, сульфаты, тяжелые металлы, пестициды).
- Климатические данные (температура, осадки, динамика оледенения).
- Индекс качества воды (WQI) для оценки пригодности подземных вод для питьевых целей.
- Индекс уязвимости DRASTIC для определения зон риска загрязнения.
- Методы статистического анализа (тест Манна–Кендала) для выявления тенденций.
- ГИС-картирование для пространственного анализа.

Для проведения экологического анализа состояния подземных вод Алматинской области использовался комплексный подход, включающий полевые исследования, лабораторные анализы и применение современных методов обработки данных.

Объект исследования.

Исследование охватывало территорию Алматинской области, включая предгорные районы Заилийского Алатау, долины рек (Иле, Талгар, Есик), а также зону интенсивного сельскохозяйственного водопользования в Енбекшиказахском, Талгарском и Панфиловском районах.

Полевые исследования.

- Отбор проб подземных вод из наблюдательных и эксплуатационных скважин.
- Измерение уровня подземных вод с использованием водомерных лент и автоматизированных датчиков.
- Фиксация сезонных колебаний уровня в зависимости от климатических условий.

Лабораторные исследования.

- Химический анализ проб на содержание нитратов, хлоридов, сульфатов, аммония, фторидов, тяжёлых металлов (Fe, Mn, Pb, Cu, Zn), пестицидов.
- Определение минерализации, жесткости, pH, электропроводности.
- Сравнение полученных данных с предельно допустимыми концентрациями (ПДК) по санитарным нормам РК и рекомендациям ВОЗ.

Методы оценки качества и уязвимости.

- Индекс качества воды (Water Quality Index — WQI): расчёт интегрального показателя пригодности воды для питьевого и хозяйственно-бытового водоснабжения.
- Индекс уязвимости DRASTIC: определение потенциально опасных зон загрязнения подземных вод.
- Статистический анализ: использование теста Манна–Кендала для выявления долгосрочных тенденций изменения уровня и качества подземных вод.

Инструментальные методы и моделирование.

- Применение ГИС-технологий для пространственного анализа и построения карт уязвимости.
- Гидрогеологическое моделирование с использованием программных комплексов MODFLOW и MT3D для прогнозирования сценариев изменения ресурсов подземных вод.

Таким образом, применённый методологический подход позволил всесторонне оценить текущее состояние подземных вод Алматинской области, выявить ключевые экологические риски и предложить практические рекомендации по их рациональному использованию.

Результаты исследования

Анализ полученных данных показал:

- Уровень подземных вод снижается в среднем на 0,12–0,45 м в год в районах интенсивного водопользования.
- В 20 % проб содержание нитратов превышает нормы ВОЗ, особенно вблизи орошаемых земель и сельскохозяйственных угодий.
- В пониженных зонах наблюдается повышение минерализации, зафиксированы локальные превышения по тяжелым металлам.
- По индексу WQI около 30 % проб попадают в категорию «плохое качество».
- По индексу DRASTIC наиболее уязвимыми являются аллювиальные отложения речных долин и районы активного орошения.

Обсуждение

Полученные результаты подтверждают, что подземные воды Алматинской области находятся под двойным давлением: с одной стороны — климатические изменения, уменьшающие естественное питание водоносных горизонтов, с другой — хозяйственная деятельность, приводящая к загрязнению и перерасходу ресурсов.

Ключевые экологические риски:

- сокращение запасов пресной воды;
- ухудшение качества питьевых источников;
- рост затрат на очистку и водоподготовку;

- деградация экосистем.

Ограничением исследования является недостаточность долгосрочных данных по некоторым районам, что требует расширения мониторинга.

Рекомендации

- Расширить сеть наблюдательных скважин (не менее 25–40 пунктов) и внедрить автоматизированные датчики уровня.
- Проводить регулярный химический контроль (ежеквартально, а в критические сезоны — ежемесячно).
- Создать региональную базу данных в формате ГИС для открытого доступа.
- Разработать лимиты водоотбора и внедрить водосберегающие технологии в сельском хозяйстве.
- Усилить контроль промышленных сбросов и санитарных зон вокруг источников.
- Использовать гидрогеологическое моделирование для прогнозирования сценариев изменения ресурсов.

Заключение

Проведённый экологический анализ состояния подземных вод Алматинской области показал, что водные ресурсы региона находятся в зоне серьёзного риска. Сочетание климатических факторов (изменение температурного режима, уменьшение площади ледников, колебания уровня осадков) и антропогенного воздействия (активное сельскохозяйственное водопользование, промышленные выбросы, урбанизация) приводит к одновременному снижению количества подземных вод и ухудшению их качества.

Выявленные тенденции указывают на необходимость перехода к системному управлению водными ресурсами. В первую очередь это связано с расширением сети мониторинга, внедрением водосберегающих технологий, а также с ужесточением контроля за промышленными и сельскохозяйственными сбросами.

В перспективе крайне важно интегрировать результаты гидрогеологических исследований в региональные программы устойчивого развития. Только при комплексном подходе, включающем научный анализ, государственное регулирование и рациональное водопользование, возможно сохранить подземные воды Алматинской области как стратегический ресурс для будущих поколений.

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УДК 666.71:621.1.016.4

ЗОЛОКЕРАМИКАНЫҢ ҚҰРАМЫНДАҒЫ ХИМИЯЛЫҚ ЭЛЕМЕНТТЕРДІ РЕНТГЕН ФЛУОРЕСЦЕНЦИЯ ӘДІСІМЕН ЗЕРТТЕУ

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Аңдатпа

Бұл мақалада золокерамиканың химиялық құрамын рентгендік флуоресцентті (РФ) әдісімен зерттеу нәтижелері ұсынылады. Зерттеу нысаны ретінде золокерамика үлгісі таңдалып, бастапқы талдау РФ-экспресс зерттеу құрылғысы арқылы жүргізілді. Кейін үлгі механикалық өңдеуден өтіп, ұсақталған материал РЛП-21 рентгендік флуоресцентті энергия-дисперсиялық аспабында талданды. Өлшеу барысында алюминий (Al) мен кремнийді (Si) анықтау үшін кадмий (Cd) нысаны және басқа элементтер үшін теллур (Te) нысаны қолданылды. Алынған спектрлер үлгінің негізгі элементтік құрамын дәл анықтауға мүмкіндік берді. Зерттеу нәтижелері золокерамиканың сапасын бағалауда және өндірістік процестерін оңтайландыруда маңызды рөл атқарады.

Кілт сөздер: золокерамика, рентген сәулесі, өндірістік қалдықтар, рентген флуоресцентті әдіс, химиялық құрамы, элементтік талдау.

STUDY OF CHEMICAL ELEMENTS IN THE COMPOSITION OF ZOLOCERAMICS USING THE X-RAY FLUORESCENCE METHOD

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This article presents the results of the study of the chemical composition of zoloceramics using the X-ray fluorescence (XRF) method. A zoloceramic sample was selected as the object of study, and the initial analysis was carried out using an X-ray express research device. Then, the sample was mechanically processed, and the crushed material was analyzed on an X-ray fluorescence energy-dispersive instrument RLP-21. During the measurement, the cadmium (Cd) form was used to determine aluminum (Al) and silicon (Si), and the tellurium (Te) form was used for other elements. The obtained spectra allowed us to accurately determine the main elemental composition of the sample. The results of the study play an important role in assessing the quality of zoloceramics and optimizing production processes.

Keywords: zoloceramics, X-rays, industrial waste, X-ray fluorescence method, chemical composition, elemental analysis.

Кіріспе

Қазақстанда өндірістік қалдықтарды қайта өңдеу мен оларды тиімді пайдалану – қазіргі уақытта аса өзекті мәселелердің бірі. Әсіресе жылу электр станцияларынан (ЖЭС) бөлінетін күл-қоқыс қалдықтары қоршаған ортаға айтарлықтай зиян келтіреді. Бұл қалдықтар ауаға зиянды бөлшектердің таралуына, топырақтың ластануына және су көздерінің бүлінуіне себеп болады. Аталған мәселелерді шешудің бір тиімді жолы – қалдықтарды қайта өңдеу арқылы оларды пайдалы өнімдерге айналдыру. Соның ішінде золокерамика өндірісі – өндірістік қалдықтарды қолданудың экологиялық жағынан қауіпсіз әрі тиімді әдістерінің бірі болып табылады.

Золокерамика – құрамында түрлі химиялық элементтері бар көп құрамды материал. Оның сапалық көрсеткіштері мен физикалық қасиеттері құрамындағы элементтердің мөлшері мен өзара қатынасына тікелей байланысты. Материалдың беріктігі, термиялық тұрақтылығы және ұзақ мерзімділігі секілді қасиеттерін жетілдіру үшін алдымен оның химиялық құрамын нақты анықтау қажет. Мұндай зерттеу нәтижелері золокерамиканың өндірістік қолдану мүмкіндіктерін арттырып қана қоймай, материалдың сапасын жақсартуға, өндіріс үдерісін оңтайландыруға және өнімнің пайдалану мерзімін ұзартуға септігін тигізеді [1].

Қазақстанда күл-қоқыс қалдықтарын тиімді пайдалануға қатысты зерттеулер әлі де жеткіліксіз деңгейде болғандықтан, осы бағыттағы жұмыстардың өзектілігі артып отыр. Әртүрлі өндіріс ошақтарынан алынған күлдің химиялық құрамы бір-бірінен ерекшеленеді, бұл золокерамиканың қасиеттеріне әсер етеді. Осыған байланысты күлден алынған материалдардың құрамындағы элементтердің нақты мөлшерін анықтау – оларды өндірісте тиімді пайдалану маңызды қадам болып табылады. Химиялық құрамды дәл зерттеу арқылы золокерамиканың сапалық және физикалық көрсеткіштерін жақсарту мүмкіндігі ашылады, бұл өз кезегінде ғылым мен техникада жаңа жетістіктерге жол ашады [2-3].

Бұл жұмыстың басты мақсаты – золокерамика үлгісінің химиялық құрамын дәл анықтау арқылы оның физикалық қасиеттерін жақсартып, өндірістік қолдану мүмкіндіктерін кеңейту. Зерттеу барысында рентгендік флуоресцентті (РФ) әдісі қолданылды. РФ-спектроскопиясы – қатты және ұнтақ тәрізді материалдардың құрамындағы элементтерді жылдам әрі дәл анықтауға мүмкіндік беретін жоғары сезімталдыққа ие аналитикалық әдіс. Оның басты артықшылықтары – зерттеу үдерісінің жылдамдығы, үлгіні бұзбай талдау жүргізу мүмкіндігі және кең элементтер спектрін анықтай алу қабілеті. РФ-әдісін пайдалану материал құрамындағы негізгі және қоспа элементтердің концентрациясын дәл анықтап, оның физикалық қасиеттерін жақсарту үшін қажетті деректерді ұсынады [5-7].

Жүргізілген зерттеу нәтижелері золокерамиканың сапасын арттыруға бағытталған ғылыми және өндірістік жұмыстарға маңызды үлес қосты. Бұл зерттеу күл-қоқыс қалдықтарын қауіпсіз әрі тиімді пайдалану жолдарын табуға көмектесіп, Қазақстандағы экологиялық жағдайды жақсартуға және материалтану саласындағы ғылыми ізденістерді ілгерілетуге мүмкіндік береді.

Материалдар мен әдістер

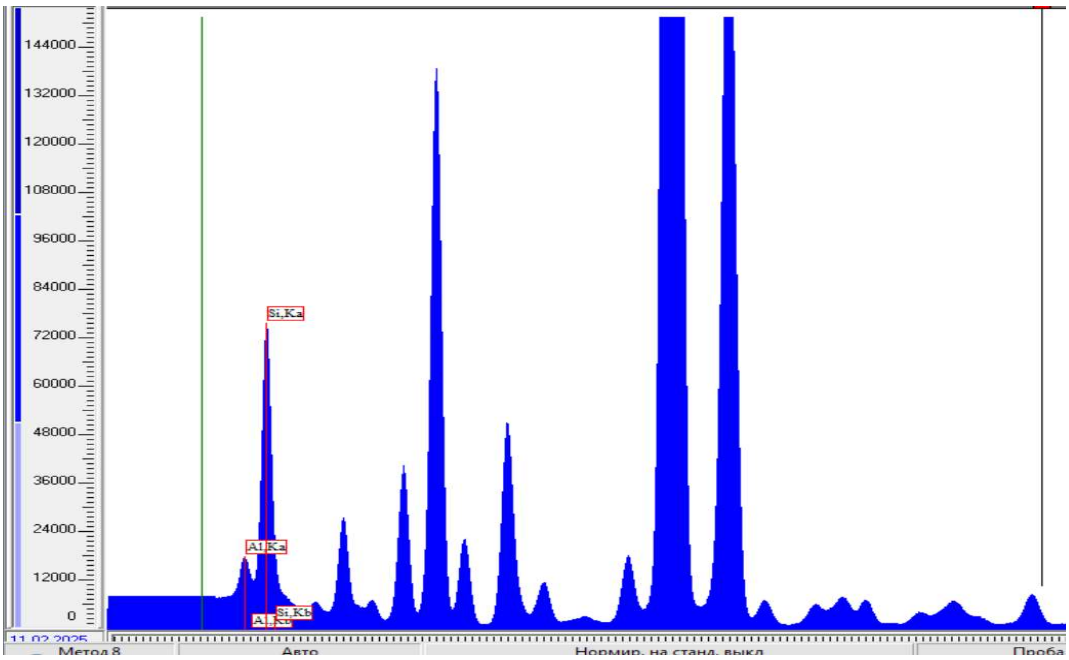
Зерттеу барысында `Z6` маркалы золокерамика үлгісі пайдаланылды. Үлгінің бетінде өндіріс кезінде қалыптасатын термиялық процестердің нәтижесін көрсететін “Құлбек сақиналары” байқалды [5]. Химиялық құрамды анықтау бірнеше кезеңнен тұрды. Алғашқы кезеңде жылдам бастапқы мәліметтер алу үшін далалық РФ-экспресс әдісі қолданылды. Кейін өлшеу дәлдігін арттыру мақсатында үлгі механикалық өңдеуден өтті: алдымен үлгі арнайы арамен кесіліп, қажетті бөліктерге бөлінді. Келесі кезеңде агат тасынан жасалған майдалағыш келіде ұсақталды және біркелкі құрылым алу үшін шар тәрізді зертханалық диірменде қосымша өңделді. Мұндай өңдеу ұнтақтың біртектілігін қамтамасыз етіп, спектрлік өлшеу кезінде қателіктерді азайтуға мүмкіндік берді.

Дайындалған ұнтақ арнайы кювет ыдысқа салынды. РФ-спектроскопиялық өлшеулер РЛП-21 рентгендік флуоресцентті энергия-дисперсиялық аспабында жүргізілді. Өлшеу кезінде екі түрлі нысан қолданылды: кадмий (Cd) нысаны – алюминий (Al) мен кремний (Si) құрамын анықтау үшін, теллур (Te) нысаны – басқа элементтерді анықтау үшін пайдаланылды. Аспаптың бағдарламалық қамтамасыз етуі алынған спектрлік мәліметтерді автоматты түрде өңдеп, құрамындағы элементтердің концентрациясын жоғары дәлдікпен көрсетті.

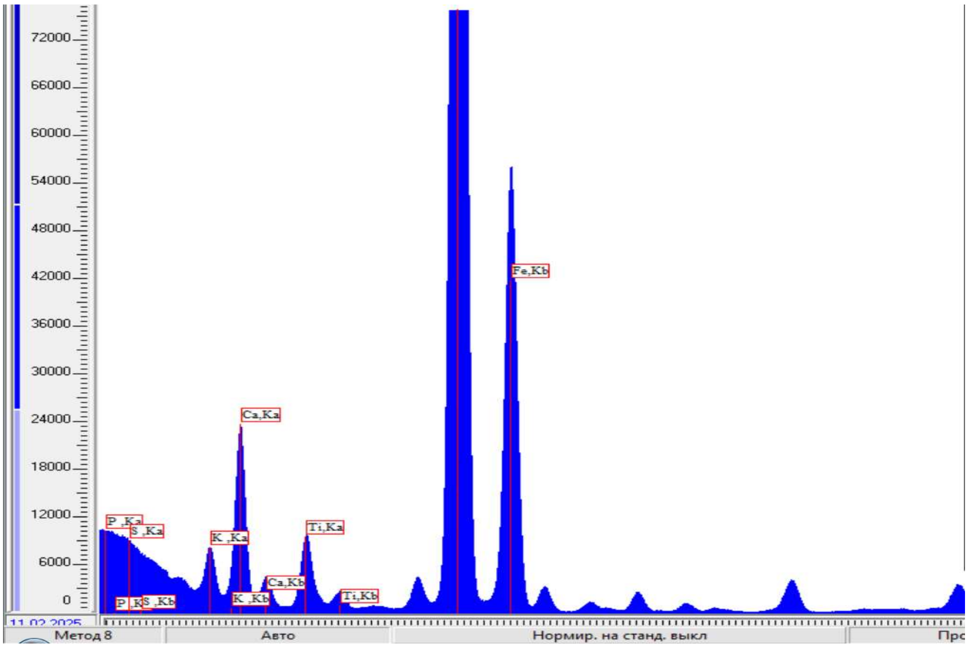
Жүргізілген зерттеу золокерамика құрамын нақты анықтап қана қоймай, РФ-спектроскопия әдісінің көп компонентті материалдарды зерттеудегі тиімділігін дәлелдеді. Алынған нәтижелер болашақта золокерамика өндірісін жетілдіруде және сапасы жоғары, экологиялық қауіпсіз материалдар әзірлеуде маңызды рөл атқарады.

Нәтижелер және талқылау

РФ-спектроскопия нәтижесінде алынған спектрлік деректер үлгі құрамындағы негізгі элементтердің концентрациясын анықтауға мүмкіндік берді. Кадмий (Cd) нысанынан алынған спектр алюминий (Al) мен кремнийдің (Si) шыңдарын (пиктерін) анық көрсете алды, ал теллур (Te) нысанасымен жүргізілген өлшеулерде темір, кальций және басқа микроэлементтердің айқын шыңдары байқалды (1-2 сурет).



1-сурет Cd нысанасынан алынған спектр



2-сурет Те нысанасынан алынған спектр

Рентген-флуоресценттік талдау (РФТ) әдіс сынама элементтерінің сипаттамалық сәулеленуін вольфрам анодты рентген түтігі арқылы қоздыруға негізделген. Пайдаланылған жабдық: Қазақстандық өндіруші «АспапГео» ЖШС шығарған РЛП-21 рентген-флуоресценттік энергия-дисперсиялық спектрометрі, зауыттық нөмірі 38. Жабдықты тексеру сертификаты қоса беріледі.

Сынамалардың құрамын зерттеу «РЛП-21 жартылай өткізгіш детекторы бар рентген-флуоресценттік энергия-дисперсиялық құрылғыда әртүрлі материалдардың ұнтақ сынамаларының элементтік құрамын анықтау» өлшеу әдістемесіне (ӨӘ) сәйкес орындалды. Бұл әдістеме аралық кадмий (алюминий мен кремнийді анықтау үшін) және теллур нысанасын (қалған элементтер үшін) пайдалануды қарастырады.

Спектрлерді өңдеу «АспапГео» ЖШС әзірлеген бағдарламалық қамтамасыз ету арқылы автоматты режимде жүргізіледі.
ӨӘ бойынша анықтау шектері: Al, Si – 0,5%-дан; Ca, K – 0,1%-дан; Fe, Mn, Ti, V – 0,01%-дан; As, Bi, Br, Cu, Ga, Ni, Pb, Rb, Se, Sr, Th, U, W, Y, Zn, Zr – 0,001%-дан; Ag, Cd, Mo, Nb – 2 мкг/г-нан.

Сапаны бақылау мақсатында зерттеу үлгілерімен қатар ГСО 8670 стандартты үлгісі зерттелді [8].

Анықталған элементтердің концентрациялары төмендегі кесте 1-де келтірілген:

Кесте 1

№	Элемент	Құрамы	№	Элемент	Құрамы
1	Fe	3.995±0.170%	16	Ni	0.0045±0.00083%
2	Cu	0.0060±0.0013%	17	Ga	0.00223±0.00083%
3	Zn	0.00761±0.0013%	18	As	0.00239±0.00083%
4	Pb	0.00237±0.00083%	19	Se	<0.0010%
5	Ag	< 2 г/т	20	Br	<0.0010%
6	Cd	3.7±1.4г/т	21	Rb	0.00796±0.0013%
7	Th	10.6±4.4г/т	22	Sr	0.0551±0.010%
8	U	6.8±(<10) г/т	23	Y	0.0044±0.00083%
9	K	1.83±0.21%	24	Zr	0.0238±0.0048%
10	CaO	4.75±0.35%	25	Nb	0.00130±0.00044%
11	Ti	0.630±0.080%	26	Mo	0.00052±0.00027%
12	V	0.021±0.0048%	27	BaSO4	0.13±0.020%
13	Cr	0.0064±0.0013%	28	W	<0.0010%
14	Mn	0.0634±0.010%	29	Bi	<0.0010%
15	Al2O3	19.05±0.60%	30	SiO2	53.38±0.99%

Зерттеу нәтижелері бойынша золокерамикада кремний (Si) мен алюминийдің (Al) мөлшері жоғары, бұл оның термиялық тұрақтылығын арттырады. Сонымен қатар, темір (Fe) мен кальцийдің (Ca) болу үлесі материалдың механикалық беріктігіне оң әсер ететінін көрсетті. Спектрлік өлшеулер дәлдігі үлгінің біртектілігін қамтамасыз ету әдістерімен және аспаптың сезімталдығымен байланысты болды.

Зерттеу барысында алынған мәліметтер золокерамиканың сапалық көрсеткіштерін бағалап, оның өндірістік қолдану мүмкіндіктерін кеңейтуде маңызды рөл атқарды. Бұл деректер золокерамиканың сапасын арттыруға және оны өндірісте тиімді қолдануға мүмкіндік береді.

Қорытынды

Бұл зерттеу жұмысы золокерамика үлгісінің химиялық құрамын рентгендік флуоресцентті спектроскопия әдісі арқылы анықтауға бағытталды. Нәтижелер үлгідегі негізгі элементтер ретінде кремний (Si), алюминий (Al), темір (Fe) және кальцийдің (Ca) болуын көрсетті. Кремний (Si) мен алюминийдің (Al) жоғары мөлшері золокерамиканың термиялық тұрақтылығын қамтамасыз етсе, темір мен кальций оның механикалық қасиеттерін жақсартады.

Алынған мәліметтер золокерамиканың сапалық көрсеткіштерін жақсартып қана қоймай, оның өндірістегі қолдану аясын кеңейтуге мүмкіндік береді. Зерттеу нәтижелері көрсеткендей, бұл зерттелген золокерамикалық материал физикалық мақсаттарға арналған жоғары сапалы өнімдер алу үшін тиімді болып табылады. Сонымен қатар, өндірістік қалдықтарды қайта өңдеу арқылы экологиялық жүктемені азайтуға септігін тигізеді.

Болашақта зерттеу аясын кеңейтіп, золокерамиканың басқа қасиеттерін зерттеу оның қолдану мүмкіндіктерін арттыруға негіз болады.

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Principles and Structure of the Real Estate Cadastre System

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Summary. This article provides a comprehensive scientific analysis of the fundamental principles, structural framework, and practical implementation of the real estate cadastre system, with a particular focus on its development in the Republic of Azerbaijan. The real estate cadastre is a crucial component of state governance, designed to collect, store, and manage legal, technical, and geospatial information concerning land parcels, buildings, and other immovable property within a unified digital information system. The main objectives of the cadastre system include defining the legal status of real estate, ensuring transparency in property relations, and promoting efficient land and resource management. The study identifies and discusses the core principles guiding the creation of the cadastre system - legal and regulatory assurance, completeness and uniformity, integration of geospatial information, data reliability and updating, and separation of administrative functions. The article explores the structural components of the system, including registration objects, databases, and functional subsystems, and explains their interconnections within the broader governance framework. Particular emphasis is placed on the "Unified State Real Estate Cadastre" and "Electronic Register System" projects currently being implemented in Azerbaijan. The research findings reveal that the effective establishment of a modern cadastre system in Azerbaijan requires continuous improvement of the legal framework, the application of advanced information technologies, enhancement of data quality, and the development of human capital in the field. The main challenges remain institutional coordination, insufficient digital infrastructure, and the lack of standardized data formats. Ultimately, the study concludes that the formation of an integrated, transparent, and technologically advanced cadastre system will substantially strengthen public administration, land policy, and economic planning in the country.
Keywords: real estate cadastre, legal and regulatory framework, information technologies, unified register, geospatial data, management principles, Azerbaijan.

Daşınmaz əmlak kadastrı sisteminin yaradılma prinsipləri və strukturu

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Xülasə. Bu məqalə daşınmaz əmlak kadastrı sisteminin yaradılma prinsipləri, struktur modeli və onun Azərbaycanda tətbiqi xüsusiyyətlərini elmi əsaslarla təhlil edir. Daşınmaz əmlak kadastrı dövlətin torpaq sahələri, binalar, qurğular və digər daşınmaz obyektlər barədə hüquqi, texniki və məkan məlumatlarının vahid informasiya sistemində toplanmasını təmin edən mühüm idarəetmə alətidir. Kadastr sisteminin məqsədi daşınmaz əmlakın hüquqi statusunun müəyyənləşdirilməsi, mülkiyyət münasibətlərinin şəffaflaşdırılması, torpaqdan və digər resurslardan səmərəli istifadənin təmin edilməsidir. Tədqiqatda sistemin yaradılmasının əsas prinsipləri - hüquqi-normativ təminat, tamlıq və vahidlik, coğrafi məlumatların inteqrasiyası, məlumatların etibarlılığı və yenilənməsi, eləcə də idarəetmə funksiyalarının ayrılığı ətraflı şəkildə izah edilmişdir. Məqalədə kadastr sisteminin struktur komponentləri - uçot obyektləri, məlumat bazaları, alt-sistemlər və onların qarşılıqlı əlaqə mexanizmləri tədqiq olunur. Xüsusilə, "Daşınmaz əmlakın vahid dövlət kadastrı" və "Elektron reyestr sistemi" kimi layihələr kontekstində Azərbaycanın təcrübəsi araşdırılır. Tədqiqat nəticələri göstərir ki, Azərbaycanda kadastr sisteminin inkişafı üçün hüquqi bazanın

təkmilləşdirilməsi, informasiya texnologiyalarının tətbiqi, kadr potensialının gücləndirilməsi və məlumat keyfiyyətinin artırılması mühüm əhəmiyyət kəsb edir. Mövcud çətinliklər əsasən institusional koordinasiya, texniki infrastrukturun yetərsizliyi və məlumatların standartlaşdırılması problemləri ilə bağlıdır. Məqalə nəticə olaraq qeyd edir ki, vahid və inteqrasiya olunmuş daşınmaz əmlak kadastrı sisteminin formalaşdırılması dövlət idarəçiliyi, torpaq siyasəti və iqtisadi planlaşdırmanın səmərəliliyini əhəmiyyətli dərəcədə artıracaq.

Açar sözlər: daşınmaz əmlak kadastrı, hüquqi-normativ baza, informasiya texnologiyaları, vahid reyestr, məkan məlumatları, idarəetmə prinsipləri, Azərbaycan.

Giriş. Daşınmaz əmlak kadastrı sistemi - dövlətin ərazi, torpaq və daşınmaz əmlak obyektlərinin hüquqi-texniki və kadastr məlumatlarının sistemli şəkildə uçota alınması, saxlanması və istifadəsinə yönəlik vahid informasiya sistemi kimi qəbul edilir. Azərbaycanda bu sistemin təşkili və inkişafı üçün hüquqi bazalar, idarəetmə mexanizmləri və informasiya texnologiyaları əsas rol oynayır. Məsələn, ölkədə "daşınmaz əmlakın vahid dövlət kadastrı" anlayışı torpaq sahələri, binalar, ayrı yaşayış və qeyri-yaşayış sahələri daxil olmaqla müxtəlif əmlak obyektlərini əhatə edir. Məqalənin məqsədi daşınmaz əmlak kadastrı sisteminin yaradılma prinsiplərini, struktur komponentlərini və Azərbaycanda tətbiqi aspektlərini nəzərdən keçirməkdir.

Hüquqi – norrmativ prinsip. Kadastr sisteminin qurulması üçün ilk növbədə müvafiq qanunvericilik və normativ-texniki çərçivənin mövcud olması vacibdir. Azərbaycanda "Daşınmaz əmlakın vahid dövlət kadastrı" haqqında layihə qanununda bu sistemlə bağlı anlayışlar, uçot obyektləri, uçotun aparılması və strukturu kimi müddəalar müəyyən edilib. Bu prinsipə görə, kadastr işi və uçotu yalnız hüquqi baxımdan təmiz və şəffaf olmalıdır.

Tamlıq və vahidlik prinsipi. Kadastr sisteminin qarşısında duran əsas tələblərdən biri bütün daşınmaz əmlak obyektlərinin - mülkiyyət növündən asılı olmayaraq - uçota alınmasıdır. Məsələn, yuxarıda qeyd olunan qanun layihəsinə görə "kadastr uçotu obyekti" anlayışına regionda yerləşən bütün növ daşınmaz əmlak daxil edilir. Bu prinsip sistemin vahidliyini, təkrarçılığın aradan qaldırılmasını və məlumatların strukturlaşdırılmasını təmin edir.

Uçot obyektləri. Kadastr sistemində uçot obyektləri - uçota alınan daşınmaz əmlak növləridir. Məsələn, Azərbaycanda layihə-qanuna görə uçot obyektlərinə torpaq sahələri, binalar (yaşayış evləri daxil olmaqla), qurğular, binanın tərkib hissəsi olan ayrıca yaşayış və qeyri-yaşayış sahələri daxil edilmişdir.

Məlumat bazaları və informasiya sistemləri. Kadastr sisteminin "ürəyi" vahid məlumat bazasıdır — burada hər uçot obyekti ilə bağlı hüquqi, texniki, kəmiyyət və keyfiyyət göstəriciləri saxlanılır. Azərbaycanda "daşınmaz əmlakın elektron reyestri və kadastrı informasiya sistemi" adlı geniş layihə hazırlanmışdır. Məlumat bazası komponentləri aşağıdakılardır:

1. Kadastr uçotu üzrə göstəricilər (ölçü, sərhəd, koordinatlar)
2. Hüquqi qeydiyyat göstəriciləri (mülkiyyət, hüquqlar, yükümlülüklər)
3. Ünvan və coğrafi məlumatlar
4. Əlavə texniki sənədlər (məsələn, kadastr planı, pasportu)

Təşkilati sturuktur və funksional alt sistemlər. Bir kadastr sistemi müxtəlif alt-sistemlərə malikdir. Azərbaycanda elektron reyestr və kadastr sistemi çərçivəsində alt-sistemlər müəyyən edilmişdir:

1. Dövlət kadastrı alt-sistemi (torpaq sahələri, daşınmaz əmlak uçotu)
2. Dövlət reyestri alt-sistemi (hüquqların qeydiyyatı)
3. Məlumatların verilməsi alt-sistemi (məlumatların sorğu, çıxarış, təqdim edilməsi)

Daşınmaz əmlak kadastrı sisteminin yaradılma prinsipləri

№	Prinsipin adı	Qısa izah	Əsas məqsəd	Azərbaycanda tətbiq nümunəsi
1	Hüquqi-normativ təminat	Kadastr sisteminin hüquqi bazasının yaradılması və normativ sənədlərlə tənzimlənməsi	Hüquqi şəffaflıq və hüquqların qorunması	"Daşınmaz əmlakın vahid dövlət kadastrı haqqında" qanun layihəsi
2	Tamlıq və vahidlik	Bütün daşınmaz əmlak növlərinin (torpaq, bina, sahə və s.) uçota alınması	Məlumatların bütövlüyü və təkrarçılığın aradan qaldırılması	Dövlət Kadastr və Reyestr Sistemi

Daşınmaz əmlak kadastrı sisteminin struktur modeli

Struktur elementi	Təsviri	Əsas funksiyalar	İstifadə olunan texnologiyalar / sistemlər	Qısa şərh
Kadastr uçotu	Daşınmaz obyektlərin ilkin qeydiyyatı və identifikasiyası	Obyekt kodlaşdırılması, sərhədlərin müəyyənləşməsi	GIS, GPS, CORS, elektron xəritəçəkmə	Hər obyektə unikal kadastr nömrəsi verilir
Məlumat bazası (DB)	Hüquqi və texniki məlumatların saxlanıldığı əsas platforma	Məlumatların idarə olunması, arxivləşmə, axtarış	SQL, Oracle, PostgreSQL + GIS modulları	Vahid məlumat bazası vahid idarəetməni təmin edir
Reyestr alt-sistemi	Hüquqların və yüklülüklərin qeydiyyatı	Hüquqi sənədlərin təsdiqi, çıxarışların verilməsi	Elektron imza, e-hökumət platforması	Əmlak mülkiyyət hüquqlarının rəsmiləşdirilməsi təmin edilir
Məkan məlumatları alt-sistemi	Kadastr planlarının və xəritələrin inteqrasiyası	Coğrafi sərhədlərin idarə olunması və vizuallaşdırma	GeoServer, ArcGIS, QGIS	Məkan dəqiqliyi təmin edilir
İnformasiya təqdimetmə alt-sistemi	İstifadəçilərə məlumatların verilməsi və sorğu xidmətləri	Çıxarış, arayış, elektron sorğu və analiz	E-kadastr portalı, API interfeyslər	Vətəndaş və dövlət orqanlarının əlçatanlığı artırılır
İdarəetmə və nəzarət bloku	Bütün sistemin fəaliyyətinə nəzarət və koordinasiya	Audit, monitorinq, hesabatlılıq	Analitik modullar, BI sistemləri	Dövlət nəzarət orqanı tərəfindən idarə olunur

Elektron sistemlərə keçid və informasiya texnologiyaları. Elektron kadastr və reyestr sistemlərinin yaradılması istiqamətində ciddi addımlar atılmışdır. Məsələn, müraciətlərin elektron qəbulu, sənədlərin onlayn təqdim edilməsi və məlumatların elektron formatda saxlanması kimi. Ancaq informasiya texnologiyaları infrastrukturu, kadr potensialı və sistemlərarası interoperabillik baxımından bəzi çətinliklər qalmaqdadır.

Məlumatların etibarlılığı, yenilənməsi və açıqlığı. Kadastr sistemində yer alan məlumatların dəqiq, aktual və açıq olması lazımdır. Azərbaycanda bu məqsədlə informasiya sistemləri, elektron reyestrlərə keçid təşəbbüsləri mövcuddur. Məlumatların açıqlığı isə vətəndaşların, dövlət orqanlarının və özəl sektorun bu sistemdən düzgün faydalanmasını təmin edir.

Tövsiyələr:

1. Daşınmaz əmlak kadastrı sisteminin qurulmasında beynəlxalq təcrübələrin (məsələn, Avropa ölkələrinin kadastr modelləri) öyrənilməsi və uyğunlaşdırılması faydalıdır.
2. Elektron kadastr-reyəstr sistemlərinin daha da inkişaf etdirilməsi və istifadəçi yönümlü xidmətlərin təmin edilməsi vacibdir.
3. Məlumat standartlarının işlənməsi və sistemlərarası məlumat mübadiləsinin təmin edilməsi üçün vahid texniki-normativ sənədlər hazırlanmalıdır.
4. Kadastr sahəsində kadr hazırlığına xüsusi diqqət yetirilməli, kadastr mühəndislərinin və əlaqəli peşələrin akkreditasiyası sistemi gücləndirilməlidir.

Nəticə. Kadastr sisteminin yaradılmasında hüquqi-normativ baza, vahid uçotun təmin edilməsi, məkan məlumatlarının inteqrasiyası, məlumatların etibarlılığı və sistemin idarə olunması prinsipləri əsas rol oynayır. Azərbaycanda bu istiqamətdə əhəmiyyətli irəliləyişlər əldə edilmişdir, lakin praktiki tətbiq mərhələsində müəyyən çətinliklər - texniki, institusional və idarəetmə yönümlü - mövcuddur. Gələcəkdə sistemin tam elektron formata keçməsi, kadr potensialının artırılması, standartların uyğunlaşdırılması və məlumatların keyfiyyətinin təmin olunması prioritetlər kimi qalır.

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Кластеризация районов Чикаго на основе демографических и инфраструктурных данных

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Аннотация

В работе представлена методика кластеризации районов города Чикаго на осно- ве интеграции демографических и инфраструктурных признаков. Использованы открытые данные American Community Survey (ACS) и OpenStreetMap (OSM). Понижение размерности выполнялось с помощью алгоритма UMAP (metric=cosine, n_neighbors=10, min_dist=0.05), а кластеризация — методом K-Means (k=7). Полу- ченные семь кластеров отражают различия между центральными, периферийными и социально уязвимыми районами города. Результаты подтверждают, что объедине- ние демографических и пространственных данных повышает интерпретируемость и устойчивость кластерной модели городской структуры.

Ключевые слова: кластеризация, UMAP, K-Means, городская структура, демография, инфраструктура, Чикаго.

Abstract

This study presents a clustering approach for Chicago neighborhoods based on integrated demographic and infrastructure indicators. Open datasets from the American Community Survey (ACS) and OpenStreetMap (OSM) were used. Dimensionality reduction was performed using UMAP (metric=cosine, n_neighbors=10, min_dist=0.05), and clustering was carried out with K-Means (k=7). The resulting seven clusters capture clear distinctions between central, peripheral, and socially vulnerable areas. Findings demonstrate that combining demographic and spatial features improves the interpretability and robustness of urban structure classification.

Keywords: clustering, UMAP, K-Means, urban structure, demography, infrastructure, Chicago.

1 Введение

Современные исследования городской структуры всё чаще опираются на интеграцию разнородных пространственных данных — демографических, инфраструктурных и по- веденческих. Такой подход, известный как urban computing [1], позволяет комплексно описывать городскую среду и выявлять скрытые закономерности её развития. Целью данной работы является построение и анализ кластерной модели районов Чикаго на основе совмещённых демографических показателей (ACS) и инфраструктурных харак- теристик (POI из OSM). Для снижения размерности использовался метод UMAP, а для кластеризации — K-Means с метрикой cosine и числом кластеров $k = 7$.

2 Данные и признаки

Для анализа использовались данные по 866 районам (Census Tracts) города Чикаго. В исследование вошли демографические показатели и плотности инфраструктурных объектов (POI), агрегированные по тем же районам.

2.1 Демографические признаки

Демографические признаки и их источники приведены в табл. 1.

Таблица 1: Демографические признаки и источники данных

Показатель	Описание	Источник
Total_Population Pop_Density Pct_BachelorPlus Pct_LessHS Employment_Index	Общее население тракта Плотность населения (чел/км²) Доля жителей с высшим образовани- ем Доля жителей без среднего образова- ния Индекс занятости (занятые – безра- ботные)	ACS, Table B01003 Вычислено по площади ACS, Table S1501 ACS, Table S1501 ACS, Table S2301

2.2 Инфраструктурные признаки (POI, OSM)

Инфраструктурные характеристики (POI) представлены в табл. 2.

Таблица 2: Инфраструктурные признаки (POI)

Признак	Описание	OSM-теги
edu_total health_total commerce_total business_total leisure_total transport_total	Образовательные объекты Медицинская инфраструктура Торговля и услуги Деловая активность Социально-досуговая инфраструкту- ра Транспортные узлы	amenity=school, university amenity=hospital, clinic shop=*, restaurant, cafe office=*, coworking leisure=park, social_facility railway=station, aeroway=terminal

3 Методология

Все количественные признаки нормализованы с использованием метода StandardScaler. Плотностные показатели лог-трансформированы для снижения влияния выбросов. Ито- говый набор включал 866 наблюдений и 14 признаков (8 демографических + 6 инфра- структурных).

3.1 Понижение размерности (UMAP)

Для уменьшения размерности и выявления латентных закономерностей применял- ся алгоритм UMAP [7]. Оптимальные параметры: metric=cosine, *n_neighbors* = 10, *min_dist* = 0.05. Результаты встраивания представлены на рис. 1.

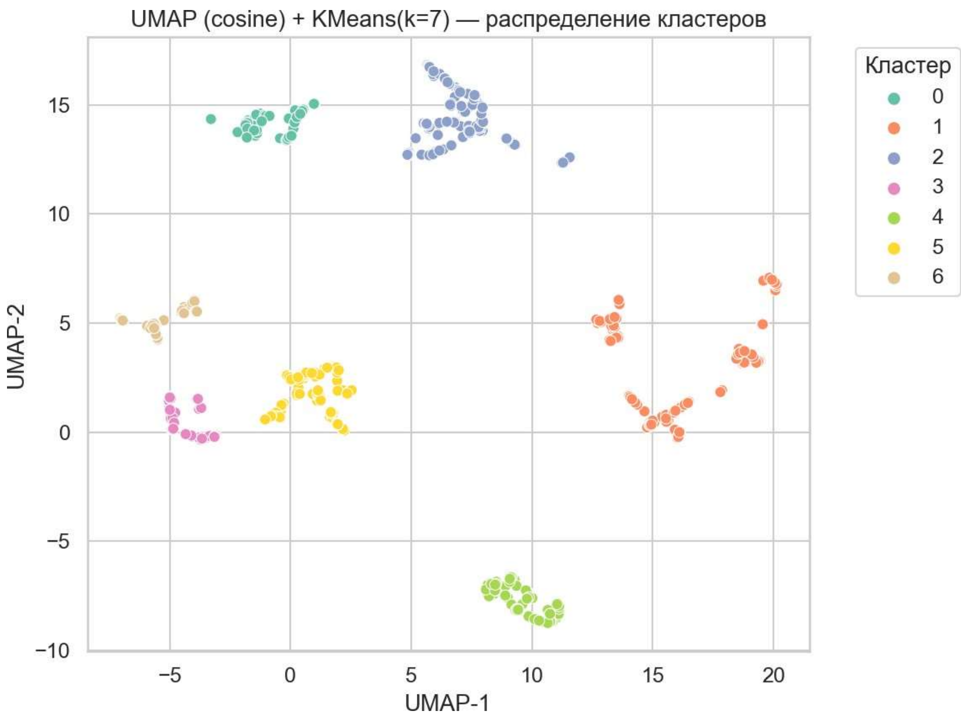

Рис. 1: UMAP-встраивание и распределение кластеров ($k = 7$).

3.2 Кластеризация

Кластеризация выполнена методом K-Means при k = 7. Оптимальные значения мет- рик: Silhouette = 0.718, Calinski–Harabasz = 3480.1, Davies–Bouldin = 0.386. Сравнение различных моделей приведено в табл. 3, а зависимости метрик — на рис. 2.

Таблица 3: Сравнение моделей кластеризации

Модель	Алгоритм	k	Silhouette	DB
DEMO	K-Means	3	0.669	0.91
POI	K-Means	5	0.716	0.35
DEMO+POI	K-Means	6	0.486	0.70
DEMO+POI (cosine)	K-Means	7	0.718	0.39

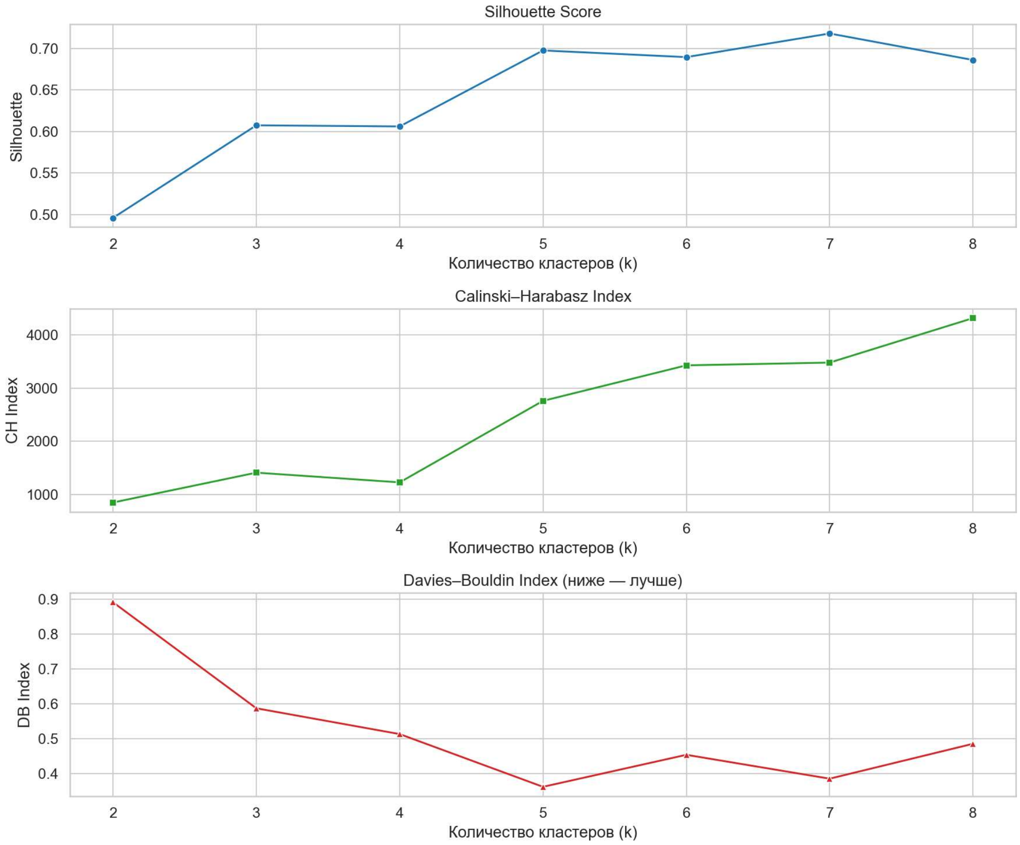

Рис. 2: Метрики кластеризации при разных значениях k.

4 Результаты и интерпретация

Средние значения нормализованных признаков по кластерам приведены в табл. 4. Пространственное распределение кластеров показано на рис. 3.

Таблица 4: Средние значения признаков по кластерам (нормализованные)

Кластер	Total	Density	Edu+	LessHS	Emp	Comm	Schools	Transp
~~0~~	~~0.18~~	~~0.15~~	~~0.31~~	~~0.11~~	~~0.78~~	~~1.90~~	~~0.63~~	~~0.24~~
1	0.26	0.41	0.75	0.08	0.74	18.59	0.65	1.73
2	0.24	0.18	0.31	0.23	0.03	1.39	0.67	0.26
3	0.37	0.22	0.51	0.18	0.73	2.05	0.12	0.23
4	0.32	0.22	0.19	0.50	0.69	1.59	0.64	0.17
5	0.13	0.10	0.28	0.20	0.83	1.27	0.35	0.52
6	0.27	0.22	0.49	0.16	0.49	4.22	0.15	0.22

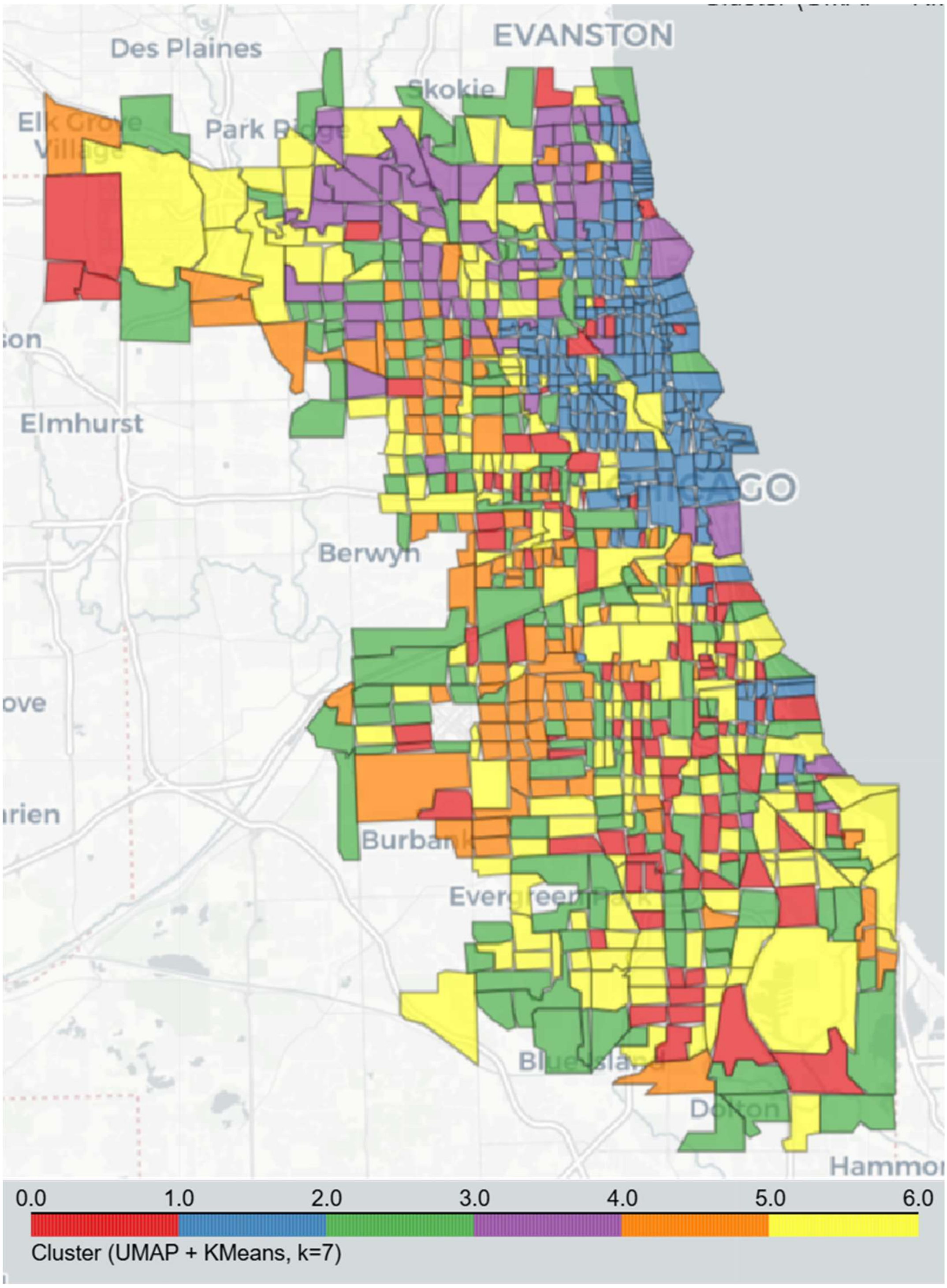

Рис. 3: Пространственное распределение кластеров DEMO+POI (UMAP metric=cosine, k=7).

5 Заключение

В работе выполнена кластеризация районов Чикаго на основе интеграции демографиче- ских и инфраструктурных данных из American Community Survey (ACS) и OpenStreetMap (OSM). Использование алгоритмов UMAP (metric=cosine, $n\_neighbors = 10$, $min\_dist = 0.05$) и K-Means ($k = 7$) позволило выделить устойчивые и интерпретируемые типы районов. Модель достигла высоких показателей качества кластеризации: Silhouette = 0.718, Calinski–Harabasz = 3480.1, Davies–Bouldin = 0.386. Полученные кластеры от-

ражают пространственную стратификацию города — от центральных деловых зон до периферийных и социально уязвимых районов. Практическая значимость работы заклю- чается в применимости результатов для анализа социально-экономических различий и планирования городской инфраструктуры. В дальнейшем планируется включение временных данных и показателей мобильности для анализа динамики городской среды.

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ЖАМБЫЛ ОБЛЫСЫНДАҒЫ ТЕРІС-АЩЫБҰЛАҚ СУ ҚОЙМАСЫНЫҢ РЕКОНСТРУКЦИЯСЫ

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7М07411-«Гидротехникалық құрылыс және құрылымдар» білім беру бағдарламасы магистранты, Қазақ Ұлттық су шаруашылығы және ирригация университеті

Терс-Ащыбұлақ су қоймасы Жамбыл облысында, Күйік асуы аумағында, Ақсу (Теріс) өзенінің ұзындығы шамамен 2 км бөгетпен жабылуы нәтижесінде орналасқан. Су қоймасын балық шаруашылығында пайдалану екінші орында және көбінесе су ағынының жоғарылауына байланысты балық шаруашылығын пайдалану мәселелері еленбейді. Су қоймасы балық қорғау құрылғысымен жабдықталмаған, сондықтан балықтың бір бөлігі жазғы-күзгі кезеңде шахталық түбіндегі су ағызу арқылы, ал қысқы-көктемгі кезеңде Ақсу өзеніне және ирригациялық желіге апаттық ағызу арқылы шығарылады.

Су қоймасының ауданы 2400 га, ұзындығы 10 км, ені 3 км. Су қоймасының максималды тереңдігі – 28,2 м, орташа - 8 м. Су қоймасының рельефі тас жоталармен қатты кесілген, түбі құм, ұсақ қиыршық тас, қара малтатас, өсімдік қалдықтары бар сазды болып келеді. Минималды деңгейде белсенді балық аулау құралдарын қолдануға болады -су қоймасы, ал резервуардың жалпы балықтарын қолдану су қоймасының жұмыс режимі келесідей: су қоймасын толтыру - қараша-ақпан, судың максималды көлемі - наурыз-сәуір, судың шығуы - сәуір-тамыз, судың минималды көлемі - қыркүйек-қазан айларында болады. Пайдаланудың жобалық режимі сақталған жағдайда су қоймасы балық шаруашылығы су айдыны ретінде пайдаланылуы мүмкін.

Жамбыл облысы Жуалы ауданындағы Терс-Ащыбұлақ су қоймасын қайта жаңарту Қазақстан Республикасы Экология, Геология және табиғи ресурстар министрлігінің "Су ресурстары комитеті" РММ (қазіргі уақытта су шаруашылығы және ирригация министрлігі) берген 2021 жылғы жобалауға арналған техникалық тапсырма негізінде әзірленді. Жобаның мақсаты бөгет бөгетінің шайылып кетуіне жол бермеу және оның мақсаты бойынша сенімді жұмыс істеуі үшін жағдай жасау, суару суын суару алқаптарына жеткізу және суармалы жерлерді ұтымды пайдалану болып табылады. Ол үшін жобада мынадай іс шараларды жүргізу көзделеді:
- жоғарғы еңістің қираған учаскелерін қалпына келтіру, бөгетті қажетті орындарға қосу және кеңейту және пайдалану жолының бөгетінің жоғарғы жағына орнату;
- жоғары беткейді монолитті темірбетон қаптамамен бекіту;
- бекіту-реттеу арматурасын ауыстыра отырып, су шығару құрылымын жөндеу;
- апатты төгу құрылымын жөндеу және қайта жаңарту;
- БӨП (КПП) үшін ғимарат салу (3 дана);
- электрмен жабдықтау объектілерін жөндеу және реконструкциялау;
- пьезометриялық ұңғымаларды қалпына келтіру;
- балық қорғау құрылғыларын салу;
- су қоймасының периметрі бойынша қоршау, жарықтандыру және бейнебақылау орнату;
- бөгетті автоматтандыру, жергілікті ескерту жүйесін орнату, қақпаларды автоматты басқару және бақылау, су деңгейінің датчиктері;
- бөгет бойынша электр жарықтандыру және жобаланатын ғимараттарды электр желісіне қосу;

- таранға қарсы құрылғы және шлагбаум.

Теріс-Ащыбұлақ су қоймасының жұмыс жобасын әзірлеу үшін мынадай жұмыс түрлері орындалды: гидротехникалық тексеру; бөгет жармасының инженерлік-геологиялық негіздемесі; топогеодезиялық іздестіру; объектіні техникалық тексеру; қызмет көрсететін пайдалану персоналы үшін ғимарат салу жөніндегі жобалау жұмыстары; электрмен жабдықтау және бейнебақылау жөніндегі жобалау жұмыстары; «Суды есепке алуды автоматтандыруды метрологиялық қамтамасыз ету» бөлімі бойынша жобалау жұмыстары; авариялық ағызу құрылысын реконструкциялау, су шығару құрылымын жөндеу және су қоймасы бөгетін күрделі жөндеу жөніндегі жобалау жұмыстары.

Теріс-Ащыбұлақ су қоймасы Теріс өзенінде Нұрлыкент ауылының шығысында Жуалы ауданында 11 км қашықтықта және Жамбыл облысы Тараз қаласының облыс орталығынан 50 км қашықтықта орналасқан. Геоморфологиялық тұрғыдан іздестіру аумағы Қаратау жотасының тау бөктеріндегі көлбеу жазығында орналасқан. Жер бедері салыстырмалы түрде тегіс. Зерттелетін бөгеттің биіктік белгілері 924,00-953,5 м аралығында ауытқиды және оңтүстіктен солтүстікке қарай көлбеу болады.

Тараз қаласы. IV климаттық кіші аудан, ауа температурасы °C: абсолюттік максимум +44,5; абсолюттік минимум -41,0; ең жылы айдың орташа максималды ауа температурасы, °C + 32,9; ең суық ауа температурасы (қамтамасыз етілуі 0,92): тәулік -26,1 бес күн -21,1. Ең суық кезеңдегі ауа температурасы (қамтамасыз етілуі 0,94) - 7,8. Ауаның орташа тәуліктік температурасы, °C, ауаның орташа тәуліктік температурасы бар кезең: <0 °C - 88 / -2,3;

<8 °C - 160/ 1,7;

<10 °C - 178/1,6.

Қараша-наурыз айларында жауын-шашын мөлшері - 170 мм, сәуір-қазан айларында жауын-шашын мөлшері - 174 мм. Төменде су қоймасының ситуациялық схемасы келтірілген.

Сурет 1 - Теріс-Ащыбұлақ су қоймасының ситуациялық қ сызбасы

Негізгі климаттық сипаттамалары:

Желтоқсан-ақпан айларында желдің басым бағыты О (Оңтүстік).

Желдің басым бағыты маусым-тамыз - С (Солтүстік).

Қаңтар айындағы орташа желдің максималды жылдамдығы - 7,3 м/сек.
Шілде айындағы румбалар бойынша желдің орташа жылдамдығының ең азы - 1,7 м/сек.
Мұздатудың нормативтік тереңдігі, м: - құмды саздар үшін - 1,00.
Нөлдік изотерманың енуі, - құмды саздар үшін - 1,10.
Қар жамылғысының биіктігі ең үлкен онжылдықтың максимумы - 50 см.
Тұрақты қар жамылғысының пайда болу ұзақтығы - 67 күн.
Дауыл шаңы бар күндердің орташа саны - 0,8 күн.
Қарлы боранмен күндердің орташа саны - 1 күн.
Найзағаймен күндердің орташа саны - 19 күн.
Жел қысымы бойынша аумақтың ауданы - V.
Көктайғақ қабырғасының қалыңдығы бойынша аудан - III.
Жел қысымының нормативтік мәні кПа - 1,0.
Қар жамылғысының нормативтік мәні, см - 50,0.

Теріс-Ащыбұлақ су қоймасы 1963 жылдан бастап ирригациялық мақсаттағы су қоймасының жобалық режимінде жұмыс істейді. Су қоймасын балық шаруашылығында пайдалану екінші орында және көбінесе су ағынының жоғарылауына байланысты балық шаруашылығын пайдалану мәселелері еленбейді. Су қоймасы балық қорғау құрылғысымен (РЗУ) жабдықталмаған, сондықтан балықтың бір бөлігі жазғы-күзгі кезеңде шахталық түбіндегі су ағызу арқылы, ал қысқы-көктемгі кезеңде Ақсу өзеніне және ирригациялық желіге апаттық ағызу арқылы шығарылады. Пайдаланудың жобалық режимі сақталған жағдайда су қоймасы балық шаруашылығы су айдыны ретінде пайдаланылуы мүмкін. Гидрохимиялық режим жылдың барлық маусымдарында қолайлы. Қыста газ режимін оңтайландыру өзен суларының түсуіне ықпал етеді. Термикалық және химиялық режимдердің қолайлы үйлесіміне қарамастан, коммерциялық мақсаттағы балықтардың мөлшері көп емес. Бұл - уылдырық шашу кезеңінде су қоймасының іске қосылуына және уылдырық шашатын жерлерді құрғатуға; фитофильді балықтардың уылдырық шашуы үшін субстраттың болмауына; су шығаруда балық қорғау құрылғысы болмауына; желді ауа-райының болуына; балық аулау шарасынан төмен балық аулауға байланысты болмақ.

Резервуардағы балықтар мен басқа гидробионттардың қорына шектеуші әсер азық-түлік базасының дамуы да әсер етеді, әсіресе азық-түлік бәсекелестігі пайда болған кезде балықтың минималды деңгейі мен ең көп концентрациясы болған кезде. Жауын-шашынның жылдық мөлшері орташа есеппен 215-260 мм құрайды, оның 70-75% - дан астамы көктем мен қыста болады. Су қоймасының аймағы жиі желмен сипатталады, олардың ұзақтығы жылына шамамен 120-160 күн. Соңғы жылдардағы ауаның орташа жылдық температурасы +12°С. Аязсыз кезеңнің ұзақтығы орта есеппен 240 күнге дейін. Терісте орташа айлық температура 3 айдан асады: желтоқсан, қаңтар, ақпан, наурыздың бір бөлігі. Ең суық ай - қаңтар, ең ыстық ай - шілде. Теріс-Ащыбұлақ су қоймасының гидрохимиялық режимі жүйелі түрде зерттелуде. Химиялық талдауға арналған су сынамалары 3 станцияда алынады. 2006 жылдың шілдесінде судың pH 7,9-8,0 құрады, бұл фотосинтез процестерінің төмен деңгейін көрсетеді. Жалпы биогендік қосылыстардың концентрациясы су флорасын дамыту үшін жеткілікті. Аммоний тұздары мен нитриттер зерттелген жерлерге біркелкі бөлінеді.

Судың минералдануы төмен, жекелеген учаскелерде ол 2005 жылы 266-дан 306 мг/дм^3-ке дейін және 2006 жылы 281-ден 283 мг/дм^3-ке дейін өзгерді. Теріс өзенінің бассейні бойынша сел тасқынымен су тасқынын қалыптастыру үшін Қаратау тауларында тату қар еритін нөсерлі жаңбырдың түсуі басты рөл атқарады.

Қарастырылып отырған учаскенің аумағында палеозойдан қазіргі жыныстарға дейінгі шөгінділер дамыған. Палеозой кристалды жыныстары тау құрылыстарының шегінде ашылады, ал жазық бөлігінде олар 500-ден 1600 м-ге дейінгі тереңдікте ұңғымалармен ашылады.палеозой жыныстарында эрозиямен жатқан бор шөгінділері барлық жерде кездеседі. Төменгі және жоғарғы бөлімдермен ұсынылған, қуаты 150-200 м-ден 630-750 м-ге дейін, сазды-құмды түзілімдер, алевролиттер, құмтастар, конгломераттар, гравелиттер. Палеоген шөгінділері бор түзілімдерінде эрозияға ұшырайды. Олардың қуаты 75 м-ге дейін жетеді, олар монотонды қара сұр саздар мен құмдармен ұсынылған. Олигоцен-миоцен жауын-шашыны саздармен, құм қабаттары бар алевролиттермен ұсынылған.

Суды сақтайтын тау жыныстары қалыдығы 10-15 м-ге дейін құмды-сазды агрегаты бар тасты-қиыршық тасты тастармен ұсынылған. Аллювиалды - пролювиалды жоғарғы төрттік шөгінділердің сулы қабаты өзендердің бірінші және екінші жайылма террассаларында дамыған. Су жинайтын шөгінділердің қуаты 30 м - ге дейін барады, олар құм, құмды саз және саздақтардың қуаты аз линзалары бар қиыршық тастар мен қиыршық тастардан тұрады. Аллювиалды-пролювиалды орта төрттік шөгінділердің сулы қабаты ауданда барлық жерде дерлік дамыған және өзендерді шығару конустарымен шектеседі. Су қоймасы шөгінділері қуаты 30-80 м дейін саздақ, құмды және құмды линзалары бар құмды және сазды агрегаты бар қиыршық тасты және майдатастармен ұсынылған. Жұмыс ауданындағы плиоцен шөгінділерінің сулы қабаты барлық жерде дамыған, пайдалану үшін негізгі коопталатын көкжиек болып табылады. Қысымды сулар, шамасы, бастауы 10-20 м су деңгейінің пайда болу тереңдігі - 35-60 м. Жер асты сулары ағынының шығыстан батысқа қарай жлпы бағыты 0,007-0,008 еңісімен ағады. Горизонттың молдығы 0,5-0,6-дан 2,5 л/с-қа дейінгі ұңғымалардың меншікті дебиттерімен сипатталады, минералдануы 0,8 г/дм^3 дейін тұщы су. Сулы горизонттың толысуы тау бөктерінде, атмосфералық жауын-шашынның инфильтрациясы есебінен қиыршық тасты-шағалды шөгінділердің даму аймақтарында жүреді. Сульфаттардың нормативтік құрамы бойынша жер асты сулары портландцементтегі бетон үшін әлсіз агрессивті, ал сульфатқа төзімді портландцементтегі бетон үшін агрессивті емес. ҚР ҚНжЕ 2.03.30-2006 сәйкес алаңның сейсмикалығы 8 баллға тең. ҚР ҚНжЕ сәйкес 8.02-05-2002, бір шөмішті экскаваторлар, бульдозерлер және қолмен игеру үшін, игеру қиындықтары бойынша бұру арнасы трассасындағы топырақтың құрылыс категориясы екінші және үшінші болып табылады.

Су қоймасының мақсаты

Қолданыстағы бөгет - Теріс өзенінің су ағынын бөгейтін және сол арқылы оның алдындағы су деңгейін көтеретін гидротехникалық құрылым. Бөгет жер, үйінді, тальвег бойынша максималды биіктігі 28,2 м, бөгеттің жотасы бойынша ұзындығы 1920,0 м, жоғарғы көлбеу жақтауы m=3,0, ал төменгі көлбеу жақтауы m=2,25. Жоғарғы беткей қалыңдығы 20 см монолитті темірбетонмен бекітілген, ал оның астында қалыңдығы 30 см құм толтырғышы бар қиыршық тас орналасқан, апаттық су төгетін қондырғы ашық типті, су тасқыны кезінде 586,0 м^3/с су мөлшерінде есептік ағынды өткізуге қызмет етеді. 36,0 м^3/с ағынды жіберуге арналған құбырлы типтегі су ағызу құрылымы, су шығынын реттеу монолитті темірбетон мұнарасына орнатылған бөгеттің жоғарғы бьефінде тереңдетілген қақпалармен жүзеге асырылады. Су қоймасының толық көлемі - 158,6 млн.м^3, ал пайдалы көлемі - 157,7 млн. м^3. Қаралып отырған объект ҚР РДС сәйкес 1.02-04-2013, жауапкершіліктің II (қалыпты) деңгейінің техникалық күрделі объектілеріне жатады, өйткені су қоймасының көлемі 50-200 млн.м^3 болатын гидротораптың тірек құрылыстары П2.2 кестесіне сәйкес. ҚР ҚНжЕ 2-қосымшасы бойынша 1-тармақ 3.04-01-2008 гидротехникалық құрылыстардың III класы бар, ал топырақ материалдарынан жасалған бөгеттер ретінде кестеге сәйкес тальвег бойынша биіктігі 28,2 м. Б2. 1. ҚР ҚНжЕ 2-қосымшасы бойынша 1-тармақ 3.04-01-2008 гидротехникалық құрылымдардың III класы есептеледі.

Қазіргі уақытта Теріс-Ащыбұлақ су қоймасы уақтылы жөндеу-қалпына келтіру жұмыстарын жүргізбегендіктен өте қанағаттанарлықсыз жағдайда тұр. Теріс-Ащыбұлақ су қоймасы 1962 жылы салынып, пайдалануға берілді. «Теріс-Ащыбұлақ» су қоймасы бойынша объектіні пайдалануға бергеннен мақсатты күрделі жөндеу жүргізілмеген. Олар ағымдағы жөндеулермен шектелді, негізінен темірбетон қаптамасымен жоғары беткейді нығайту жүргізілген. Қазіргі уақытта судың толқындық әсеріне байланысты жоғары беткей барлық жерде жуылады және шайылады, монолитті темірбетон қаптамасының бұзылуы және бетон қуыстарының пайда болуы ішінара байқалады. Бөгеттің жоғарғы жағындағы пайдалану жолы бұзылуға ұшырады, бөгет жотасыныңң ені кейбір жерлерде жобадан азайды және жауын-шашын кезінде ол арқылы өту мүмкін болмайды. Қазіргі жағдайда бөгеттің жоғарғы жағында (жотасы) кей жерлерде 0,2-ден 0,5 метрге дейін төмендеу бар. 586,0 $м^3$/сек өтуге есептелген қарабайыр салынған автоматты апаттық ағызу құрылысының жай-күйі қанағаттанарлық емес, көктемгі кезеңдерде жыл сайынғы су тасқыны өтімдерінің өтуімен су тасқынын жіберу бойынша пайдалану персоналына көптеген проблемалар туғызады. Су шығаратын қондырғыда ысырма психикалық және физикалық тұрғыдан ескірген. Берілген су көлемін өлшеуге арналған гидробекет жоқ. Тиісінше, су қоймасы бөгетінің бейнебақылау және қоршау жүйелері де жоқтың қасы.

Жобалық шешімдер

Объектінің жай-күйін егжей-тегжейлі зерттеу нәтижесінде (топотүсірілім, өлшемдер) жобада мынадай негізгі жұмыс түрлері көзделеді:

1) су қоймасының бөгеті бойынша күрделі жөндеу: - бөгеттің денесін 16 тн (сапалы үйінді) салмағымен ылғалдандырып және роликтермен илектей отырып, топырақтың біртекті құрамдарымен бөлшектеу және қайта толтыру және төсеу жолымен асфальт жолының біркелкілігін жою; - асфальттау жолымен (бөгеттің парапетін және темірбетон қаптамасын ауыстыру) жотаның бетінің су өткізбейтіндігін қамтамасыз ету қалыңдығы 10-12 см ұсақ түйіршікті асфальтбетон қоспасы, ені 6,0 м сигналдық бағаналармен іске асады; - парапеттерді жөндеу;

2) авариялық төгу құрылысын күрделі жөндеу (аратіреу бетонын жөндеу; ысырма тығыздағыштарын ауыстыру; баспалдақтарды гидробекетке монтаждау; электр көтергіштерді ауыстыру; төменгі бьефті жөндеу);

3) БӨП (КПП) ғимаратын салу (су қоймасын күзету қызметі үшін ғимарат салу (3-дана));

4) күрделі жөндеу - электрмен жабдықтау объектілері (гидроторaптың электрмеханикалық және гидромеханикалық жабдықтарын электрмен жабдықтаудың резервтік көзі көзделген);

5) бөгетті автоматтандыру. Су қоймасының периметрі бойынша қоршау, сыртқы жарықтандыру және бейнебақылау орнату. Жергілікті хабарлау жүйесін орнату: - ғимараттар мен құрылымдарды мониторингілеудің автоматтандырылған жүйесі; су деңгейінің датчиктері; ысырмаларды автоматты басқару және мониторингтеу;

6) гидробекетті күрделі жөндеу;

7) пьезометриялық ұңғымаларды қалпына келтіру және пьезометрлерді қалпына келтіру. Сорғыларды басқару қалқандарын ауыстыру;

8) су шығару (бетонды жөндеу, 2,0 x 2,0 м қақпаларды ауыстыру)

9) балық қорғау құрылғыларын орнату.

Мақаланың басында жобаның мақсаты бөгет бөгетшесінің шайылып кетуіне жол бермеу және оның тағайындалуы бойынша сенімді жұмыс істеу үшін жағдай жасау, суару суларын егіс алқаптарына жеткізу және суармалы жерлерді ұтымды пайдалану деп айтылған болатын. Теріс-Ащыбұлақ су қоймасын реконструкциялау үшін су қоймасының бөгеті бойынша күрделі жөндеу жүргізілетін болады.

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Political Studies

Cultural diplomacy and China's 'soft power' as a means of projecting national identity abroad

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Abstract

This article explores the role of China's cultural diplomacy and *soft power* in projecting national identity beyond its borders. Drawing on theoretical frameworks of cultural international relations and recent policy initiatives, the study examines how China's institutional, educational, and media instruments—such as Confucius Institutes, global cultural events, and digital platforms—contribute to shaping a positive and coherent image of the nation. The paper traces the evolution of China's *soft power* concept from its Western theoretical origins to its adaptation within the Chinese ideological context. It also highlights the interplay between cultural diplomacy and national identity formation, emphasizing their mutual reinforcement in the context of globalization. Special attention is given to China's initiatives in Central Asia, particularly in Kazakhstan, as examples of regionally embedded cultural cooperation. The study identifies both achievements and limitations of China's approach, including cultural perception gaps, political sensitivities, and ideological challenges. Finally, it outlines future research directions focusing on digital diplomacy, youth engagement, and cultural branding strategies.

Keywords: China; cultural diplomacy; soft power; national identity; globalization; Confucius Institutes; digital diplomacy; Central Asia; cultural branding; international image

Introduction

In the context of China's growing role on the global stage, the country faces the task of asserting itself not only through economic and technological achievements but also through cultural and ideological influence. One of the key instruments in this process is the concept of soft power—the ability of a state to achieve its foreign policy goals through the appeal of its culture, values, and model of development rather than coercion or force.

Originally conceptualized by Joseph Nye, the idea of soft power has undergone significant adaptation within the Chinese context. Since the early 21st century, China has actively integrated the notion of ruǎn shílì (软实力) into its foreign policy strategy, where cultural diplomacy serves as a central mechanism for shaping a positive international image and projecting national identity beyond its borders.

Contemporary Chinese cultural diplomacy performs a dual function. On the one hand, it promotes China's image as an ancient civilization with a rich cultural heritage; on the other, it conveys a modern vision of Chinese national identity built upon the ideas of the "great rejuvenation of the Chinese nation" (中华民族伟大复兴) and the "community with a shared future for mankind" (人类命运共同体). Through its global network of Confucius Institutes, international cultural festivals, educational exchanges, and media initiatives, China seeks not only to popularize its language and traditions but also to cultivate a distinct perception of its civilizational uniqueness.

The relevance of this research lies in the fact that in the 21st century, cultural forms of influence have become essential instruments of global positioning and international communication. For China, cultural diplomacy functions not merely as a component of image-building but as a systematic tool for constructing a positive international perception and reinforcing internal cohesion through its outward projection.

The aim of this article is to analyze how China's cultural diplomacy and soft power strategy serve as mechanisms for projecting national identity abroad, to identify the principal tools and approaches involved, and to assess the challenges and limitations of this process.

The study employs methods of discourse analysis, content analysis of media materials, and a comparative approach to examining national models of cultural diplomacy. The findings will help elucidate the specific characteristics of China's approach to cultural influence and evaluate its effectiveness within the broader context of international relations and intercivilizational dialogue.

The Concept of China's "Soft Power" and Its Evolution

The term "soft power", coined by Joseph Nye, originally described how states leverage culture, political values and foreign policies perceived as legitimate or attractive to shape others' preferences rather than coerce them. In practice, however, China's appropriation of the concept has diverged from Nye's people-centered, civil-society emphasis toward a *state-directed* model. Since the early 2000s Beijing has reframed soft power as an instrument integrally linked to official narratives, state institutions and strategic initiatives (e.g., the "Chinese Dream" and "community with a shared future for mankind"), thereby converting it into an element of top-down public diplomacy and governance of international discourse.

Scholars note two main analytical shifts when moving from the Western origin of the term to the Chinese usage: (1) an increased role of the state as the primary agent of soft power production, and (2) an expansion of the toolkit beyond cultural attraction to encompass institutional networks, large-scale projects (e.g., Belt and Road cultural programs), and coordinated media campaigns. This reorientation makes China's soft power both more capacious (more tools) and more politicized (closer to state strategy) than the original Nye formulation.

In the 2010s and into the 2020s, Chinese state organs—most notably the Ministry of Culture and Tourism, the Ministry of Foreign Affairs, and party-run international communication bodies—have institutionalized cultural diplomacy as a component of national strategy. These institutions coordinate cultural events, state media outlets, grant programs, and the deployment of language and study centers abroad to shape long-term perceptions of China. Empirical reviews of government-backed cultural programs and official white papers show an explicit linkage between cultural outreach and broader diplomatic goals, including economic cooperation and geopolitical influence.

Operationally, ministries and research institutes have pursued: creation and funding of Confucius Institutes and similar language centers; bilateral cultural years and touring exhibitions; state sponsorship of film festivals and international museum partnerships; and targeted media products (state television, global news outlets, and social media platforms) aimed at foreign publics. These efforts are frequently coordinated with economic initiatives such as the Belt and Road to produce mutually reinforcing narratives of connectivity and mutual benefit.

While often used interchangeably, "cultural diplomacy" and "soft power" denote related but distinct analytic categories: cultural diplomacy refers to concrete policies and actions (exchanges, exhibitions, language teaching, cultural centers), whereas soft power denotes the effect—the attraction and influence generated by these activities. In China's practice, cultural diplomacy functions as the principal instrument through which soft power is operationalized. That means the study of China's soft power necessarily examines the design, scale, and reception of cultural diplomacy programs.

Recent empirical studies (2020–2025) provide mixed assessments: large-scale, well-resourced cultural diplomacy can increase visibility and awareness, but its success in producing enduring positive attitudes is conditioned by political context, messaging credibility, and the autonomy (or lack thereof) perceived in local partner institutions. Put simply, cultural diplomacy builds the scaffolding for soft power, but domestic politics, transparency, and local reception determine whether that scaffolding becomes persuasive influence.

China's Main Directions and Instruments of Cultural Diplomacy

Confucius Institutes and Language Policy – A Core Tool of Cultural Influence

One of China's most prominent instruments for cultural diplomacy is the network of Confucius Institutes (CIs), which serve to promote Mandarin language learning and Chinese culture abroad. As Sun (2023) argues, "CIs have been recognised as agents of Beijing by promoting language and culture, fostering global recognition of China as a civilized society and cultural power."

Recently in 2024, the 20th anniversary of the Confucius Institutes was celebrated, with official statements by China's Ministry of Education reaffirming the effort to advance international Chinese-language education and cultural outreach.

At the same time, the program has drawn criticism in some Western countries regarding academic freedom and host-institution governance. For instance, Repnikova (2022) highlights that while CIs offer language and cultural access, the inducements and strategic motivations raise questions about autonomy and influence.

From a language-policy perspective, these institutes facilitate the spread of Mandarin as a vehicle for cultural influence, reinforcing the civilisational identity China wishes to project. The expansion of CIs in global regions—especially the Global South—provides empirical evidence of China's strategy to embed cultural diplomacy through educational networks.

Cultural Events, Film, Literature, Exhibitions and Tourism as Image-Building Tools

Beyond institutional language centres, China deploys cultural diplomacy via large-scale events, film and literature exports, exhibitions of Chinese art and heritage, and inbound tourism promotions. For example, a 2025 article in *China Daily* reported that China's improved ranking in the Global Soft Power Index was driven in part by social media and cultural links such as immersive travel and arts experiences that reshape perceptions.

Moreover, the integration of luxury, craft and cultural exhibitions in China and abroad are increasingly seen as soft-power vehicles, blending heritage and modernity to present China as culturally dynamic.

In cultural diplomacy terms, these efforts serve dual functions: (1) they reinforce China's civilisational narrative (ancient culture, continuity, modern resurgence), and (2) they create favourable impressions among foreign publics through experience-based engagement (festivals, exhibitions, film screenings, tourism). This shift toward experiential diplomacy is described in recent literature as moving "from push to pull" in China's soft-power strategy.

Media and Digital Platforms in Shaping China's Image (CGTN, TikTok/Douyin, Weibo)

In the digital age, China's cultural diplomacy increasingly utilises new media. Digital platforms – notably Douyin (Chinese TikTok), TikTok for international audiences, and state-media networks such as CGTN – act as channels for projecting Chinese culture, values and soft power. For instance, Chinese media outlets highlight daily life, cultural experiences and travel narratives in China to transform foreign perceptions.

2025 research piece describes how short-video platforms have become central to China's influence strategy: "soft power appears… less like a national campaign and more like an algorithm that promotes… culture, commerce and movement."

Thus, through digital storytelling, viral content and cross-platform engagement, China re-frames the Chinese identity in terms of innovation, youth culture, and civilisational appeal (e.g., the "C-Cool" trend).

This media dimension of cultural diplomacy reflects the idea that image shaping no longer passes solely through official channels, but increasingly through participatory, experience-based, algorithm-driven platforms.

International Education and Academic Exchange Programmes (Confucius China Studies Program, Silk Road Scholarships)

Educational and academic exchange programmes are another key instrument of China's cultural diplomacy. For example, the Chinese Government's "CSC Silk Road Program" is aimed at students, scholars and teachers from abroad to study or conduct research in Chinese universities, thereby deepening mutual understanding and building alumni networks.

In the higher-education arena, China also fosters university alliances and global partnerships under the framework of the Belt and Road Initiative to promote "knowledge diplomacy" and internationalisation of its universities. A 2023 study in *Higher Education* demonstrates how China uses university alliances as both soft-power and diplomacy tools.

Through these programmes, China positions itself as a centre of cultural attraction, academic opportunity and global networking, thereby projecting its national identity via educational appeal. As a policy dimension, this approach links cultural diplomacy with human-capital diplomacy: those who study in China become nodes of influence and potential partners in research, teaching and institutional cooperation.

Strategy for Projecting National Identity Outward

Promoting Chinese culture globally to strengthen national distinctiveness

China deliberately uses global cultural promotion as a means to solidify and externalize its national identity. By exporting language, heritage, arts, and tourism themes, it presents itself as a civilisation that is both ancient and modern, distinctive yet universally accessible. For example, the headline initiative Chinese Dream (中国梦) links the rejuvenation of the Chinese nation with global participation. The promotion of Confucian values, intangible cultural heritage and major cultural-tourism "years" (Culture & Tourism Years) underscores a narrative of China as a culturally confident actor rather than just an economic power.

By engaging in people-to-people exchange, establishing sister-city links across continents, and hosting international cultural festivals, China frames its identity as globally embedded, thereby reinforcing the domestic sense of unity and historic continuity while projecting an image of cultural leadership abroad.

The "Chinese Dream" (中国梦) and the "Community of Shared Future for Mankind" (人类命运共同体) – Contemporary national narratives with global resonance

Two key ideological constructs lie at the heart of China's outward-projection strategy: the Chinese Dream and the Community of Shared Future for Mankind. The former emphasizes the revitalisation of the Chinese nation and collective identity; the latter proposes that China's national rise is intertwined with global common interests. As one official source states, the Community of Shared Future "provides China's answer to the question of our times — what kind of world we should build and how we should build it."

These narratives serve dual functions: internally, they foster cohesion, national pride, and a sense of historical mission; externally, they position China as a benevolent civilisational power, engaged in global cooperation, responsible for both its own development and the common good of humanity. The discursive study of the Chinese Dream shows how it constructs a collective identity: "we the people of all ethnic groups in China should bear our mission in mind and make concerted efforts to turn the wisdom and strength of our 1.3 billion people into an invincible force."

Constructing the image of China as a "benevolent, civilised, peaceful" nation via cultural diplomacy

A central objective of China's cultural diplomacy is to cultivate and project the image of China as peaceful, civilised, innovative and inclusive—antithetical to the image of a purely economic or military power. The official narrative of building a community with a shared future emphasises harmony, win-win cooperation and global responsibility:

"The initiative … is aimed to seek the broadest common interests of countries in building a better future for mankind, and will be conducive to enhancing heart-to-heart communication between people in China and other countries." mfa.gov.cn+1
Through cultural festivals, heritage diplomacy, educational exchange, and media outreach, China reinforces its self-image and projects it internationally: a nation that values tradition and innovation, domestic development and global connectivity. These efforts help recast the Chinese national identity in global terms—not simply as "the rising power", but as "the partner, the contributor, the civilising actor."
By shaping this narrative externally, China reinforces internally the conception of national progress that is bound up with global engagement, thus making external projection and internal identity mutually reinforcing.

Challenges and Limitations of China's Cultural Diplomacy

Critical perspectives in Western countries on China's cultural policies (information risks, ideological expansion)

China's cultural diplomacy has faced growing scrutiny in many Western countries—where it is frequently characterised not simply as benign cultural engagement but as a component of a broader ideological or strategic agenda. For example, scholars observe that China's initiatives through institutions such as the Confucius Institute Headquarters are often framed in Western discourse as "cultural infiltration" or soft-power expansion under the guise of language and culture.

At the international governance level, China's cultural policy within organisations like UNESCO has faced criticism for being "state-driven", lacking transparency or civil-society participation, creating a trust deficit that limits its agenda-setting capacity.

Such skepticism manifests in responses such as host-institutions shutting down Confucius Institutes, state media characterising China's cultural outreach as a component of strategic competition, and public opinion in some countries becoming increasingly cautious about collaborations perceived to carry ideological strings attached.

Thus, one clear limitation of China's cultural diplomacy is the perception problem: when external audiences interpret its activities as vehicles for ideological influence or geopolitical leverage, the soft-power effect is undermined.

Obstacles to the effectiveness of "soft power": differences in cultural reception, linguistic barriers, political factors

Effectiveness of soft power depends heavily on recognition, acceptance and resonance among target publics. In the Chinese case, several structural obstacles reduce its reach:

- Cultural mismatch: Chinese narratives often emphasise collectivist values, group solidarity and state-led modernisation, which may contrast with individualistic or pluralistic value systems prevalent in many Western societies. The result is lower resonance or even rejection of the intended messages.
- Linguistic and institutional barriers: While the expansion of Mandarin learning is significant, language remains a barrier; moreover, the local institutional context (education, media, civil society) may not always align with the form and content of Chinese-led programmes.
- Political and strategic constraints: The broader geopolitical context shapes reception: territorial disputes, ideological competition, concerns about technology transfer, and security narratives often overshadow cultural diplomacy efforts. For example, a recent study notes that in Vietnam, historical antagonism and strategic alignment with the United States severely reduce the effectiveness of Chinese cultural diplomacy despite large investment. clausiuspress.com

In sum, China's soft power ambitions are tempered by the gap between the scale of investment and the degree of genuine influence, as well as by the interlocking political, cultural and structural obstacles.

Internal contradictions: balancing traditional values and a modern image

Another set of limitations emerges from domestic contradictions inherent in China's dual drive to project tradition and modernity simultaneously. On one hand, the cultural-diplomatic narrative emphasises China's ancient civilisational roots, harmony, and continuity; on the other hand, it aims to present China as modern, innovative, global-oriented and open. This duality can generate tension:

- If traditional values are overly emphasised, the image of a forward-looking modern China may be weakened among younger or global audiences.
- If modernity or innovation is emphasised too strongly, the civilisational narrative may seem superficial or disconnected from lived realities of Chinese society. Moreover, the ideological control exercised domestically (media regulation, censorship, emphasis on state-led narrative) may complicate external outreach: foreign publics may view the projected image as carefully managed or lacking authenticity. For example, China's own commentary acknowledges that in Southeast Asia "concerns sometimes arise over politicised media, biased textbooks, and dominant Chinese symbols overshadowing local cultures."
- Therefore, the challenge for China's cultural diplomacy is to maintain coherence between the internal model of national identity and the external image being projected—with inconsistencies or disjunctions reducing credibility and soft-power impact.

Cultural Diplomacy between China and Central Asian Countries: A Model of Interaction

China's cultural initiatives in Kazakhstan: Confucius Institutes, cultural festivals, academic projects

The bilateral cultural-diplomatic cooperation between Kazakhstan and China has notably expanded in recent years. For example, as of 2023, Kazakhstan hosts five Confucius Institutes established in partnership with Chinese universities.

These institutes serve not only language and cultural teaching functions but act as platforms for broader people-to-people exchange.

Cultural festivals—such as the "Kazakhstan Tourism Year in China" and the reciprocal "China Tourism Year in Kazakhstan"—demonstrate how tourism and culture converge in bilateral strategy.

Media cooperation also plays a strong role: in July 2024 in Astana, a major China-Kazakhstan cultural exchange event was held where Chinese and Kazakh artists, institutions (such as the editorial office of CMG and Eurasian National University) signed memoranda of cooperation.

Academic projects are part of the mix too: e.g., on 21 May 2023, the Al-Farabi Kazakh National University signed cooperation memoranda with several leading Chinese universities covering staff and student exchanges, joint conferences and research.

Together, these initiatives show how China uses multi-layered tools (language centres, festivals, academic ties, joint media) to deepen cultural diplomacy with Kazakhstan — thereby anchoring its external cultural-identity projection within a regional partner state.

China's national identity and its manifestation in cultural partnership with Kazakhstan

The China-Kazakhstan cultural cooperation reveals how China's national identity is externally articulated: as ancient civilisation turned modern innovator, as responsible global partner, and as culturally open for exchange. For instance, the joint production of the film *"The Composer"* by Chinese and Kazakh filmmakers, and the creation of mutual cultural centres (in Astana and Beijing) reflect China's desire to present itself as a collaborative civilisational power engaged in shared heritage.

Kazakhstan thus becomes a site where China's narrative of identity is reified: through Confucius Institutes, academic alliances and cultural festivals, Chinese-style values, cultural tropes and language enter into a bilateral context — not just as export, but as co-creation with local institutions. The cultural exchange drives mutual understanding while simultaneously embedding China's identity narrative in Central Asian space.

Lessons from China's experience and regional policy recommendations

From the bilateral China-Kazakhstan experience, several policy-relevant lessons emerge:

- Local partnership and institutional embedding matter: successful cultural diplomacy depends on host-country institutions being involved (universities, cultural centres, local media) rather than purely top-down imposition. Kazakhstan's universities' active role (e.g., KazNU, KIMEP) illustrates this.
- Mutual cultural framing enhances acceptance: China's identity projection gains legitimacy when cultural exchanges reflect joint narratives (shared Silk Road heritage, common civilisation links) rather than unilateral dissemination.
- Diversified tools strengthen resonance: language centres, media cooperation, joint productions, festivals and academic exchanges form an ecosystem rather than a single instrument.
- Regional specificity and respect for local identity are crucial: while projecting its identity, China must adapt to Kazakhstan's language, cultural context and national priorities. Failure to respect local priorities may reduce impact.
- Sustainability and reciprocity improve outcomes: Long-term outcomes arise when exchanges are continuous, institutionalised and mutually beneficial, rather than episodic.

Policy-recommendations for further regional cooperation:

- Expand regional cultural hubs that act as Sino-Central Asia centres of excellence in culture and education.
- Strengthen joint curricula and research programmes linking Chinese and Central Asian universities with a focus on shared history, culture and future innovation.
- Use digital platforms and media co-productions to reach younger demographics in Central Asia with culturally resonant content.
- Ensure local agency and co-ownership of projects so the host country (e.g., Kazakhstan) sees benefit beyond receiving culture — but as an equal partner in shaping programmes.
- Monitor and evaluate cultural diplomacy outcomes in terms of mutual cultural understanding, identity resonance, and institutional embedding rather than short-term event statistics.

Conclusion

Summarizing the findings of this research, it becomes evident that China's cultural diplomacy serves as an effective instrument for both strengthening national identity and shaping its international image. Through the strategy of *soft power*, China systematically promotes its cultural values, language, history, and image of modern development to the global community. This process functions not only as a tool of image-building but also as a mechanism for consolidating national identity at both domestic and international levels.

The effectiveness of cultural diplomacy lies primarily in its comprehensive and institutionalized nature: Confucius Institutes, international education programs, media and digital platforms, tourism, and cultural events collectively constitute an integrated ideological and cultural policy framework. As China's experience demonstrates, cultural diplomacy has evolved into a key tool for harmonizing national interests with international cooperation.

At the same time, this study revealed several challenges and limitations in the implementation of the "soft power" strategy, including differences in cultural perception, language barriers, issues of political trust, and critical attitudes from Western countries. These factors underscore the necessity of further refining and diversifying China's approaches to cultural diplomacy.

Future research directions may include the following areas:

- Digital diplomacy — analyzing China's experience in disseminating national narratives through platforms such as TikTok (Douyin), Weibo, and other social media;
- Youth policy and educational diplomacy — exploring strategies of cultural influence through international student engagement and academic exchange programs;
- Cultural branding — examining how the concepts of the *"Chinese Dream"* and the *"Community of Shared Future for Mankind"* are promoted as elements of China's national brand at the global level.

Thus, China's cultural diplomacy emerges not only as an instrument of foreign policy but also as a vital ideological and cultural platform for safeguarding and revitalizing national identity in the context of globalization.

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ҚАЗАҚСТАНДАҒЫ САЙЛАУ ПРОЦЕСІНДЕГІ ӘЛЕУМЕТТІК МЕДИА МАНИПУЛЯЦИЯЛАРЫ

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Аңдатпа. Бұл мақалада Қазақстандағы сайлау процестерінде әлеуметтік медианың атқаратын рөлі мен оның саяси манипуляция құралы ретіндегі ерекшеліктері жан-жақты талданады. Зерттеу әлеуметтік желілердің электораттың мінез-құлқына ықпал ету тетіктерін, атап айтқанда таргеттелген жарнама, фейк жаңалықтар, эмоциялық контент, блогерлік насихат және алгоритмдік сүзгілер арқылы қоғамдық пікірді бағыттау тәсілдерін қарастырады. Эмпирикалық база ретінде 2019–2023 жылдар аралығындағы Қазақстандағы президенттік және парламенттік сайлаулардың тәжірибесі алынған. Нәтижесінде әлеуметтік медианың демократиялық коммуникацияны кеңейту әлеуетімен қатар, ақпараттық манипуляция мен фейк контенттің таралу қаупі артып отырғаны анықталды. Автор әлеуметтік медианың саяси процестерге әсерін төмендету үшін цифрлық сауаттылықты арттыру, онлайн насихатты құқықтық тұрғыда реттеу және фейк ақпаратқа қарсы тұрақты мониторинг жүйесін енгізу қажеттігін негіздейді.

Түйін сөздер: әлеуметтік медиа, саяси манипуляция, сайлау процесі, саяси манипуляция, фейк жаңалықтар, таргеттелген жарнама, ақпараттық қауіпсіздік, цифрлық сауаттылық, демократия.

Жулдыз Балмурзина, Макпал Анламасова
«СОЦИАЛЬНЫЕ МЕДИА-МАНИПУЛЯЦИИ В ИЗБИРАТЕЛЬНОМ ПРОЦЕССЕ КАЗАХСТАНА»

Аннотация. В статье всесторонне рассматривается роль социальных медиа в избирательных процессах Казахстана и их использование как инструмента политической манипуляции. Исследование анализирует механизмы влияния социальных сетей на поведение избирателей, в частности таргетированную рекламу, распространение фейковых новостей, эмоциональный контент, блогерскую агитацию и алгоритмические фильтры, формирующие общественное мнение. Эмпирической основой исследования послужил анализ президентских и парламентских выборов в Казахстане за период 2019–2023 годов. В результате установлено, что, наряду с потенциалом социальных медиа в расширении демократической коммуникации, возрастает и риск информационных манипуляций и распространения дезинформации. Авторы обосновывают необходимость повышения цифровой грамотности населения, правового регулирования онлайн-агитации и внедрения постоянной системы мониторинга фейковых новостей для снижения влияния социальных медиа на политические процессы.

Ключевые слова: социальные медиа, политическая манипуляция, избирательный процесс, фейковые новости, таргетированная реклама, информационная безопасность, цифровая грамотность, демократия.

Zhuldyz Balmurzina, Makpal Anlamassova

«SOCIAL MEDIA MANIPULATIONS IN KAZAKHSTAN'S ELECTORAL PROCESS»

Abstract. This article provides a comprehensive analysis of the role of social media in Kazakhstan's electoral processes and its growing use as an instrument of political manipulation. The study explores the mechanisms through which social networks influence voter behavior — including targeted advertising, fake news dissemination, emotional content, influencer-driven campaigning, and algorithmic filtering that shapes public opinion. The empirical basis of the study draws on the analysis of Kazakhstan's presidential and parliamentary elections between 2019 and 2023. The findings reveal that while social media holds significant potential for enhancing democratic communication, it also increases the risks of informational manipulation and the spread of disinformation. The authors argue for the necessity of improving digital literacy, strengthening legal regulation of online campaigning, and establishing a continuous monitoring system against fake news to mitigate the political influence of social media.

Keywords: *social media, political manipulation, electoral process, fake news, targeted advertising, information security, digital literacy, democracy.*

... Манипуляцияның ең тиімді
тәсілі — адамдар өздері қабылдаған шешім
деп сенетін нәрсені қабылдату.

Ноам Хомский

Кіріспе

XXI ғасырда сайлау процестері цифрлық кеңістікпен тығыз байланысты бола түсті. Ақпараттық технологиялар мен әлеуметтік медиа саяси коммуникацияның басты арнасына айналып, электораттың мінез-құлқын қалыптастыруда шешуші рөл атқаруда[1]. Цифрландырудың әсерінен саяси партиялар мен үміткерлер дәстүрлі бұқаралық ақпарат құралдарынан гөрі интернет-платформаларға басымдық беріп, қоғаммен интерактивті байланыс орнатуға ұмтылады [2]. Мұндай үрдіс сайлау кампанияларының сипатын түбегейлі өзгертіп, онлайн манипуляция мен ақпараттық ықпал ету қауіпін арттырды [3].

Instagram, TikTok, Telegram және Facebook сияқты платформалар қазіргі саяси өмірдің маңызды құрамдас бөлігіне айналды. Бұл желілер ақпарат тарату жылдамдығы, аудиториямен тікелей байланыс орнату мүмкіндігі және эмоциялық ықпал ету әлеуеті арқылы электоралдық процестердің динамикасын түбегейлі өзгертті. Саяси коммуникация енді тек ақпарат жеткізудің құралы емес, сонымен қатар қоғамдық пікір мен сайлаушылардың мінез-құлқын қалыптастырудың пәрменді тетігіне айналып отыр [4].

Бүгінгі таңда сайлаушылардың басым бөлігі ақпаратты дәстүрлі БАҚ емес, әлеуметтік медиа арқылы алады. Бұл құбылыс саяси үгіт-насихаттың әдіс-тәсілдерін түбегейлі өзгертіп, электоралдық кеңістікте жаңа мүмкіндіктермен қатар жаңа қатерлер туғызды. Бір жағынан, әлеуметтік медиа азаматтардың саяси ақпаратқа қолжетімділігін кеңейтсе, екінші жағынан, жалған жаңалықтар, таргеттелген жарнама, алгоритмдік сүзгі және эмоциялық манипуляция арқылы қоғамдық санаға әсер етудің күрделі формалары пайда болды [5].

Қазақстан жағдайында бұл үрдіс айқын көрініс тапты. Соңғы президенттік және парламенттік сайлауларда цифрлық науқандар ерекше белсенділікпен жүргізілді.

Кандидаттар мен партиялар электоратпен тікелей байланыс орнату, жеке имидж қалыптастыру және ақпараттық күн тәртібін басқару мақсатында әлеуметтік медианы кеңінен пайдаланды [6]. Осы арқылы саяси коммуникацияның дәстүрлі формалары екінші орынға ығысып, электоралдық белсенділіктің негізгі алаңы виртуалды кеңістікке көшті.

Алайда, бұл процестің оң нәтижелерімен қатар, саяси манипуляцияның жаңа формалары да күшейе түсті. Әлеуметтік желілер арқылы сайлаушылардың пікірін бағыттау, фейк контент тарату, қоғамдық пікірді поляризациялау және эмоционалды ықпал ету сияқты тәсілдер саяси процестің ашықтығы мен әділдігіне қауіп төндіруде [7]. Сондықтан әлеуметтік медиа платформалары тек коммуникациялық құрал ғана емес, сонымен қатар қоғамдық сана мен саяси мінез-құлықты басқарудың заманауи механизмі ретінде қарастырылуы тиіс.

Осы тұрғыдан алғанда, зерттеу тақырыбының өзектілігі қазіргі қоғамдағы сайлау процестерінің цифрлық трансформациясын, оның ішінде әлеуметтік желілер арқылы жүзеге асатын манипуляция әдістерін ғылыми тұрғыда зерделеудің қажеттілігімен айқындалады.

Зерттеу жұмысының мақсаты – Қазақстандағы сайлау процесінде әлеуметтік желілер арқылы жүзеге асатын манипуляциялық әдістерді талдап, олардың саяси коммуникация мен қоғамдық пікірге ықпал ету ерекшеліктерін анықтау.

Зерттеу нысаны – Қазақстан Республикасындағы сайлау процестері мен олардың цифрлық кеңістіктегі көрінісі.

Зерттеу пәні – әлеуметтік желілердегі саяси манипуляция формалары мен олардың электоратқа ықпал ету тетіктері.

Зерттеу барысында отандық және шетелдік ғалымдардың еңбектері, сондай-ақ Қазақстандағы сайлау науқандарына қатысты ашық дереккөздер мен медиа материалдар пайдаланылды. Жұмыстың теориялық негізін саяси коммуникация, цифрлық саясат және ақпараттық манипуляция теориялары құрайды [8; 9].

Теориялық бөлім: әлеуметтік медиа және саяси манипуляция ұғымдары

XXI ғасырда саяси процестердің цифрлық кеңістікпен тоғысуы жаңа әлеуметтік феномендерді дүниеге әкелді. Солардың бірі — әлеуметтік медиа арқылы саяси манипуляция. Бұл құбылысты түсіндіру үшін заманауи саяси коммуникация теориялары мен ақпараттық қоғам тұжырымдамалары маңызды методологиялық негіз бола алады.

Кесте 1. Саяси процестердегі әлеуметтік медиа манипуляцияларын түсіндіретін теориялық тұжырымдамалардың салыстырмалы талдауы

Ғалым / Теория	Негізгі еңбегі / Тұжырымдамасы	Негізгі идеясы	Әлеуметтік медиа манипуляциясына қатысы
Мануэль Кастельс	Желілік қоғам теориясы (The Network Society)	Ақпарат – биліктің негізгі көзі. Қазіргі саясат желілік құрылымдар арқылы жүзеге асады.	«Ақпаратты кім бақылайды — сол билікке ие» қағидасы әлеуметтік медиадағы алгоритмдік бақылау мен ақпарат таратудың саяси салдарын түсіндіреді.
Пиппа Норрис	Digital Divide	Цифрлық теңсіздік демократиялық процестердің сапасына әсер етеді.	Ақпаратқа тең қолжетімсіздік манипуляция тиімділігін арттырады; медиасауатсыз азаматтар фейк контентке бейім болады.
Харольд Лассуэлл	Коммуникация моделі: "Кім айтады — не айтады — қандай арнамен — кімге — қандай әсермен"	Ақпараттың құрылымы мен әсерін талдау арқылы саяси коммуникацияны түсіндіреді.	Әлеуметтік медиада әр қолданушы әрі хабар таратушы, әрі қабылдаушы рөлінде — бұл манипуляция мүмкіндігін арттырады.
Маршалл Маклюэн	Medium is the Message қағидасы	Ақпарат мазмұнынан гөрі оны жеткізу тәсілі (медиум) маңызды.	Саяси хабарламаның мәнінен гөрі әлеуметтік желілердегі тарату форматы мен алгоритм шешуші рөл атқарады.
Нил Постман	Technopoly, Amusing Ourselves to Death	Медиа қоғамның ойлау мәдениетін өзгертеді.	Әлеуметтік желілер ақпаратты ойын-сауық түрінде беріп, саяси ойлау

			тереңдігін әлсіретеді.
Cambridge Analytica ісі	Facebook деректерін қолдану арқылы электоралдық манипуляция	Сайлаушылардың психологиялық профилін пайдалану арқылы бағытталған жарнама жасау.	Эмоциялық манипуляция мен жеке деректерді саяси мақсатта пайдалану қауіпті тенденция екенін көрсетті.
Е. Тәукелбаев	Қазақстандағы ақпараттық қауіпсіздік мәселелері	Ақпараттық мәдениет пен медиасауаттың төмендігі – манипуляцияға қолайлы орта.	Цифрлық сауаттылық деңгейін арттыру саяси манипуляцияның алдын алудың негізгі тетігі.
Д. Цой	Интернет және демократия	Интернет азаматтық қатысуды арттырады, бірақ фейк ақпараттың таралуына да жол ашады.	Желілік белсенділіктің өсуі бір жағынан демократияны нығайтса, екінші жағынан бақылау мен манипуляцияны күшейтеді.

Мануэль Кастельс өзінің «Желілік қоғам» тұжырымдамасында ақпараттың билік құралына айналғанын атап өтеді. Оның пікірінше, қазіргі саяси қатынастар желілік құрылымдар арқылы жүреді, сондықтан «ақпаратты кім бақылайды — сол билікке ие болады» [10]. Бұл идея әлеуметтік медианың сайлау процестеріндегі рөлін түсінуге мүмкіндік береді, өйткені цифрлық платформалар бүгінде саяси пікір қалыптастырудың басты алаңы болып отыр.

Норрис Пиппа «Digital Divide» еңбегінде интернеттің азаматтық қатысуға ықпалын зерттей отырып, цифрлық теңсіздік демократиялық процестердің сапасына әсер ететінін көрсетеді [11]. Оның тұжырымынша, ақпараттық ресурстарға тең қолжетімсіздік саяси манипуляцияның тиімділігін арттырады, себебі азаматтардың ақпараттық сауат деңгейі төмен болған сайын, олар жалған немесе бұрмаланған ақпаратқа тез сенеді.

Кастельс пен Норристің көзқарастарын салыстырсақ, біріншісі ақпараттық билік пен желілік құрылымның маңызын, ал екіншісі — ақпаратқа қолжетімділік пен медиасауаттылық факторының саяси салдарын баса көрсетеді. Бұл екі бағыт біріге отырып, қазіргі цифрлық манипуляцияның институционалды және әлеуметтік негіздерін түсіндіреді.

Саяси манипуляция ұғымы коммуникациялық процестің ажырамас бөлігі ретінде көптеген зерттеушілер еңбегінде талданған. Харольд Лассуэллдің классикалық коммуникация моделінде саясаттағы ақпарат ағымы «кім айтады — не айтады — қандай арнамен — кімге — қандай әсермен» деген формула арқылы сипатталады [12]. Бұл модель әлеуметтік медиа жағдайында жаңа мәнге ие болып отыр: қазір әрбір пайдаланушы ақпарат таратушы және қабылдаушы рөлін қатар атқарады.

Постман Нил мен Маклюэн Маршалл медиа технологияларды қоғамдағы ойлау формаларына ықпал ететін құрал ретінде қарастырды. Маклюэннің «medium is the message» қағидасы әлеуметтік желілер контексінде ерекше өзектілікке ие, себебі сайлаулар кезінде саяси хабарламаның мазмұнынан гөрі оны ұсыну форматы мен тарату алгоритмі үлкен әсер етеді [13; 14].

Осы теориялар тұрғысынан қарағанда, әлеуметтік медиа манипуляциясы — тек ақпарат мазмұнын бұрмалау емес, сонымен қатар оның таратылу логикасын басқару процесі. Мысалы, алгоритмдік фильтрлер арқылы сайлаушылар тек өз көзқарасына сай жаңалықтарды көреді, бұл «ақпараттық көпіршік» феноменін тудырып, қоғамдық пікірдің поляризациясын күшейтеді [15].

Cambridge Analytica ісі әлеуметтік медиа манипуляциясының нақты мысалы ретінде жаһандық деңгейде талқыланды. Бұл компания Facebook деректерін пайдалана отырып, сайлаушылардың психологиялық профилін жасап, әр топқа жеке бағытталған жарнамалық хабарламалар жіберген [16]. Осы әдіс саяси жарнаманы дербестендіріп, әр азаматтың эмоциялық әлсіз тұстарын мақсатты түрде пайдалануға мүмкіндік берген.

Көптеген ғалымдар бұл жағдайды цифрлық демократияның дағдарысы деп бағалайды. Себебі деректер мен алгоритмдер арқылы басқарылатын электоралдық процестер азаматтардың рационалды таңдау құқығын шектейді. Қазақстан контексінде де осыған ұқсас үрдістер байқалады: әлеуметтік медиа кеңістігінде мақсатты жарнамалар мен «боттық белсенділіктің» артуы саяси науқандар кезінде жиі тіркеледі.

Отандық зерттеушілер де бұл мәселені өз еңбектерінде талдап келеді. Мысалы, Е. Тәукелбаев ақпараттық қауіпсіздік пен медиа мәдениеттің төмендігі Қазақстанда әлеуметтік манипуляцияға қолайлы жағдай туғызатынын атап өтеді [8]. Ал Д. Цой «Интернет және демократия» еңбегінде желілік белсенділіктің артуы азаматтық қатысудың жаңа формаларын тудырғанымен, саяси бақылау мен фейк ақпараттың таралуына да жол ашқанын айтады [17].

Осылайша, шетелдік және қазақстандық ғалымдардың еңбектері әлеуметтік медиа манипуляциясының күрделі әрі көпқырлы құбылыс екенін дәлелдейді. Теориялық тұрғыдан алғанда, ол ақпараттық билік, алгоритмдік бақылау және саяси коммуникацияның жаңа формаларымен тығыз байланысты.

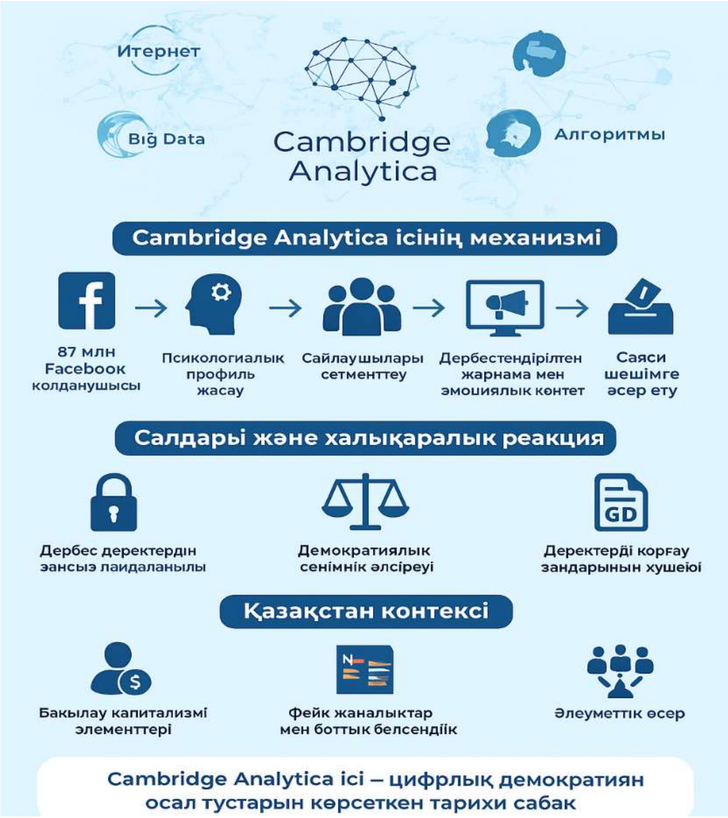
Халықаралық тәжірибе мысалы – Cambridge Analytica ісі

XXI ғасырдағы ақпараттық қоғам жағдайында сайлау процестері мен цифрлық коммуникацияның өзара байланысы айтарлықтай күшейді. Саяси технологиялар, электоралдық стратегиялар және үгіт-насихат тәсілдері енді тек дәстүрлі бұқаралық ақпарат құралдары арқылы емес, әлеуметтік медиа платформалары арқылы жүзеге асуда. Бұл құбылыстың ең жарқын әрі даулы мысалы – 2018 жылы әшкереленген Cambridge Analytica ісі, ол заманауи демократиялық процестердегі деректердің манипуляциялық әлеуетін айқын көрсетті [13].

Cambridge Analytica — Ұлыбританияда тіркелген деректерді талдау және саяси консалтинг компаниясы. Ол Facebook әлеуметтік желісінің шамамен 87 миллион пайдаланушысының жеке деректерін заңсыз жинап, оларды сайлаушылардың психологиялық портретін жасау үшін пайдаланған [14]. Жиналған мәліметтер негізінде сайлаушылардың мінез-құлқы, қызығушылықтары және эмоциялық реакциялары туралы нақты ақпарат алынған. Осы деректердің көмегімен компания сайлаушыларды психографиялық тұрғыда жіктеп, әр топқа бағытталған саяси жарнамаларды бейімдеп таратқан. Бұл тәсіл электоралдық шешім қабылдау процесіне тікелей ықпал етуді көздеді.

Зерттеулер көрсеткендей, бұл компания қолданған технологиялар дәстүрлі саяси коммуникация тәсілдерінен түбегейлі ерекшеленеді. Егер бұрын сайлау науқандары жаппай аудиторияға бағытталған болса, енді жеке тұлғалардың дербес психологиялық ерекшеліктеріне сай әсер ету тәсілі қолданыла бастады [15]. Мұндай тәсіл электораттың еркін таңдауына әсер етіп қана қоймай, азаматтардың ақпараттық кеңістігін де бұрмалайтын «дербестендірілген манипуляция» моделін қалыптастырды.

Бұл оқиға халықаралық демократиялық қауымдастықта үлкен резонанс тудырды. Cambridge Analytica ісі азаматтардың дербес деректерін қорғау, цифрлық платформалардың жауапкершілігі және саяси манипуляцияның жаңа формалары жөнінде кең пікірталасқа жол ашты [7]. Көптеген зерттеушілер бұл жағдайды «бақылау капитализмі» (surveillance capitalism) дәуірінің көрінісі ретінде бағалады, яғни деректер экономикалық және саяси биліктің басты көзіне айналды деген тұжырым қалыптасты [5].



Саяси ғылым тұрғысынан бұл жағдай медиа тәуелділік теориясы (Ball-Rokeach & DeFleur) мен қоғамдық күн тәртібі теориясының (Agenda-setting theory) өзектілігін күшейтті. Алгоритмдік жүйелер мен әлеуметтік желілердің жаңалық тарату механизмдері қоғамның назарын нақты тақырыптарға шоғырландыру арқылы қоғамдық пікірді бағыттай алады. Осылайша, сайлаушылар өздерінің ақпарат алу процесін еркін таңдау арқылы емес, платформа алгоритмдерінің логикасы арқылы қалыптастырады [16].

Посткеңестік кеңістікте, соның ішінде Қазақстанда, Cambridge Analytica ісінің кейбір элементтерін еске түсіретін үрдістер байқалады. Соңғы жылдары әлеуметтік желілерде мақсатты жарнама, боттық белсенділік, фейк аккаунттар мен жалған ақпаратты тарату әрекеттері айтарлықтай артты [17]. Мұндай құбылыстар әсіресе сайлау науқандары кезінде жиі тіркеледі және қоғамдық пікірге жасырын ықпал ету стратегияларының жаңа формасын көрсетеді.

Қазақстандық зерттеуші А. Байтенова әлеуметтік желілердің саяси процестерге әсерін талдай келе, олардың екіжақты табиғатын атап өтеді: бір жағынан, олар азаматтардың ақпаратқа қолжетімділігін арттырады және қоғамдық қатысу белсенділігін көтереді; екінші жағынан, олар манипуляция мен ақпараттық бұрмалаудың тиімді алаңына айналады [4]. Ал Е. Тәукелбаев бұл құбылысты ақпараттық қауіпсіздік тұрғысынан бағалай отырып, медиа мәдениеттің төмендігі және цифрлық сауатсыздық саяси манипуляцияны жеңілдететін факторлар екенін көрсетеді [8].

Осылайша, Cambridge Analytica ісі тек Батыс демократиялары үшін ғана емес, барлық цифрлық қоғамдар үшін маңызды сабақ болды. Бұл оқиға әлеуметтік медиа платформаларының саяси процестердегі күшін, сондай-ақ деректердің саяси қару ретінде қолданылу мүмкіндігін дәлелдеп берді. Қазақстан жағдайында бұл тәжірибеден туындайтын басты қорытынды – цифрлық кеңістіктегі саяси коммуникацияның ашықтығын арттыру, медиасауаттылықты дамыту және дербес деректерді қорғау мәдениетін қалыптастыру қажеттілігі [4; 8].

Қазақстандағы сайлау процестеріндегі әлеуметтік медиа ерекшеліктері және манипуляциялары

XXI ғасырдағы саяси процестер цифрлық коммуникацияның әсерімен түбегейлі өзгеріске ұшырады. Дәстүрлі БАҚ бұрынғыдай саяси науқандардың негізгі алаңы болып табылса, қазір бұл рөлді әлеуметтік медиа платформалары – Facebook, Instagram, TikTok, Telegram және YouTube өз қолына алды [18]. Әлеуметтік медиа тек ақпарат тарату құралы ретінде ғана емес, сонымен қатар қоғамдық пікірді қалыптастыру мен саяси имиджді насихаттаудың басты алаңы болып отыр. Қазақстанда да бұл үрдіс айқын көрініс тауып, сайлау науқандарының форматы, әдістері мен аудиториямен коммуникациясы түбегейлі өзгерді. Цифрлық кеңістіктің саяси мәні артқан сайын, әлеуметтік медиа арқылы ықпал ету және манипуляция жасау тәсілдері де күрделене түсті.

2019 жылғы президенттік сайлау әлеуметтік желілердің Қазақстандағы саяси науқандарда алғашқы рет кеңінен қолданылған кезеңі болды. Кандидаттар мен партиялар ресми аккаунттары арқылы электоратпен тікелей байланыс орнатуға, пікірталас жүргізуге және саяси имидж қалыптастыруға ұмтылды. Бұл үрдіс 2022–2023 жылдардағы президенттік және парламенттік сайлауларда одан әрі дамып, әлеуметтік медиа саяси коммуникацияның негізгі құралына айналды. Кандидаттар мен партиялар TikTok, Instagram, Telegram және YouTube платформаларында сториз, лайв-сессиялар, қысқа видеороликтер арқылы аудиториямен қарым-қатынас орнатты. Бұл процесс электоралдық белсенділікті арттыруға және кандидаттардың жеке имиджін қалыптастыруға бағытталды [19].

Әлеуметтік медианың артықшылықтары қатарында сайлаушылардың саясатқа қатысу белсенділігін арттыруды атап өтуге болады. Азаматтар платформалар арқылы кандидаттар туралы пікірлерімен бөлісе алады, сауалнамалар мен опростарға қатысады, сондай-ақ өз ойларын жария түрде білдіруге мүмкіндік алады. Мұның нәтижесінде саяси науқанның ашықтығы мен жеделдігі артады, электоралдық қатысу белсенділігі жоғарылайды [20]. Дегенмен, әлеуметтік медианың демократиялық процеске ықпалы екіұшты болып келеді. Бір жағынан ол ақпаратқа қолжетімділікті арттырып, саяси қатысуды жеңілдетсе, екінші жағынан фейк жаңалықтар, таргеттелген жарнама, боттар мен тролльдер арқылы манипуляция жасау алаңына айналады.

Кесте 2 – Қазақстандағы сайлау процесіндегі әлеуметтік медиа манипуляцияларының түрлері мен сипаттамалары

№	Манипуляция түрі	Сипаттамасы	Қазақстандағы көрінісі	Қауіп деңгейі
1	Таргеттелген жарнама	Әлеуметтік желілердегі пайдаланушылардың жасы, жынысы, аймағы, қызығушылығы және іздеу тарихы негізінде жеке саяси контент көрсету тәсілі.	2023 жылғы сайлау кезінде жастар аудиториясына бағытталған TikTok пен Instagram жарнамалары жиі қолданылды.	Жоғары
2	Фейк жаңалықтар (дезинформация)	Қоғамдық пікірге әсер ету мақсатында әдейі бұрмаланған немесе жалған ақпарат тарату.	Factcheck.kz деректеріне сәйкес, 2023 жылғы сайлау кезінде 70-тен астам жалған жаңалық анықталды.	Өте жоғары
3	Эмоциялық контент	Қорқыныш, ашу, үміт немесе ашу-ыза секілді эмоцияларды қоздыру арқылы саяси шешімге ықпал ету.	«Болашақ тұрақтылық тек осы партиямен» немесе «Қауіп демократияға төніп тұр» деген мазмұндағы видеолар кең таралды.	Орташа
4	Блогерлік насихат	Әлеуметтік желілердегі танымал тұлғалардың (инфлюенсерлердің) жасырын немесе тапсырыспен жасалатын саяси жарнамалары.	TikTok және Instagram блогерлері сайлау науқаны кезінде партияларды немесе кандидаттарды ашық не бейсаналы түрде жарнамалады.	Жоғары
5	Алгоритмдік фильтрлер және «эхо-камералар»	Пайдаланушының өз көзқарасына сай контентті ғана көрсету арқылы ақпараттық ортадан өзгеше пікірлерді оқшаулау.	Telegram және Facebook платформаларында біржақты ақпарат тарататын қауымдастықтар күшейді.	Орташа

6	Боттар мен фейк аккаунттар	Жасанды аккаунттар арқылы пікірталастарды бұрмалау, тренд қалыптастыру және қоғамдық пікірді бақылау.	2022 жылғы сайлау кезінде 8 000-нан астам жалған аккаунт белсенділік танытқаны анықталды.	Өте жоғары

Бұл кесте әлеуметтік медиадағы саяси манипуляция түрлерін жүйелеп, олардың Қазақстандағы нақты көріністерін көрсетеді.Талдау нәтижелері сайлау процестерінде ақпараттық ықпал ету құралдары күрделеніп, цифрлық платформалар қоғамдық пікір қалыптастырудың басты алаңына айналғанын дәлелдейді. Әсіресе фейк жаңалықтар мен боттық белсенділік – ең қауіпті және кең таралған манипуляциялық әдістер ретінде анықталды.

Қазақстандағы әлеуметтік медиадағы манипуляцияның негізгі формаларына бірнеше бағытты жатқызуға болады. Біріншіден, фейк жаңалықтар мен дезинформацияның таралуы. Мысалы, 2023 жылғы Мәжіліс сайлауында әлеуметтік желілерде жалған сауалнама нәтижелері, белгілі кандидаттар туралы бұрмаланған мәліметтер және «сайлаудан бас тартты» деген ақпараттар жиі жарияланды. Мұндай контенттің негізгі мақсаты — электораттың сенімін бұзу және нақты саяси фигуралар жөнінде күмән тудыру [21]. Медиа сауаттылық деңгейінің төмендігі бұл құбылысты күшейтеді, себебі әлеуметтік желі пайдаланушылары әрдайым ақпараттың сенімділігін тексермейді.

Екіншіден, таргеттелген жарнама мен алгоритмдік іріктеу механизмдері қазіргі заманғы манипуляцияның басты құралдары болып табылады. Сайлаушылардың әлеуметтік-демографиялық ерекшеліктері, интернеттегі мінез-құлықтары мен қызығушылықтарына сүйене отырып, әр азаматқа жеке бағытталған контент ұсынылады. Cambridge Analytica ісінен кейін бұл тәсілдің саяси науқандағы потенциалы әлемдік тәжірибеде айқын көрінді, ал Қазақстанда да кандидаттар мен партиялар Instagram және Facebook платформаларында осындай алгоритмдік іріктеу әдістерін қолдана бастады [22]. Мұндай әдістер азаматтардың ақпараттық таңдауының еркіндігін шектеп, қоғамдық пікірді бір жақты бағыттауға мүмкіндік береді.

Үшіншіден, әлеуметтік медиадағы боттар мен тролль фабрикаларының белсенділігі байқалды. 2022 жылғы президенттік сайлау кезінде Telegram және X (бұрынғы Twitter) платформаларында белгілі кандидаттар туралы жасанды позитивті және негативті пікірлердің ағыны тіркелді. Халықаралық Digital Forensic Lab ұйымының зерттеуіне сәйкес, кейбір аккаунттар бірнеше минут ішінде жүздеген бірдей мазмұндағы пікір қалдырған, бұл олардың автоматтандырылған боттар екенін дәлелдеді [23]. Мұндай белсенділік қоғамдық пікірдің табиғи эволюциясын бұрмалап, жасанды саяси консенсус немесе наразылық көрінісін тудырады.

Төртіншіден, кандидаттардың саяси имиджін қалыптастырудағы әлеуметтік медианың рөлі ерекше. Қазақстандық үміткерлер TikTok, Instagram платформаларында өздерінің жеке өмірінен фрагменттер, эмоциялық үндеулер, бейресми қарым-қатынас үлгілері арқылы «жақын», «сенімді» тұлға ретінде көрсетуге тырысты [24]. Бұл үрдіс халықаралық «персонализацияланған саясат» трендін көрсетеді, яғни науқан енді идеологиялық бағдардан гөрі жеке тұлғаның бейнесіне тәуелді бола бастады.

Сондай-ақ, әлеуметтік медианың манипуляциялық әлеуеті азаматтардың ақпараттық көпіршіктерде (filter bubble) оқшаулануына әкеледі. Pariser Э. атап өткендей, алгоритмдер әр пайдаланушыға тек өз көзқарасына сәйкес ақпарат қана ұсынады, бұл қоғамдық пікірдің поляризациясын арттырады және шынайы пікір алмасу мүмкіндігін шектейді [25]. Қазақстан тәжірибесінде бұл тенденция айқын көрінеді: әлеуметтік медиадағы манипуляциялар қоғамдық сенім дағдарысын тереңдетіп, ақпараттық кеңістіктегі жауапкершілік мәселесін өзекті етті.

Эмпирикалық мысал ретінде 2022 жылғы президенттік сайлау алаңын қарауға болады. Сол кезде Қасым-Жомарт Тоқаев өз сайлауалды тұғырнамасын «Әділетті мемлекет, Әділетті экономика, Әділетті қоғам» атты үш блок бойынша әлеуметтік медиада жариялады, бұл сөз тіркесі кейіннен үгіт-насихат ұранына айналды [26]. Басқа кандидаттар да өз бағдарламаларын Telegram, Instagram және YouTube арқылы насихаттады. Мысалы, Мейрам Қажыкеннің «Игілік түбірі – ынтымақ» бағдарламасы әлеуметтік теңдік, азаматтық қоғамның дамуы және сот жүйесінің тәуелсіздігі сияқты мәселелерге бағытталды [27]. Жигули Дайрабаев өз науқанында ауылдық инфрақұрылым, аграрлық секторды дамыту және өңірлік теңдікті насихаттады [28]. Қарақат Әбден әлеуметтік бағыттағы бағдарламасын, әсіресе отбасылар мен жастарға қатысты ұсыныстарын әлеуметтік желілер арқылы жеткізді [29]. Бұл мысалдар әлеуметтік медианың сайлау науқанындағы рөлін нақты көрсетеді.

Қазақстандағы әлеуметтік медианың артықшылықтары мен тәуекелдерін салыстырмалы талдау көрсеткендей, ол электоралдық қатысуды арттыру мен ақпаратқа қолжетімділікті кеңейту мүмкіндігімен қатар, манипуляция, фейк жаңалықтар, алгоритмдік бақылау және боттар арқылы қоғамдық пікірді бұрмалау қаупін тудырады [30]. Сондықтан әлеуметтік медиаcalled заңнамалық реттеу, ақпараттық сауаттылықты арттыру, платформаларды мониторингтеу және азаматтық бақылауды күшейту — елдің демократиялық үдерістерін нығайту үшін маңызды шара болып отыр.

Қазақстандағы тәжірибе көрсеткендей, әлеуметтік медианың саяси науқанға ықпалы тұрақты және көпқырлы: ол ақпараттық, эмоционалды, имидждік және манипуляциялық компоненттерді біріктіреді. Сондықтан саясаттанушылар мен коммуникация мамандары цифрлық науқанның осы аспектілерін зерттеуді, әлеуметтік медианың демократиялық әлеуетін және тәуекелдерін кешенді талдауды жалғастыруы қажет.

Сайлаушыларды манипуляциялау әдістері

XXI ғасырдағы сайлау процестері цифрлық коммуникацияның ықпалымен түбегейлі өзгеріске ұшырады. Әлеуметтік медиа сайлаушылардың ақпарат алу көзін ғана емес, сонымен бірге олардың саяси таңдауына әсер етудің басты тетігіне айналды. Қазіргі уақытта саяси манипуляция әдістері дәстүрлі ақпарат құралдарынан әлеуметтік желілердің алгоритмдік және психологиялық мүмкіндіктеріне ауысты. Бұл бөлімде Қазақстан жағдайына бейімделген негізгі бес әдіс — таргеттелген жарнама, фейк жаңалықтар, эмоциялық контент, блогерлік насихат және алгоритмдік фильтрлер жүйелі түрде талданады.

Манипуляция әдісі	Мақсаты мен мәні	Қолдану тетігі	Қазақстандағы мысалдар	Ықтимал салдары	Қарсы шаралар
Таргеттелген жарнама	Белгілі бір әлеуметтік топқа саяси хабарламаны дәл бағыттау арқылы мінез-құлыққа әсер ету	Әлеуметтік желілердегі демографиялық, географиялық және психографиялық деректерге негізделген жарнамалық алгоритмдер	2023 жылғы Мәжіліс сайлауында жастар мен аймақтық аудиторияларға бағытталған бейнежарнамалар мен сторилер таралды	Ақпараттық теңсіздік, қоғамның әртүрлі топтарының шынайы ақпараттан оқшаулануы	Саяси жарнаманы ашық жариялау міндеті, платформалардағы таргеттеу ережелерін қатаңдату
Фейк жаңалықтар мен дезинформация	Қарсы кандидатқа сенімсіздік тудырып, сайлаушылардың көзқарасын бұрмалау	Әлеуметтік желілер мен мессенджерлер арқылы расталмаған ақпарат тарату	Telegram мен Facebook-та кандидаттарға қатысты жалған посттар мен фейк видеолардың таралуы	Қоғамдық сенімнің төмендеуі, саяси поляризацияның күшеюі	Фактчек институттарын қолдау, жалған ақпарат үшін жауапкершілікті күшейту
Эмоциялық контент	Сайлаушы шешіміне сезім арқылы әсер ету	Патриоттық, қорқыныш немесе үміт сияқты эмоцияларды қоздыратын бейне және визуалды материалдар	TikTok-та «болашақ үшін дауыс бер» сияқты ұрандармен жасалған қысқа видеолар	Рационалды ойлаудың әлсіреуі, шешім қабылдауда эмоция басымдығы	Медиасауаттылықты дамыту, эмоциялық манипуляцияны анықтау тетіктері
Блогерлік насихат және жасырын жарнама	Танымал тұлғалар арқылы саяси идеяны бейтарап форматта тарату	Инфлюенсерлердің контенті арқылы саяси тапсырысты “жеке пікір” ретінде ұсыну	TikTok және Instagram блогерлерінің кандидат идеяларын бейтарап видео арқылы насихаттауы	Ақпараттық адалдықтың бұзылуы, аудиторияны алдау	Жасырын жарнамаға заңдық шектеулер енгізу, блогерлерді саяси контентті белгілеуге міндеттеу

Алгоритмдік фильтрлер және «эхо-камера» эффектісі	Қолданушыны тек өз пікірін қуаттайтын ақпараттық ортада ұстау	Әлеуметтік желілердің ұсыныс жүйесі бұрынғы белсенділікке сүйене отырып ұқсас контент ұсыну арқылы жүзеге асады	2022–2023 жылдары Facebook-та саяси топтар арасында ақпараттық оқшаулану байқалды	Қоғамдық пікірдің поляризациясы, балама идеяларға жабықтық	Алгоритм ашықтығы, түрлі көзқарастарды ұсынатын «балансты контент» тетіктерін енгізу

1. Таргеттелген жарнама

Таргеттелген жарнама — әлеуметтік желілердің пайдаланушылар туралы жинақтаған деректеріне сүйене отырып, нақты топтарға арналған саяси хабарламаларды жеткізу әдісі [31]. Facebook, Instagram және TikTok сияқты платформаларда жарнама берушілер жас, жыныс, орналасқан жер, қызығушылықтар мен онлайн мінез-құлық бойынша аудиторияны сегменттеп, сол топқа бағытталған контент тарата алады. Мұндай тәсіл сайлаушылардың психологиялық бейініне сәйкес әсер етуге мүмкіндік береді.

Мысалы, 2023 жылғы Мәжіліс сайлауы кезінде Қазақстанда кейбір саяси қозғалыстар әлеуметтік желілерде нақты жастар аудиториясына бағытталған бейнероликтер мен жарнамалар таратты. Мұндай жарнамалар көбіне “жаңа мүмкіндіктер”, “жастар үні” сияқты позитивті ұрандарға сүйеніп, эмоциялық және рационалды әсерді біріктірді [32]. Сонымен қатар, тәуелсіз бақылаушылардың деректеріне сүйенсек, кейбір партиялар аймақтық таргеттеу арқылы белгілі облыстарда ерекше белсенді жарнама саясатын жүргізген [33].

Таргеттелген жарнаманың басты қаупі — ол саяси хабарламаны қоғамның шағын тобына ғана бағыттап, жалпы ақпараттық теңсіздік тудырады. Яғни, әр түрлі әлеуметтік топтар әр түрлі саяси ақпарат алады, бұл демократиялық процестердің ашықтығын төмендетеді. Мұндай құбылыс Cambridge Analytica ісінде айқын көрініс тапқан болатын [34].

2. Фейк жаңалықтар мен дезинформация

Фейк жаңалықтар (fake news) немесе дезинформация (disinformation) — сайлау науқаны кезінде жиі қолданылатын манипуляциялық құралдардың бірі. Бұл әдіс арқылы қарсы кандидат немесе партия туралы жалған ақпарат таратылып, сайлаушылардың сенімін өзгерту көзделеді [35].

Қазақстанда да мұндай мысалдар кездесті. 2023 жылғы сайлау кезінде Telegram мен Facebook платформаларында кейбір үміткерлерге қатысты расталмаған мәліметтер тараған. Мысалы, бірқатар пабликтерде “кандидат шетелде жылжымайтын мүлік сатып алған” немесе “партия мүшелері шетелдік демеушілерден қаржы алады” деген сипаттағы посттар кеңінен тарады, кейін бұл ақпараттардың ешқайсысы ресми расталмаған [36].

Фейк жаңалықтар жиі қолданушылардың эмоциялық реакциясын тудыру үшін арнайы эмоционалды лексикамен безендіріледі. Сонымен қатар, жалған ақпараттар “фактчекингті қиындату” мақсатында бірнеше “жартылай шындық” элементтерімен толықтырылады [37]. Осы себептен фейк контенттің таралуына қарсы күресте фактчек институттарының, соның ішінде Factcheck.kz және StopFake.kz сияқты қазақстандық платформалардың рөлі ерекше [38].

3. Эмоциялық контент

Эмоциялық манипуляция — сайлаушылардың шешім қабылдауына рационалды аргумент емес, сезім арқылы әсер ету тәсілі. Бұл әдіс саяси коммуникацияда ең жиі кездесетін манипуляциялық құрал болып саналады [39].

Мысалы, кейбір бейнероликтерде немесе TikTok форматындағы қысқа видеоларда “ел тағдыры”, “болашақ үшін дауыс бер” сияқты патриоттық және үмітке толы ұрандар қолданылады. Мұндай хабарламалар көбіне жастар мен бірінші рет дауыс беретін азаматтарға бағытталады. Ал басқа контент түрлері қорқыныш пен үрейге негізделіп, “билік ауысса, тұрақтылық жоғалады” деген идеяны күшейтуі мүмкін.

Эмоциялық контенттің тиімділігі — оның қысқа уақыт ішінде жоғары таралу әлеуетіне ие болуында. Мәселен, Facebook пен TikTok алгоритмдері “жоғары эмоциялық реакция” тудыратын контентті жиі ұсынады, себебі ол пайдаланушылардың белсенділігін арттырады [40]. Нәтижесінде сайлаушылар рационалды талдау орнына сезімге сүйенген шешім қабылдай бастайды.

Қазақстандық контексте мұндай контенттің әсері аймақтық және жас ерекшелігіне қарай әртүрлі байқалады. Мысалы, ауылдық аймақтарда қорқыныш пен қауіпсіздікке қатысты эмоционалды контент көбірек әсер етсе, қалалық жастар аудиториясында үміт пен прогресс идеясы тиімдірек жұмыс істейді [41].

4. Блогерлік насихат және жасырын жарнама

Соңғы жылдары блогерлер мен инфлюенсерлер саяси коммуникацияда маңызды рөлге ие бола бастады. Блогерлік насихат (influencer campaigning) — белгілі әлеуметтік желі тұлғалары арқылы саяси идеяны бейтарап немесе тұрмыстық форматта жеткізу әдісі [42].

Кейде блогерлер өздерінің жазбаларында белгілі бір партия немесе кандидат туралы пікір айтып, бірақ оның тапсырыспен жасалғанын ашып көрсетпейді. Мұндай “жасырын жарнама” сайлаушылардың сенімін бұзады, себебі олар ақпараттың саяси мақсатта екенін білмей қалады.

Қазақстанда 2023 жылғы сайлау кезінде бірқатар танымал TikTok және Instagram блогерлері кандидаттардың бағдарламасын тікелей атамай, бірақ сол идеяларды “қоғамдық белсенділік”, “жастардың таңдау еркіндігі” сияқты бейтарап формада таратқан жағдайлар болды [43].

Бұл әдістің тиімділігі — блогер аудиториясы дәстүрлі БАҚ-қа қарағанда сенім деңгейі жоғары, әрі олар саяси контентті жеңіл қабылдайды. Сондықтан саяси тапсырыс “жеке пікір” немесе “өмірлік мотивация” ретінде көрінеді. Блогерлік насихаттың осындай жасырын сипаты медиаэтиканың және сайлау заңнамасының жаңа салаларын реттеуді қажет етеді [44].

5. Алгоритмдік фильтрлер және «эхо-камера» эффектісі

Алгоритмдік фильтрлер (filter bubble) мен «эхо-камера» эффектісі (echo chamber) — әлеуметтік желілердің пайдаланушыларға тек олардың көзқарасына сай контентті көрсету үрдісі. Мұндай жағдай қоғамды пікірлік тұрғыда поляризациялайды және сайлаушылардың балама идеяларды қабылдау мүмкіндігін шектейді [45].

Қазақстандық зерттеулер көрсеткендей, Facebook және TikTok алгоритмдері пайдаланушылардың бұрынғы белсенділігіне сүйене отырып, сол тақырыптағы контентті жиі ұсынады. Мысалы, егер қолданушы оппозициялық көзқарастағы видеоларды жиі қараса, жүйе ұқсас мазмұндағы видеоларды ұсына береді; нәтижесінде адам тек өз позициясын растайтын ақпараттық ортада қалады [46].

Бұл эффект демократиялық пікір алмасуға кедергі келтіреді. 2022–2023 жылдардағы әлеуметтік желілердегі талдаулар көрсеткендей, сайлау тақырыбындағы топтарда “ақпараттық тұйық шеңберлер” қалыптасып, пайдаланушылар арасындағы тікелей диалог сиреген [47].

Мұндай құбылысты азайту үшін алгоритмдік ашықтықты арттыру, «балама көзқарастарды ұсыну» функциясын енгізу және медиасауат бағдарламаларын күшейту маңызды [48].

Жоғарыда қарастырылған әдістердің барлығы өзара байланыста жұмыс істейді. Таргеттелген жарнама сайлаушылардың психологиялық бейініне бейімделсе, эмоциялық контент олардың сезімін қоздырады, фейк жаңалықтар сенімсіздік тудырады, ал блогерлік насихат пен алгоритмдік фильтрлер бұл әсерді күшейтіп, қоғамдық пікірді біржақты бағытқа бұрады.

Қазақстандағы сайлау процестерінде әлеуметтік медиа манипуляцияларының күшеюі ақпараттық кеңістіктің ашықтығына және саяси мәдениет деңгейіне байланысты. Демек, манипуляцияны азайту үшін кешенді тәсіл қажет: құқықтық реттеу, платформалар жауапкершілігі, медиасауаттылықты арттыру және азаматтық қоғамның белсенді қатысуы.

Қорытынды

Қазіргі жаһандану және цифрлану дәуірінде әлеуметтік медиа саяси коммуникацияның маңызды аренасына айналды. Ол бір жағынан азаматтардың ақпаратқа қолжетімділігін кеңейтіп, қоғамдық пікірталас пен электоралдық белсенділікті арттырудың қуатты құралына айналса, екінші жағынан — саяси манипуляция мен ақпараттық ықпал ету тетігі ретінде қолданыла алады. Қазақстандағы соңғы президенттік және парламенттік сайлаулардың тәжірибесі көрсеткендей, әлеуметтік желілер саяси дискурс пен сайлаушылардың мінез-құлқына айтарлықтай әсер ететін фактор ретінде қалыптасқан.

Әлеуметтік медианың ерекшелігі — оның екіжақты табиғатында. Бір жағынан, ол демократиялық қатысу мәдениетін нығайтып, азаматтардың үні мен бастамаларын билікке жеткізуге мүмкіндік береді. Екінші жағынан, әлеуметтік желілердің алгоритмдік құрылымы мен таргеттелген жарнаманың дамуы ақпараттық кеңістікті бақылау мен манипуляциялау үшін қолайлы жағдай туғызады. Бұл жағдайды Cambridge Analytica ісі секілді әлемдік мысалдар дәлелдесе, Қазақстан жағдайында да бот-аккаунттар, фейк жаңалықтар мен блогерлік насихат түріндегі манипуляция элементтері жиі байқалған.

Қазақстандағы ақпараттық кеңістіктің ерекшелігі — әлеуметтік медиадағы белсенділіктің жоғарылауымен қатар, медиамәдениеттің әлі де қалыптасу сатысында болуы. Көптеген қолданушылар ақпараттың шынайылығын тексермей бөліседі, бұл өз кезегінде фейк контенттің таралуына жол ашады. Сонымен қатар, онлайн насихат пен саяси жарнаманы реттейтін нақты құқықтық тетіктердің әлсіздігі саяси бәсекенің әділдігіне әсер етуі мүмкін.

Сондықтан ақпараттық манипуляцияны азайту үшін бірқатар бағыттарды жүзеге асыру өзекті болып отыр. Біріншіден, цифрлық сауаттылықты арттыру – әлеуметтік медиа қолданушыларының ақпаратты сыни тұрғыдан қабылдау қабілетін дамытады. Екіншіден, сайлау заңнамасында онлайн насихатты реттеу – саяси жарнаманың ашықтығын қамтамасыз етеді және ықтимал манипуляцияларды құқықтық шеңберге енгізеді. Үшіншіден, фейк ақпаратқа қарсы мониторинг жүйесін күшейту арқылы медиа кеңістіктегі жауапкершілік мәдениетін қалыптастыруға болады.

Жалпы алғанда, әлеуметтік медиа Қазақстандағы демократиялық трансформацияның ажырамас бөлігіне айналды. Оның әлеуетін тиімді пайдалану үшін мемлекеттің, азаматтық қоғамның және медианың өзара әрекеттестігі шешуші рөл атқарады. Ақпараттық мәдениетті дамыту, этикалық нормаларды күшейту және ашық коммуникациялық орта қалыптастыру – әлеуметтік медиа мен демократиялық институттардың үйлесімді дамуын қамтамасыз ететін басты шарттар болып табылады.

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Sociological Sciences

STUDENTS' SUBJECTIVE AND OBJECTIVE WELL-BEING: A BIBLIOGRAPHICAL ANALYSIS

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Abstract
The transition to university life represents a critical stage marked by academic, social, and emotional changes that directly influence students' well-being. This article presents a bibliographic analysis of research on students' subjective and objective well-being published between 2004 and 2024, based on data from the Scopus database. The study aimed to identify key trends, geographical distribution, and conceptual structures in this field, applying the PRISMA methodology for systematic selection and VOSviewer for bibliometric mapping. Out of 9,786 initial records, 538 studies met the inclusion criteria. The results revealed a steady growth of research interest, particularly after 2020, reflecting heightened global attention to students' mental health, academic environment, and social support. Western Europe and North America dominate publication activity, while emerging contributions from Asia and Central Asia indicate increasing globalization of the topic. The conceptual analysis identified three main research clusters: psychological well-being, academic and educational factors, and social-contextual dimensions. The findings underscore the interdisciplinary nature of student well-being research and its vital role in shaping educational quality and psychological sustainability.

Keywords: student well-being, subjective well-being, objective well-being, bibliometric analysis, PRISMA, VOSviewer, higher education, mental health.

INTRODUCTION

Research Relevance. One of the most critical transitions in young people's lives is entering university. This period is marked by substantial academic, social, and emotional changes. For students, it represents both an exciting and challenging stage, as they must adapt to a new level of independence, cope with increased academic demands, establish new social relationships, and manage the process of everyday adjustment to university life. The overall well-being and psychological health of university students depend on numerous factors that include both subjective and objective dimensions. The objective well-being of students reflects their living conditions, such as material status, quality of life, access to education, and level of social security. These factors form the foundation for students' mental stability, physical health, academic success, and personal development. Meanwhile, subjective well-being encompasses life satisfaction, emotional stability, and a sense of life meaning and fulfillment (Almeida, 2025; Delgado-Lobete et al., 2020; Doriza et al., 2024). Maintaining positive mental health plays a crucial role in achieving academic success, fostering healthy social relationships, and ensuring a smooth transition into adult life. Empirical studies have shown that positive relationships, self-acceptance, autonomy, and a sense of purpose are essential components of psychological well-being (Morales-Rodríguez et al., 2020; Özdoğan, 2021).

The decline in young people's mental health has become a pressing global issue, particularly in developing countries, where it has evolved into a widespread and complex psychological challenge (Laftman et al.; Hyseni et al., 2023). Given this context, the present study aims to conduct a bibliographic analysis of scientific articles published between 2004 and 2025 that focus on the objective and subjective well-being of university students.

Research Aim. The main objective of this research is to perform a bibliographic analysis of studies on students' well-being published over the last two decades, using the Scopus database as the primary data source. Although several studies have addressed the relationship between social support and student well-being, there remains a lack of systematic bibliometric and structural characterization of the published research. This gap underscores the necessity for a comprehensive literature review and bibliometric mapping to provide an integrated understanding of research trends, distribution, and conceptual development in this field.

Research question. Based on the above rationale, this study seeks to answer the following overarching question:

What are the dynamics, geographical distribution, and conceptual structure of research on the objective and subjective well-being of university students, based on articles indexed in the Scopus database between 2004 and 2024?

Sub-questions. To address this main question, four specific research sub-questions are formulated:

1. *What trends can be observed in the annual publication dynamics of studies on the objective and subjective well-being of university students?*
2. *Which regions and countries have been the main centers of research activity in this field?*
3. *How are the core concepts and thematic directions in student well-being research clustered and interrelated?*

The significance of this study lies in its contribution to understanding the well-being of university students as a crucial factor in their academic success, psychological health, and social adaptation. In recent years, the issue of student well-being has become increasingly relevant due to the growing prevalence of mental health challenges among young people worldwide. By conducting a bibliographic analysis of research published between 2004 and 2025, this study provides a comprehensive overview of how the concepts of subjective and objective well-being have evolved in higher education research. The analysis allows for identifying key trends, thematic focuses, and regional differences in scientific approaches to the study of student well-being. The results are expected to deepen theoretical knowledge about the determinants of life satisfaction, emotional stability, autonomy, and social support, while also highlighting the interaction between individual and environmental factors. On a practical level, the findings can serve as an evidence base for educators, university administrators, and policymakers to design effective strategies aimed at improving students' mental health, social inclusion, and overall quality of life. Thus, this study not only expands academic understanding of student well-being but also contributes to the development of supportive and psychologically sustainable university environments.

Literature Review

The concept of well-being was first introduced in the field of health by the World Health Organization in 1948, when it provided an initial definition of the term. Since then, interest in the concept has grown significantly, particularly from the early 2000s, with the development of positive psychology (Seligman & Csikszentmihalyi, 2000). Although there is no universally accepted definition of well-being, it is most often associated with happiness and the ability to cope effectively with daily life challenges. Well-being is a multidimensional phenomenon, and numerous theoretical models have been proposed to explain it. One of the most influential frameworks is Martin Seligman's PERMA model, which conceptualizes well-being through five core elements: positive emotion, engagement, relationships, meaning, and accomplishment. Research has demonstrated that this model effectively enhances university students' overall well-beingparticularly by fostering positive relationships and engagement. The model has been successfully applied among undergraduate students in relation to academic engagement and mental health (Kovich et al., 2023; Dorri Sedeh et al., 2024).

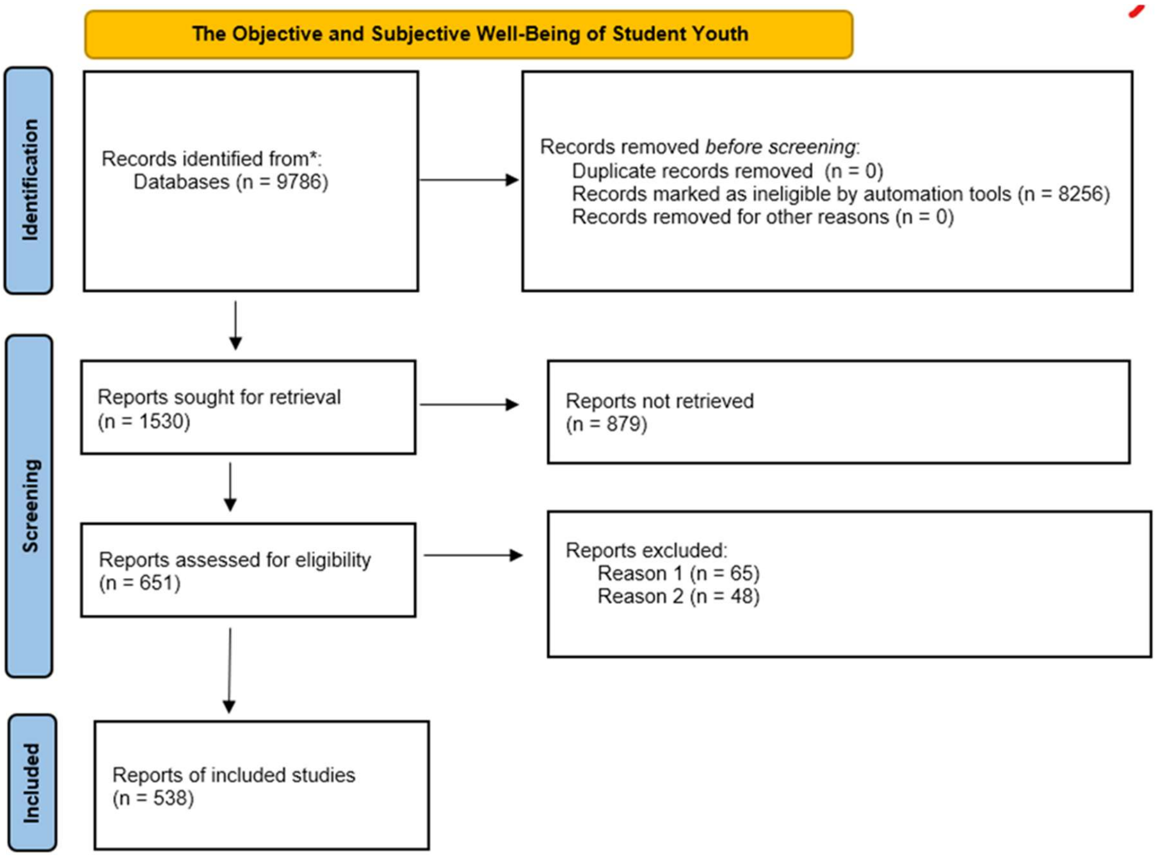
From the perspective of positive psychology, a high level of well-being is characterized by life satisfaction, positive emotions, vitality, a sense of meaning in life, and low psychological distress. Studies have identified two main approaches to understanding well-being: hedonic and eudaimonic. The hedonic approach emphasizes subjective feelings such as happiness and life satisfaction, while the eudaimonic approach focuses on self-realization and fulfilling one's potential. Empirical evidence suggests that hedonic well-being is sometimes negatively associated with academic achievement and emotional stability, whereas eudaimonic well-being is positively correlated with lower stress levels and improved emotional functioning (Chen et al., 2022; Schaffner, 2023). Well-being is generally divided into two major components: subjective and objective well-being. Subjective well-being refers to the balance of emotional reactions related to life evaluation and life satisfaction (Diener et al., 2018). In contrast, objective well-being encompasses measurable indicators such as physical health, economic status, and academic achievement. Among university students, both subjective and objective well-being play a crucial role in determining academic performance and overall quality of life.

Research indicates that academic achievement and a clear sense of life purpose are significant predictors of subjective well-being. For example, students who demonstrate high academic performance and strong life goals tend to experience greater satisfaction and joy from the learning process, which in turn enhances their overall well-being (Sharma et al., 2023). Social support also plays an essential role in improving subjective well-being. According to Mahasneh (2022), students with higher levels of social support report feeling happier and more satisfied with their lives. Social support contributes to higher self-esteem, resilience, and optimism, helping students cope more effectively with stress. Furthermore, Deci and Ryan's (2008) Self-Determination Theory identifies three fundamental psychological needs that underpin well-being: autonomy, competence, and relatedness. The fulfillment of these needs strengthens students' intrinsic motivation and psychological well-being, while the lack of such fulfillment can lead to anxiety, stress, and emotional exhaustion.

METHODS AND METHODOLOGY

In this study, research articles published over the past twenty years were analyzed using data obtained from the Scopus database. The selection and analysis process followed the PRISMA methodology to ensure transparency, reproducibility, and scientific rigor. All studies that did not meet the inclusion criteria or were irrelevant to the research objectives were excluded from the final analysis (Figure 1). This review focused on publications released between 2004 and 2024, encompassing studies that examined factors influencing university students' well-being. The chosen time frame provides a balanced overview of the evolution of research in this area, allowing for the identification of emerging trends, conceptual developments, and the dynamic changes in the understanding of student well-being over the past two decades. The use of the PRISMA framework ensured a systematic approach to literature identification, screening, eligibility assessment, and inclusion. This methodological rigor strengthened the reliability of findings and enabled a comprehensive analysis of both subjective and objective aspects of well-being within higher education research.

Figure 1.- PRISMA flow diagram of the study selection process for articles on students' Well-Being (2004–2024)

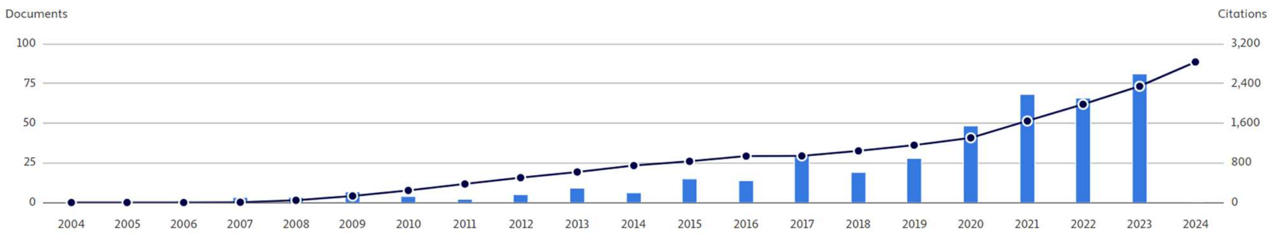


According to Figure 1 the data selection process followed a systematic and structured approach. In the identification phase, a total of 9,786 records were retrieved from the Scopus database. After the initial automated screening, 8,256 records were excluded as irrelevant or duplicate entries. The remaining 1,530 reports were sought for full-text retrieval. During the screening phase, 879 reports could not be retrieved due to limited access or missing full texts, leaving 651 reports for eligibility assessment. Of these, 113 reports were excluded based on specific criteria 65 for the first reason and 48 for the second. Consequently, a total of 538 studies met all inclusion criteria and were incorporated into the final bibliographic and content analysis. These studies formed the empirical foundation for examining trends, conceptual structures, and thematic developments related to the objective and subjective well-being of university students between 2004 and 2024. To explore the structure and dynamics of research in this field, VOSviewer software was employed for bibliometric mapping and visualization. This tool enabled the identification of major research clusters, co-occurrence networks of keywords, and patterns of collaboration among authors, institutions, and countries.

RESULTS

The findings of the study revealed a steady increase in scientific interest in the topic of students' objective and subjective well-being between 2004 and 2024 (Figure 2). In the early years, publication activity remained at a very low level: between 2004 and 2009, only one to seven studies were published annually, indicating that researchers paid limited attention to this topic during that period. Starting from 2010, a gradual rise in publication output was observed. In 2010, four articles were published, and by 2015, the number had increased to fifteen, reflecting the growing recognition of well-being as a significant area of research within higher education studies.

Figure 2.- Annual publication dynamics on students' objective and subjective Well-Being (2004–2024)



Interest in the topic increased markedly in 2018–2019, with the number of publications rising from 19 to 28. From 2020 onward, a sharp growth in research activity was recorded: 48 articles in 2020, 68 in 2021, 66 in 2022, 81 in 2023, and a remarkable 129 in 2024. This upward trend clearly demonstrates the expanding scholarly engagement with issues related to students' psychological and social well-being. The surge in research output during the 2020s can likely be attributed to the heightened awareness of mental health challenges, transformations in educational environments, and the global impact of crisis phenomena such as the COVID-19 pandemic. Overall, the bibliographic analysis indicates that the study of students' objective and subjective well-being has entered a phase of active development and is gaining increasing scientific relevance within the interdisciplinary fields of psychology, education, and social sciences.

Geographical Distribution of Scientific Publications

The analysis of the geographical distribution of publications on students' objective and subjective well-being demonstrates a clear predominance of socially and economically developed regions, particularly Western Europe and North America. These regions have established strong academic traditions and maintain a consistent level of interdisciplinary collaboration in the field of student well-being. Conversely, emerging contributions from Asia, the Middle East, and developing regions highlight a gradual globalization of research interest in this topic (Table 1).

Table 1. - Geographical Distribution of Scientific Publications on Students' Objective and Subjective Well-Being (2004–2024)

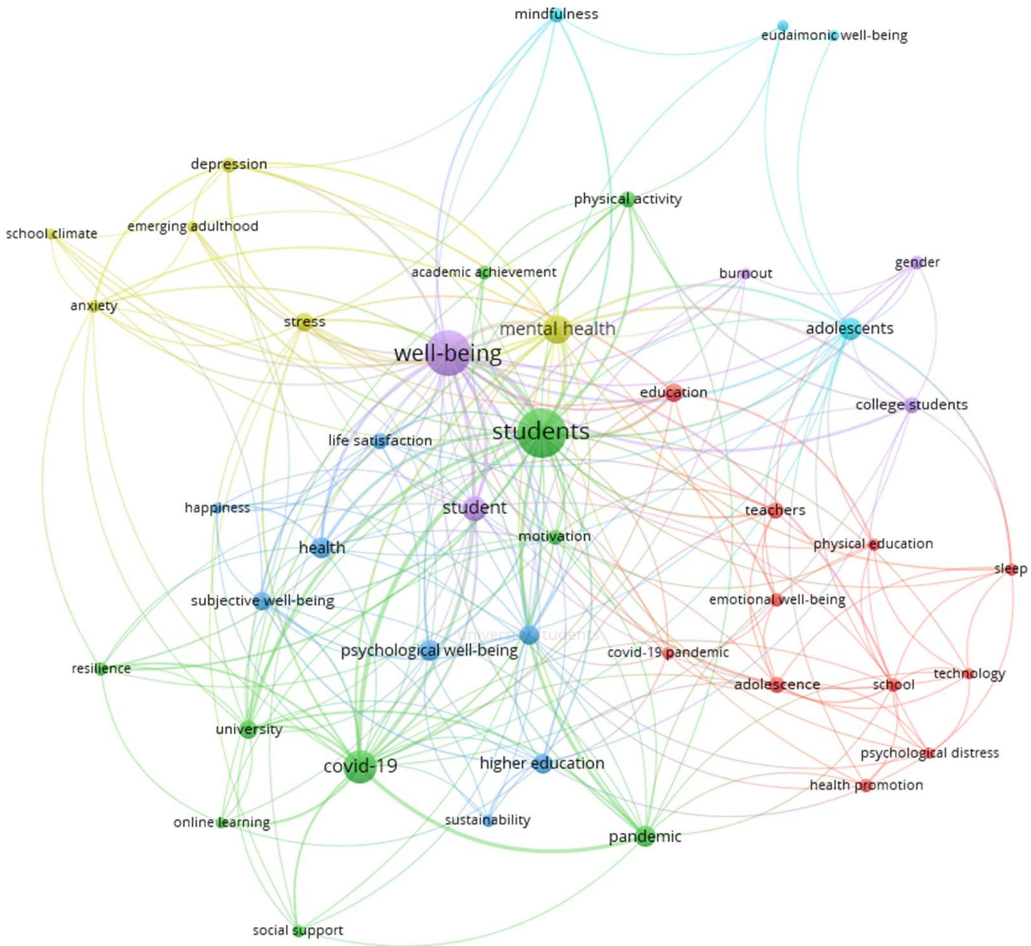
Region	Countries	Number of Publications	Trend
Western Europe	United Kingdom, Spain, Italy, Netherlands, Germany, France, Belgium, Sweden, Finland, Denmark	210	Established academic field with steady development and a high level of international collaboration.
North America	United States, Canada	146	Absolute leadership in student well-being research; strong interdisciplinary focus and sustained scholarly interest.
Asia (East and Southeast)	China, Indonesia, Japan, South Korea, Taiwan, Malaysia, Vietnam, India	90	Active research development; growing attention to the effects of digitalization and academic stress on student well-being.
Middle East and North Africa	Israel, Jordan, Iran, Egypt, Qatar, UAE, Saudi Arabia, Türkiye	56	Expanding participation in international studies; noticeable increase in publications after 2020.
Eastern Europe	Poland, Czech Republic, Lithuania, Hungary, Romania, Belarus	35	Gradual growth in publication activity; research mainly focused on social and educational aspects of student well-being.
Oceania	Australia, New Zealand	33	High research engagement; Australia ranks among the global leaders in publication output.
Latin America	Brazil, Chile, Mexico, Colombia, Argentina, Peru	30	Steady but limited contribution; primarily empirical studies conducted at the university level.
Sub-Saharan Africa	South Africa, Nigeria, Ghana, Uganda, Kenya, Ethiopia	15	Low but increasing activity; studies focus mainly on socio-economic determinants of student well-being.
Central Asia	Kazakhstan, Kyrgyzstan, Uzbekistan	10	Emerging research direction; growing interest in student well-being within the context of educational reforms in regional universities.

The data indicate that Western Europe and North America jointly account for over 65% of global publications, confirming their central role in advancing research on student well-being. Meanwhile, the steady rise in contributions from Asia, the Middle East, and Central Asia reflects a broadening of the global academic dialogue, signaling the integration of diverse socio-cultural perspectives into the study of students' objective and subjective well-being.

Conceptual structure and thematic clusters of research on student Well-Being

Figure 3 presents the cluster map of key concepts used in studies on student well-being, based on a co-occurrence network of research terms. The visualization includes 50 nodes, each representing a distinct research concept or keyword, interconnected by 170 weighted links that reflect the strength of conceptual relationships within the academic literature. The network was visualized as a node-link diagram, where colors indicate thematic clusters, and the size of each node corresponds to its relative frequency and importance within the dataset. The analysis of co-occurring terms demonstrates that research on student well-being has a distinctly interdisciplinary character, integrating perspectives from psychology, education, sociology, and health sciences. The structure of the network is organized around several densely connected core nodes located near the center of the map. The terms "students" (green node) and "well-being" (purple node) act as the central focal points, indicating their foundational role across all examined studies. Surrounding these, the nodes "mental health" (yellow) and "psychological well-being" (blue) emerge as secondary hubs with extensive connections to multiple thematic directions.

Figure 3. Cluster map of key concepts in research on student Well-Being



Of particular significance is the "psychological well-being" construct, which displays high centrality and functions as a bridge between peripheral concepts, connecting diverse aspects of student experience and well-being. This highlights its mediating role in linking mental health, educational environment, and social adaptation domains. The structural configuration of the network thus reveals that the majority of research focuses on understanding students' well-being through the interaction of psychological and educational factors.

The educational and academic cluster, located in the eastern and southeastern parts of the map, encompasses terms such as *education*, *academic achievement*, *college students*, and *physical education*. This group reflects a focus on academic performance, institutional factors, and learning environments as determinants of well-being. The psychological cluster, concentrated in the central and northern regions of the map, includes terms such as *depression*, *anxiety*, *stress*, *burnout*, and *emotional well-being*. This cluster highlights the dominance of studies addressing mental health challenges and emotional stability among students.

A separate pandemic-related cluster comprising *COVID-19*, *pandemic*, *online learning*, and *higher education* illustrates the temporal focus of research during and after the COVID-19 pandemic, emphasizing its profound influence on students' psychological well-being and educational experiences. Additional thematic areas incorporate social and contextual factors (*social support*, *resilience*, *motivation*), health-related indicators (*sleep*, *physical activity*, *health promotion*), and demographic variables (*adolescents*, *gender*, *teachers*). Overall, the cluster analysis confirms that the study of student well-being is multifaceted and interdisciplinary, with major research directions concentrated around educational environment, mental health, and social support systems. This conceptual landscape reflects the ongoing evolution of student well-being research toward a more integrated understanding of how psychological, academic, and social dimensions interact to shape students' overall quality of life and academic success.

DISCUSSION

The present bibliographic analysis provides a comprehensive overview of research trends, conceptual development, and regional patterns in the study of students' subjective and objective well-being between 2004 and 2024. The results highlight a continuous and accelerating growth of scholarly interest in this topic, especially in the last five years. This section discusses the main findings, their interpretation and significance, comparisons with previous research, as well as limitations, unexpected outcomes, and directions for future studies.

The analysis revealed a steady increase in research output on student well-being, with a notable surge after 2020. This trend suggests that the academic community increasingly recognizes student well-being as a multifaceted indicator of educational quality and psychological resilience. The COVID-19 pandemic served as a catalyst for this expansion, intensifying attention to mental health, online learning, and social adaptation in higher education. The geographical analysis demonstrated that Western Europe and North America dominate the field, accounting for more than 65% of all publications. Their leadership reflects strong research infrastructures and long-standing academic traditions in psychology, education, and health sciences. However, the growing contributions from Asia, the Middle East, and Central Asia mark a positive shift toward the globalization of the research agenda and the inclusion of diverse cultural and socio-economic perspectives.

The conceptual cluster analysis revealed three dominant thematic areas:

1. Psychological well-being and mental health, focusing on depression, anxiety, stress, and emotional resilience;
2. Educational and academic factors, emphasizing academic achievement, motivation, and learning environments;
3. Social and contextual dimensions, centering on social support, relationships, and coping mechanisms.

This pattern underscores the interdisciplinary nature of student well-being research, showing that well-being is not a static psychological state but a dynamic process shaped by individual, institutional, and societal influences. The central role of "psychological well-being" in the co-occurrence network further confirms its function as a mediating construct connecting emotional stability, academic engagement, and social integration.

The findings of this research align with and extend earlier literature emphasizing the dual structure of well-being subjective (hedonic) and objective (eudaimonic)as described by Diener et al. (2018), Chen & Zeng (2022), and Seligman & Csikszentmihalyi (2000). Similar to the results of Dorri Sedeh et al. (2024) and Kovich et al. (2023), this study confirms that the PERMA model (Positive Emotion, Engagement, Relationships, Meaning, Accomplishment) remains a dominant theoretical framework guiding modern investigations into university students' well-being. Moreover, the analysis supports Deci and Ryan's Self-Determination Theory (2008) by demonstrating that autonomy, competence, and relatedness consistently appear as recurring concepts within the clusters. The growing focus on resilience, social support, and motivation also resonates with previous empirical studies (Mahasneh, 2022; Morales-Rodríguez et al., 2020), further validating the psychological underpinnings of student well-being research. However, compared to earlier works, this study provides a broader, data-driven synthesis that highlights how the discourse has evolved from isolated case studies to an interconnected global research network. This shift suggests the maturation of the field into a coherent interdisciplinary discipline.

CONCLUSION

This bibliographic analysis provides a comprehensive overview of how the study of students' subjective and objective well-being has evolved over the past two decades. The results clearly demonstrate that academic attention to this topic has grown steadily, particularly since 2020, reflecting the increasing recognition of student well-being as a central element of educational quality, mental health, and social adaptation. The research findings indicate that the field of student well-being is now a mature and interdisciplinary domain, integrating knowledge from psychology, education, sociology, and health sciences. The bibliometric mapping revealed three dominant conceptual directions: psychological well-being and mental health, educational and academic factors, and social and contextual determinants such as social support and resilience. The term *psychological well-being* emerged as a mediating construct that connects emotional, academic, and social aspects of student life, emphasizing the holistic and dynamic nature of the concept.

The analysis also highlighted significant regional disparities in publication activity. Western Europe and North America remain the leading contributors, producing more than 65% of all indexed studies, which reflects their established academic infrastructures and research capacity. However, the rising participation of Asian, Middle Eastern, and Central Asian countries demonstrates a gradual globalization of research, where new perspectives and methodologies are being introduced to enrich the global discourse. At the same time, this study extends previous knowledge by providing a systematic and data-driven synthesis that maps the structural interconnections and thematic evolution of the field. Despite its strengths, the research faces several limitations, including reliance on the Scopus database, potential language bias, and limited analysis of qualitative dimensions. These constraints suggest that future studies should adopt multi-database searches, cross-cultural designs, and mixed-method approaches to achieve a more comprehensive and balanced understanding of well-being.

In conclusion, the study affirms that the concept of student well-being has transitioned from a peripheral topic to a core focus of higher education research. It now serves as a vital framework for understanding how psychological health, academic engagement, and social relationships collectively shape students' success and life satisfaction. The growing international attention to this field underscores the urgent need for evidence-based educational policies and institutional practices that foster mental resilience, inclusivity, and sustainable well-being among university students. By continuing to explore these interconnections, future research can contribute not only to academic advancement but also to the creation of healthier and more supportive educational environments worldwide.

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Philological Sciences

Fransız dilinin qrammatikası: nəzəri və elmi baxış

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Abstract

French belongs to the group of Roman languages and is derived from Latin. His grammatical sisyeme carries both synthetic and analytical characteristics. This means that both endings and auxiliary words are used to express meaning. The article analyzes the grammatical system of the French language from theoretical and scientific aspects.Morphology and syntax, the structure of articles ,nouns, adjectives,verbs, as well as the stages of the historical development of grammar theories are described. The article also shows the application of modern structural and functional approaches.

Key words: French, grammatics, morphology, syntax, scientific analysis, innovative, modern structure, International Communication.

1. Giriş:

Fransız dili, dünya miqyasında və beynəlxalq ünsiyyətdə mühüm rol oynayan bir dildir. Qrammatika - dilin bütün sahələrini ələ alıb, araşdıran elmin adıdır. Ərəb dilində "*sərf* və *nəhv*" olaraq tanınan bu elm, qərb dillərində qrammatika olaraq adlandırılır. Bir dili səslərdən cümlələrə qədər, ehtiva etdiyi bütün komponentləri ilə, geniş bir şəkildə araşdıran elmə qrammatika deyilir. Qrammatika Roman dilləri qrupuna aiddir və latın dilindən törəmişdir. Qrammatika — yunan sözüdür. Hər bir dilin əsasını təşkil edir və onun strukturunu, sözlərin və cümlələrin qarşılıqlı əlaqəsini müəyyən edir. Bu məqalədə Fransız dilinin qrammatik sistemi elmi və nəzəri aspektlərdən təhlil olunur. Məqalənin məqsədi həm dil öyrənənlər, həm də lingvistlər üçün qrammatik qaydaları sistemləşdirməkdir. Onun qrammatik sistemi həm sintetik, həm də analitik xüsusiyyətlər daşıyır. Bu o deməkdir ki, mənanı ifadə etmək üçün həm sonluqlardan, həm də köməkçi sözlərdən istifadə olunur.

Qrammatika sözlərin dəyişməsi və onların cümlədə birləşməsi qaydalarının məcmusudur. Qrammatika bizə nitqimizi düzgün qurmaq, fikrimizi səlis və aydın ifadə edə bilmək, sözləri cümlədə necə dəyişdirmək və işlətmək, onları bir-biri ilə necə əlaqələndirmək, hansı ardıcıllıqla düzmək və s. qayda-qanunlarını öyrədir.Nəyə görə qrammatika hər şeydən vacibdir və hansı üsullar onun gizlinliyinə medaxilə etməlidir? Bu müzakirənin məqsədi fransız dilinin qrammatikasının mahiyyətini açmaq, onun əsas komponentlərini diqqət mərkəzində qoymaq və qrammatik bacarıqlarımızı saflaşdırmaq üçün strategiyaları təqdim etməkdir.

Fransız dilinin qrammatikasına yiyələnmək həm çətin, həm də dəyərləndirici bir iş sayılır. Əsas tə'limləri anlamaq, dərin axtarışlar aparmaq, qrammatikanı real vəziyyətlərdə tətbiq etmək, texnologiyadan istifadə etmək və daimi təkmilləşməyə nail olmaq qrammatik ustalığa yol açır. Hər bir öyrənmə anını qəbul edin və fransız dilinin qrammatikasının mürəkkəbliklərinin necə baş verdiyini izləyin, bu isə sizi rəvanlığa və ondan kənara çıxmağa doğru aparır.

2 . Qrammatikanın əsas bölmələri

1. Morfologiya- Morfologiya sözlərin quruluşu və dəyişməsi haqqında elm.
2. Sintaksis- cümlə quruluşu və sözlərin əlaqəsi.
3. Fonologiya və orfografiya- səslərin və yazı sisteminin qaydaları.

2.1. Morfologiya sözlərin quruluşu və dəyişməsi ilə məşğuldur. Fransız dilində morfologiya həm sintetik, həm də analitik xüsusiyyətlər daşıyır. Sintetik quruluş fellərin və isimlərin sonluqları vasitəsilə mənanı ifadə edir, analitik quruluş isə köməkçi sözlərlə(artikl, və köməkçi fellər) formalaşır. Fransız dilinin qrammatikası genişdir və dərk etmək üçün çoxsaylı qaydaları əhatə edir. Bununla belə, bir neçə əsas prinsipdən çıxış edir:
- Nitq hissələri- Sözlər cümlə daxilindəki roluna görə ayrı-ayrı qruplara bölünür. Fransız dilinin qrammatikası 8 əsas kateqoriyanı tanıyır:isimlər, tələffüzlər, feillər, sifətlər, zərflər, prepozisionlar, conjonksiyonlar və interjeksyionlar.
- Hərəki fellər- hərəkətlərin və ya vəziyyətlərin baş verərkən əks olunması, keçmişə, indiki və gələcəyə bölünməsi, hər birinin dörd nüansı – sadə, davamlı (mütərəqqi), ani mükəmməl və mükəmməl davamlı olması.
- Fellərin şəxsə və kəmiyyətə görə isim və əvəzliklə uzlaşması – məsələn: “Elle chante” və “Ils chantent” ilə izah olunması.
- Cümlə quruluşu: Sərt cümlələrində, adətən, mövzu və feillər olur, bəzən isə əşya ilə tamamlanır. Onlar sadə, mürəkkəb şəkilçilər qəbul edə bilər və onların hər biri ünsiyyət rolunu yerinə yetirir.
- Durğu işarələri: Nöqtə işarələri, aksan işarələri, vurğu nöqtələri, sual işarələri oxunaqlılığın artırılmasın
da və dərinlik əlavə etməkdə həlledici əhəmiyyətə malikdir. Onlar yol göstərir, yazıların sürətini və aydınlığı təyin edirlər.
edir. Bununla belə, bir neçə əsas prinsipdən çıxış edir:

2.2. Sintaksis.
Cümlə quruluşu (la phrase) əsasən mübtəda+ xəbər+ tamamlıq, zərflik strukturuna əsaslanır.
Ən əsas struktur:
- Mübtəd+ fel, +tamamlıq.
  Ex: Je lis un livre.
- Söz sərası: Fransız dilində söz sırası çox sabitdir. Qrammatik funksiya əsasən yerinə görə müəyyən edilir, çünki, hallanma yoxdur.
  Ex: Marie aime Paul.
- Sual və inkar:
  Ex: Est-ce que tu viens? Je ne parle pas.

İnkar formada: İnkar hissəcikləri (ne və pas-dır)
Sual forması 4 cürdür. Ümumi sual, sadə iversiya, mürəkkəb inversiya və sual əvəzlikləri.Ex: Est-ce que je parle? Parles-tu? Nana, parle-t-elle?

Fransız dilində söz sırası sabitdir. Qrammatik funksiya əsasən yerinə görə müəyyən olunur, çünki, hallanma yoxdur.Cümlənin başqa üzvlərinin işlənmə yerləri isə müxtəlifdir.

2.3. Fonologiya və Orfoqrafiya. Fransız yazı sistemi latın qrafikasına əsaslanır. Amma, tələffüs qaydaları mürəkkəbdir
Qrafem-fonem uyğunluğu sabit deyil.
- Burun samitləri(on, an, in, un,ən,) və səsli dəyişmələr qrammatik mənaya təsir edə bilir.

3. Qrammatik qabiliyyətinimizi yaxşılaşdırmaq üçün aşağıdakı effektiv
üsullara diqqət yetirək:

- Müntəzəm oxumaq: Bu,yaxşı yazılmış mətnlərə dalmaq, düzgün qrammatika ritmi tutmaq və tətbiq etməklə həyata keçirilir.
- Ardıcıl yazı: Yazı məşqləri ilə məşğul olmaq qrammatikamızı möhkəmləndirir, təkmilləşmə üçün sahələri vurğulayır. Gündəlik və ya əlaqə saxlamaq uçun böyük məşğuliyyətdir.
- Qrammatika resurslarından istifadə: Özünüzü mötəbər qrammatika kitabları, onlayn platformalar və ya proqramlarla təchiz edin. Bu resurslar qrammatik qaydaları daha yaxşı başa düşməyə kömək edə bilər.
- Konstruktiv rəylər axtarmaq: Forumlardan, dil mübadiləsindən və ya bilikli dostlardan fransız dili istifadənizə dair rəy istəyin və onların məsləhətlərini proqramınıza daxil edin.
- Səbir və israrla məşq etmək: Qrammatikada ustalıq tədricən və davamlı bir səydir. Qətiyyətli olun, ardıcıl məşq edin və hər bir irəliləyişi qeyd edin.

4. Qrammatik bilikləri dərinləşdirmək üçün çalışma nümunələri:

- Testlər: Qrammatika testləri biliklərinizi sınamaq üçün klassik bir üsuldur. Bütün çətinlik səviyyələrində olurlar və sadə feliklərdən mürəkkəb tikinti və qrammatik qaydalara qədər olan müxtəlif mövzuları daxil edirlər. Hər hansı bir səviyyəyə, başlanğıcdan qabaqcıl olmaq üçün qrammatika testlərini tapa biləcəyiniz bir çox onlayn mənbələr var.
- Qrammatika təlimləri: qrammatika məşqləri qrammatika qaydalarını gücləndirməyə və qrammatik konstruksiyalardan düzgün istifadə etməyə kömək edir. Yazılı, ya da şifahi ola bilər. Yazılı məşqlər cümlələrdəki boşluqları doldurmaq, bir felin və ya sifətin düzgün formasını seçərək və s. Şifahi məşqlər xüsusi bir mövzuda cümlə yazılı tapşırıqları, xüsusi qrammatik konstruksiyalardan istifadə və s .
- Mətnlərin düzəldilməsi: Qrammatika haqqında biliklərinizi sınamaq üçün əla bir yoldur. Hər hansı bir mətnin içərisində qrammatik səhvləri düzəltməyə çalışın. Bu, qrammatika qaydalarını real mətnlərdə düzgün tətbiq etməyi başa düşməyə kömək edəcəkdir.
- Proqramlar və onlayn resurslardan istifadə: Bunun üçün qrammatika biliklərinizi sınamağa və inkişaf etdirməyə kömək edəcək bir çox tətbiq və onlayn mənbələr var. Bəziləri interaktiv məşqlər təklif edir, digərləri müxtəlif mövzularda qrammatika testləri var.
- Film və şoular: Filmlər və televiziya şoularını izləmək daha faydalı ola bilər. Yeni başlayanlar üçün sadə filmlər və seriyalardan başlaya bilərsiniz və sonra daha mürəkkəblərə keçə bilərsiniz.
- Onlayn müzakirələr: Bu müzakirələrdə iştirak edə bilər, dil klublarına qoşula və ya Fransız ünsiyyətində bir tərəfdaş tapa bilərsiniz.

5. Nəticə:

Fransız dilinin qrammatikası genişdir və dərk etmək üçün çoxsaylı qaydaları əhatə edir. Əsas etibarilə, qrammatika dilin çərçivəsini təşkil edir – sözlərin strukturlaşdırılmasının mənalı, bir-biri ilə sıx bağlı ifadələrə yönəldilən qaydalar və anlayışlar dəstidir. Qrammatik normalara riayət etmək, mesajların aydın ötürülməsini çaşqınlıqdan qaçınmasını təmin edir . Təsəvvür edin ki, mebelləri təlimatsız yığmağa çalışırıq, nəticə isə çox xoşagəlməz hal ola bilər! Eynilə, şifahi və yazılı mübadilə zamanı qrammatikaya etinasız yanaşmaq anlaşılmazlığa və xaosa gətirib çıxara bilər.

Fransız dilinin qrammatika nəzəriyyəsi fransız dilində effektiv ünsiyyətin bel sütunudur. Mənalı və düzgün cümlələrin qurulması üçün zəruri olan qayda və strukturları təmin edir. Fransız dilinin qrammatikasının əsası isimlərin, feillərin, adjektiv və digər nitq hissələrinin rollarını anlamaqla başlayır. Hər bir element qarşılıqlı təsirə girərək bir-birinə bağlı cümlələr yaradır.

Fransız dilinin qrammatikası həm tarixi, həm də struktur-funksional aspektlərdə tətiq olunur. Elmi baxımdan zəngin bir sistemə malikdir. Onun sistemliliyi və qaydalarının sabitliyi, fransız dilini beynəlxalq səviyyədə öyrənilməsi asan, lakin incəlikləri ilə zəngin bir dilə çevrir.

Morfologiya və sintsksis, artikl, fellər, və digər nitq hissələrinin quruluşu dilin strikturunu müəyyən edir. Müasir yanaşmalar qrammatikanı həm struktur, Həm də funksiya aspektində təhlil etməyə imkan verir. Getdikcə daha çox inkişaf etmiş ölkədə fransız dilində effektiv ünsiyyət həlledici rol oynayır. Bu dili öyrənməyə başlayanlar qrammatik çətinliklərlə üzləşir. Bunun üçün güclü intellekdən istifadə etmək lazımdır.

Fransız dilinin qrammatikası həm nəzəri, həm də elmi baxımdan çox sistemli şəkildə qurulub və indiki müasir roman dillərinin içində ən çox öyrənilənlərdir.

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Xarici dilin tədrisi zamanı yazı vərdişlərinin aşılanması yolları

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Xülasə

Müasir dövrdə qloballaşma prosesləri xarici dillərin öyrənilməsini və öyrədilməsini zəruri etmişdir. Xarici dilin tədrisi təkcə kommunikativ bacarıqların formalaşdırılması ilə məhdudlaşmır, eyni zamanda dinləmə, danışma, oxu və yazı kimi əsas dil bacarıqlarının kompleks inkişafını nəzərdə tutur. Bu bacarıqlar arasında yazı xüsusi əhəmiyyətə malikdir, çünki o, dilin həm funksional, həm də akademik istifadəsini təmin edir. İngilis dili kimi beynəlxalq ünsiyyət vasitəsini öyrənən şəxslər üçün yazı bacarıqlarının düzgün formalaşdırılması onların akademik, peşəkar və sosial sahələrdə effektiv ünsiyyət qurmasına şərait yaradır. Lakin yazı bacarığının inkişafı bəzən digər bacarıqlardan geri qalır və bu da öyrənənlərdə yazılı ifadə zamanı çətinliklər yaradır.

Yazı bacarığının formalaşdırılması üçün yaradıcı mühitin yaradılması, mərhələli öyrənmə yanaşmasının tətbiqi və müxtəlif yazı formaları ilə işləmək vacibdir. Esse, rəsmi məktub, hesabat və təqdimat kimi tapşırıqlar tələbələrə müxtəlif yazı tipləri ilə tanış olmaq və bu sahədə praktiki bacarıqlar qazanmaq imkanı verir. Müəllimlərin bu prosesdə rolu xüsusi əhəmiyyət daşıyır; onlar yalnız bilik ötürən deyil, həm də istiqamətləndirici və motivasiyaedici rol oynayırlar. Yazı prosesinin bütün mərhələlərində müəllimin dəstəyi və fərdi rəy öyrənənlərin fikirlərini daha aydın və səlis ifadə etməsinə kömək edir.

Eyni zamanda, texnologiyaların tətbiqi də yazı bacarıqlarının inkişafına mühüm təsir göstərir. Rəqəmsal platformalar, onlayn korrektə alətləri və tərəfdaş yoxlaması üsulları tələbələrin dil səhvlərini müəyyənləşdirməsinə və tənqidi düşünmə qabiliyyətini gücləndirməsinə şərait yaradır. Məqalədə ingilis dilinin tədrisində yazı bacarıqlarının inkişafı, rəsmi və akademik yazı nümunələrinin quruluşu, yazı prosesində istifadə olunan metodlar və durğu işarələrinin rolu araşdırılaraq bu sahədə effektiv metodların və praktik yanaşmaların müəyyənləşdirilməsi əsas məqsəd kimi qoyulur.

Açar sözlər: Akademik yazı, rəsmi yazı, yazı bacarığı, nəticə yönümlü yanaşma, proses yönümlü yanaşma

Yazı məhsuldar bacarıqlardan biri olmaqla yanaşı, həm də düşüncələrin ardıcıl və məntiqi şəkildə ifadə olunmasına xidmət edir. Xarici dili öyrənən tələbələrin bu bacarığı mənimsəməsi, onların dili yalnız ünsiyyət vasitəsi kimi deyil, həm də akademik və sosial məqsədlərlə istifadə edə bilməsinə imkan yaradır. Yazı bacarığı, həm struktur baxımından mürəkkəbliyi, həm də tələb olunan dəqiqlik və dil qaydalarına riayət olunması baxımından digər dil bacarıqları ilə müqayisədə daha çox diqqət və məşq tələb edir.

Yazı, əsasən, düşüncələrin planlı və məqsədyönlü şəkildə ifadə olunmasını tələb etdiyi üçün xarici dil öyrənənlərin lüğət ehtiyatı, qrammatik bilikləri və durğu işarələri ilə işləmək bacarığı bu prosesdə mühüm rol oynayır. Həmçinin yazı zamanı dilin formal və qeyri-formal üslublarına uyğunluq, abzas quruluşunun düzgün təşkili və fikir axınının məntiqi ardıcıllıqla verilməsi tələb olunur. Bu baxımdan yazı bacarığının inkişafı, digər dil bacarıqlarının formalaşmasına da bilavasitə təsir edir.

Yazının tədrisində istifadə olunan metodlar müxtəlif yanaşmalar əsasında qurulur. Ənənəvi "nəticəyönümlü" yanaşmada şagirdlərə əvvəlcədən müəyyən edilmiş struktura uyğun yazı nümunələri təqdim olunur və onlar bu struktura əsaslanaraq öz fikirlərini ifadə etməyə çalışırlar.

Digər yanaşma – "prosesyönümlü" modeldə isə əsas diqqət yazı prosesinin mərhələlərinə (planlaşdırma, ilk versiyanın yazılması, redaktə və yekunlaşdırma) yönəldilir. Bu yanaşma tələbələrin yazı bacarığını mərhələli şəkildə inkişaf etdirməyə imkan verir [4, s. 51].

Həmçinin, yazı bacarığının formalaşdırılması zamanı digər dil bacarıqları ilə inteqrasiyalı şəkildə işləmək daha effektiv nəticə verir. Məsələn, oxu fəaliyyətləri vasitəsilə tələbələr həm leksik, həm də struktur baxımından yeni nümunələrlə tanış olur, bu da onların yazı zamanı həmin bilikləri tətbiq etməsinə imkan yaradır. Belə yanaşma həm motivasiya yaradır, həm də real kommunikativ ehtiyaclara xidmət edir [3, s. 326].

Qeyd edildiyi kimi, ingilis dilində rəsmi və akademik yazı bacarığı, xarici dil öyrənən şəxslər üçün xüsusi əhəmiyyət daşıyır. Rəsmi yazı dilin ciddi və nizamlı, müəyyən qayda-qanun çərçivəsində istifadəsini tələb edir; bu zaman struktur, üslub, leksik seçim və qrammatik dəqiqlik ön plana çıxır. Belə yazılara misal olaraq esse, məqalə, hesabat, iş məktubu və ərizə kimi nümunələr göstərilə bilər.

Rəsmi yazının əsas xüsusiyyəti onun obyektiv və qeyri-şəxsi xarakter daşımasıdır. Yazı müəllifi emosional ifadələrdən uzaq durmalı, fikirlərini əsaslandırılmış və məntiqi şəkildə təqdim etməlidir. Struktur baxımından isə rəsmi yazı giriş, əsas hissə və nəticə bölmələrindən ibarət olur. Hər bir abzas bir əsas fikir üzərində qurulmalı, onlar arasında keçidlər aydın və məntiqi şəkildə təşkil olunmalıdır [4, s.10].

Yazının dili rəsmi olmalı və danışıq dilindən uzaq dayanmalıdır. Məsələn, qısa formalar (*can't, won't*), qeyri-rəsmi ifadələr (*a lot of, stuff, things like that*) və şəxsi fikirlərin vurğulanması (*"I think", "I believe"*) minimal səviyyədə və məqsədəuyğun şəkildə istifadə olunmalıdır [3, s. 39].

Rəsmi yazıda cümlə quruluşunun düzgün qurulması da vacib amillərdəndir. Sadə və mürəkkəb cümlələr arasında balans qorunmalı, əlavə olaraq, artikllar, bağlayıcılar və bağlayıcı vasitələr *("however", "therefore", "in addition", "consequently")* yazının axıcılığını və məntiqi ardıcıllığını təmin etməlidir. Bu elementlər yazının akademik səviyyədə təqdim edilməsində əhəmiyyətli rol oynayır. [5, s.114].

Xarici dil öyrənən tələbələrin ən çox çətinlik çəkdiyi məqamlardan biri də abzas quruluşunun düzgün təşkil edilməsidir. Hər abzas konkret bir əsas fikir ətrafında qurulmalı və onu dəstəkləyən cümlələrlə inkişaf etdirilməlidir. Bu baxımdan müəllimlərin yazı nümunələri təqdim etməsi və strukturlaşdırma üzrə təlimlər keçməsi faydalı ola bilər.

Qeyd etmək lazımdır ki, rəsmi yazı bacarığının inkişafı yalnız dil biliklərinin deyil, eyni zamanda məntiqi düşüncə tərzinin formalaşmasına da müsbət təsir göstərir. Belə bacarıqların aşılanması şagirdlərin həm akademik fəaliyyətində, həm də gələcək peşəkar həyatında uğur qazanmasına zəmin yaradır.

Yazılı ünsiyyətdə durğu işarələri dilin aydın və başadüşülən şəkildə ifadəsi üçün əvəzsiz vasitədir. Onlar yalnız cümlənin intonasiyasını və quruluşunu müəyyənləşdirmir, eyni zamanda məna dəyişikliklərini də tənzimləyir. Xüsusilə rəsmi və akademik yazıda durğu işarələrinin düzgün istifadəsi yazının keyfiyyətinə birbaşa təsir edir.

Xarici dil öyrənənlərin çoxu üçün durğu işarələrinin istifadəsi çətinlik yaradan sahələrdən biridir. Bu çətinliyin əsas səbəbi ingilis dilində durğu sisteminin onların ana dillərindəki sistemdən fərqli olması ilə bağlıdır. Məsələn, ingilis dilində vergülün istifadəsi başqa dillərə nisbətən daha sərtdir və sintaktik struktura ciddi şəkildə bağlıdır [7, s.76].

Əsas durğu işarələrinə nöqtə (.), vergül (,), nöqtəli vergül (;), iki nöqtə (:), sual işarəsi (?), nida işarəsi (!), dırnaq işarələri (" "), mötərizə və tire daxildir. Hər birinin konkret funksiyası və istifadəsi qaydası vardır:

- Nöqtə- cümlənin bitdiyini, yəni fikrin tamamlandığını göstərir.
- Vergül- cümlə üzvlərinin əlavəsini, həmcins üzvləri və mürəkkəb cümlələrin tərkib hissələrini ayırmaq üçün istifadə olunur. Lakin ingilis dilində vergüldən artıq istifadə bir sıra səhvlərə yol aça bilər. Belə ki, tamamilə fərqli məna yükünə sahib iki müstəqil cümləni vergüllə

ayırmaqla (buna ingilis dilində “comma splice” deyilir. [3, s.303]) düzgün olmayan fikir ardıcıllığı yaranır. Məsələn, *She loves reading, she goes to the library every week.* Nümunədən də aydın görünür ki, cümlələr arasında məntiqsiz bir rabitə var. Əslində, bu cümlələr ya nöqtə, ya bağlayıcı, ya da nöqtəli vergüllə ayrılmalıdır.

- İki nöqtə- açıqlama və nümunələrdən əvvəl istifadə olunur.
- Nöqtəli vergül- isə iki müstəqil cümlə arasında sıx əlaqə yaratmaq üçün tətbiq edilir [7, s.112].

Durğu işarələrinin istifadəsi, yazı zamanı informasiyanın oxucuya necə ötürüləcəyini müəyyənləşdirir. Məsələn, bir vergülün yerində olmaması cümlənin mənasında ciddi çaşqınlıq yarada bilər. Bu məsələni məşhur bir nümunə ilə izah etmək olar: *“Let’s eat, Grandma!”* və *“Let’s eat Grandma!”* ifadələri arasındakı yeganə fərq vergül olsa da, mənaca tamamilə fərqli məlumat ötürür [7, s.9].

Bu cür fərqlər xarici dil öyrənənlərin durğu işarələrinə diqqətli yanaşmasının vacibliyini göstərir.

Durğu işarələrinin tədrisi zamanı müəllimlər həm izahlı qaydaları, həm də praktik tətbiqləri birgə təqdim etməlidir. Tələbələrə yanlış və düzgün nümunələrin müqayisəsi ilə yanaşı, mətn üzərində redaktə və düzəliş işləri vermək onların bu sahədəki bacarıqlarını inkişaf etdirə bilər. Bundan başqa, rəsmi sənədlərin və akademik yazı nümunələrinin təhlili tələbələrə real kontekstdə durğu işarələrinin necə işlədiyini göstərir [5, s.129].

Durğu işarələrinin öyrədilməsi yalnız texniki bir bacarıq deyil, həm də yazı düşüncəsinin formalaşması üçün vacib bir mərhələdir. Durğu işarələrindən düzgün istifadə yazının anlaşıqlılığını artırır, yazı müəllifinin fikirlərini daha səlis və təsirli şəkildə ifadə etməsinə imkan verir.

Yazı bacarığının tədrisi sadəcə nəzəri biliklərin ötürülməsi ilə məhdudlaşmamalı, həm də praktik və məqsədyönlü yanaşmalara əsaslanmalıdır. Xarici dili öyrənən tələbələr üçün yazı prosesi çox vaxt çətin və yorucu görünə bilər. Bu səbəbdən yazı tədrisində istifadə olunan metodlar həm maraqlı, həm də tələbəyönümlü olmalıdır.

- Yönləndirilmiş yazı (guided writing)

Yönləndirilmiş yazı məşqləri müəllim tərəfindən verilmiş struktur və məzmun istiqamətləri əsasında aparılır. Bu üsul xüsusilə yazı bacarığı zəif olan tələbələr üçün əlverişlidir. Onlara əvvəlcədən plan, söz bazası, cümlə nümunələri və ya başlanğıc cümlələri təqdim olunur. Bu cür strukturlaşdırılmış fəaliyyətlər tələbələrin yazı prosesinə olan inamını artırır [3, s. 326].

- Qarşılıqlı yoxlama və rəyvermə (peer review & feedback)

Yazı bacarığının inkişafında tələbələrin bir-birinin işinə rəy verməsi onların həm yazıya, həm də oxucu mövqeyinə yanaşmasını dəyişir. Bu metod tələbələrin tənqidi düşünmə qabiliyyətini inkişaf etdirir və eyni zamanda redaktə vərdişləri formalaşdırır. Həmçinin müəllimdən alınan individual rəy də (teacher feedback) tələbənin zəif cəhətlərini görməsi baxımından vacibdir [5, s.145].

- Yazı portfolioları və gündəliklər

Yazı portfolioları tələbənin yazı prosesindəki inkişafını izləmək üçün effektiv vasitədir. Bu portfoliolar şagirdin müxtəlif mövzularda yazdığı işləri əhatə edir və onların zamanla necə irəlilədiyini göstərir. Digər tərəfdən, gündəlik yazılar tələbəyə sərbəst fikir ifadə etmə imkanı verir və yazı ilə özünüifadə bacarığını gücləndirir [4, s.128].

- Oxu və yazının inteqrasiyası

Oxu və yazı bacarıqları qarşılıqlı şəkildə bir-birini dəstəkləyir. Tələbələr yüksək keyfiyyətli mətnlər oxuduqda, həmin mətnlərdəki leksik və struktur nümunələri öz yazılarında tətbiq etməyi öyrənirlər. Müəllimlər oxu fəaliyyətlərindən sonra tələbələrə yazılı tapşırıqlar verdikdə bu iki bacarığın inteqrasiyası daha da güclənir [3, s.332].

- Rəqəmsal alətlərdən istifadə

Müasir texnologiyalar yazı tədrisinə dəstək məqsədilə geniş imkanlar yaradır. Məsələn, onlayn yazı platformaları, avtomatik yoxlayıcılar (spell/grammar check), bulud əsaslı sənəd paylaşımı və AI dəstəyi (məsələn, yazı planlaşdırma vasitələri) yazı prosesini həm asanlaşdırır, həm də təhsilalanın motivasiyasını artırır. Bununla yanaşı, müəllimlər də şagirdlərin işini rahatlıqla izləyə və qiymətləndirə bilirlər.

➢ Qiymətləndirmə meyarları və rubriklər

Yazının qiymətləndirilməsi zamanı obyektiv meyarlar və rubriklərdən istifadə olunması vacibdir. Bu rubriklərdə məzmunun aydınlığı, struktur, qrammatika, durğu işarələri, lüğət seçimi kimi elementlər yer almalıdır. Tələbə rubrik vasitəsilə yazısında hansı sahədə güclü, hansı sahədə zəif olduğunu konkret şəkildə görə bilir [5, s.153].

Praktik metodların sistemli şəkildə tətbiqi yazı bacarığının yalnız texniki tərəflərini deyil, həm də düşüncə və planlaşdırma vərdişlərini inkişaf etdirir. Yazını öyrənən tələbə həm özünü daha yaxşı ifadə etməyi, həm də dilə qarşı məsuliyyətli münasibət qurmağı öyrənir.

Yazı bacarığının inkişafında yalnız struktur və qrammatik dəqiqlik deyil, həm də tələbənin özünəməxsus yazı tərzinin formalaşması vacib amillərdən biridir. Bu, dil öyrənənin öz fikirlərini yaradıcı və fərdi üslubda ifadə etməsinə şərait yaradır. Müəllimlər tələbələri yalnız qaydaları öyrənməyə deyil, eyni zamanda öz yazı üslubunu kəşf etməyə təşviq etməlidirlər. Bu məqsədlə yaradıcı yazı tapşırıqları (creative writing), şəxsi esselər və müzakirəyə açıq mövzularda yazılar tələbələrin fərdi yanaşma bacarığını inkişaf etdirə bilər. Fərdi üslubun təşviqi həmçinin motivasiyanı artırır və yazı prosesini tələbələr üçün daha mənalı edir.

Yazının son keyfiyyəti yalnız ilkin yazı mərhələsinə deyil, həm də redaktə və korrektə prosesinə bağlıdır. Bir çox tələbə yazı işini tamamladıqdan sonra redaktə mərhələsini ötürür və bu da yazının keyfiyyətinə mənfi təsir göstərir. Bu səbəbdən, redaktə vərdişlərinin tədrisi yazı bacarığının ayrılmaz hissəsi kimi təqdim olunmalıdır. Müəllimlər tələbələrə redaktə texnikaları – məntiqi ardıcıllığın yoxlanması, qrammatik səhvlərin düzəldilməsi, sinonimlərin istifadəsi, cümlə strukturunun təkmilləşdirilməsi – haqqında praktiki məşğələlər keçməli və yazı sonrası düzəlişin əhəmiyyətini izah etməlidirlər. Bu mərhələdə həmçinin texnoloji alətlər yazının dəqiqliyini artırmaq üçün istifadə oluna bilər.

Yazı vərdişlərinin aşılanması zamanı fənlərarası inteqrasiya və yazının kontekstləşdirilməsi də önəmli faktorlardan hesab edilir. Belə ki, yazı bacarığının yalnız dil dərsi çərçivəsində deyil, digər fənlərlə əlaqələndirilməsi də onun praktikliyini artırır. Tələbələrə qeyri-ixtisas fənləri ilə bağlı mövzularda yazılar yazdırmaq onların həm məzmun biliklərini, həm də fənlərarası inteqrasiyanı gücləndirir. Belə tapşırıqlar dil bacarığının daha real və funksional kontekstlərdə tətbiqinə şərait yaradır. Eyni zamanda, bu metod interdisiplinar yanaşmanın inkişafına və akademik tədqiqat qabiliyyətlərinin formalaşmasına xidmət edir. Kontekstual yazılar həm də tələbələrin analitik və tənqidi düşüncə bacarıqlarını stimullaşdırır, onları daha dərin və əsaslandırılmış şəkildə fikir bildirməyə təşviq edir.

Nəticə:

Yuxarıda qeyd edilən məlumatlardan aşağıdakı nəticələrə gəlmək olar:

Yazı bacarığı digər dil bacarıqlarından fərqli olaraq, həm dilin texniki tərəflərinin, həm də düşüncə və ifadə vərdişlərinin inteqrasiyasını tələb edir. Xüsusilə, rəsmi və akademik yazının öyrədilməsi tələbələrə yalnız düzgün cümlə qurmağı deyil, həm də fikirlərini məntiqi, aydın və inandırıcı şəkildə təqdim etməyi öyrədir.

Tədqiqat göstərdi ki, yazı bacarığının formalaşdırılmasında sistemli yanaşmalar – yönləndirilmiş yazı, rəyvermə və redaktə, oxu ilə inteqrasiya, portfolioların tətbiqi və rəqəmsal vasitələrdən istifadə – müsbət nəticələr verir. Müəllimlərin yazı prosesinə mərhələli yanaşması (planlaşdırma, yazı, redaktə və qiymətləndirmə) tələbələrdə həm yazı texnikasını, həm də özünəinamı gücləndirir [3, s.325].

Bununla yanaşı, durğu işarələrinin düzgün istifadəsi yazının mənasına və aydınlığına birbaşa təsir göstərdiyi üçün ayrıca diqqət tələb edir. Tələbələrin buraxdığı tipik səhvlər onların durğu işarələrini ya həddindən artıq, ya da yersiz şəkildə istifadə etməsi ilə bağlıdır. Bu isə tədrisdə durğu işarələrinin sistemli və nümunəyə əsaslanan şəkildə öyrədilməsinin vacibliyini göstərir [7, s.76].

Tədqiqatın gəldiyi nəticələrə istinadən yazı vərdişlərinin təhsilalanlara daha effektiv şəkildə aşılanması üçün bir sıra məsələlər daim diqqətdə saxlanılmalıdır. Belə ki:

- Təhsilverənlər üçün təlimlər təşkil olunmalıdır – Rəsmi və akademik yazı standartları üzrə müəllimlərə metodik dəstək verilməli, praktik təlimlər keçirilməlidir. Təlimlərin doğma dil daşıyıcıları tərəfindən həyata keçirilməsi prosesin məhsuldarlığını daha da artıran faktor kimi dəyərləndirilməlidir.
- Dərslik və vəsaitlər yenilənməlidir– Yazı bacarığının inkişafını dəstəkləyən tapşırıq və fəaliyyətlər müasir tədris proqramlarında daha çox yer almalıdır. Mümkün qədər tədris prosesində autentik, yəni orijinal materiallar istifadə edilməlidir.
- Təhsilalanlara yazı nümunələri təqdim edilməlidir – Yaxşı və zəif yazı nümunələrinin müqayisəsi tələbənin öz səhvlərini görməsinə kömək edir. Bu zaman tələbələrin müqayisə aparması üçün daha keyfiyyətli yazı nümunələri ilə təchiz olunub, müqayisəli təhlillər aparmaq baxımından süni intellektin imkanlarından faydalanmaq üçün onlara icazə verilməli və fürsət yaradılmalıdır.
- Qiymətləndirmə şəffaf olmalı və rubrikə əsaslanmalıdır – Hər yazı işinə obyektiv və əsaslandırılmış qiymət verilməsi tələbələrin yazı keyfiyyətini yüksəldir.
- Durğu işarələrindən düzgün istifadəni təşviq etmək üçün işçi tədris proqramlarında müvafiq fənlər üzrə ayrıca dərs saatları ayrılmalıdır– Tələbələrin yazı zamanı bu elementlərə diqqət etməsi üçün xüsusi təlimlər faydalıdır.
- Rəqəmsal platformalardan aktiv istifadə olunmalıdır– Təhsilalanlara yazılarını elektron formatda yazmaq, redaktə etmək və paylaşmaq üçün imkan yaradılmalıdır.

Beləliklə, yazı bacarığının inkişafı yalnız dilin qrammatik aspektləri ilə bağlı məsələ deyil, həm də yaradıcı düşüncə, strukturlaşdırma və məntiqi ifadə qabiliyyəti ilə sıx bağlı olan kompleks bir prosesdir. Bu bacarığın tədrisi keyfiyyətli və ardıcıl şəkildə aparıldıqda, şagirdlər həm akademik uğurlar əldə edir, həm də real həyatda ünsiyyət bacarıqlarını inkişaf etdirirlər.

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Platform Grammar: Affordances, Algorithmic Mediation, and Structural Linguistic Innovation in the Digital Age

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Abstract

This paper presents a focused, empirically grounded account of how platform affordances and algorithmic mediation drive structural linguistic innovation in contemporary digital interaction. Moving beyond descriptive inventories, the article analyzes three tightly linked mechanisms: (1) affordance-level selection (character limits, caption timing, sticker toolkits) that channels producers toward compression and orthographic creativity; (2) algorithmic mediation that privileges engagement-optimizing variants and thereby ties indexical meaning to measurable metrics; and (3) socio-political governance (moderation, deplatforming) that shapes both the survival and social meaning of emergent forms. Drawing on large-scale diffusion studies, multimodal corpus analyses, and qualitative investigations of user strategies to evade moderation, the paper shows that platform-specific grammars emerge through routinization of multimodal resources (emoji sequences, typographic elongation, caption prosody) and that diffusion trajectories are co-determined by network topology and identity dynamics rather than by either factor alone. Empirical anchors include an agent-based validation against a 10% Twitter sample that demonstrates complementary network/identity roles in urban versus rural diffusion, observational and experimental evidence that commercial speech and language technologies exhibit systematic differential performance for marginalised varieties (increasing WER), and interview-based documentation of “algospeak” as a reproducible counter-strategy to moderation. The paper concludes by outlining integrated methods (multimodal annotation + time-series modeling + governance auditing) necessary to separate genuine sociolinguistic innovation from algorithmic amplification and to provide ethically responsible mappings of digital language change.
Keywords: Digital sociolinguistics, platform affordances, multimodal communication, language and technology, platform governance.

Introduction

This paper examines a narrow, empirical problem: how do the technical affordances of contemporary social platforms together with algorithmic curation and governance mechanisms produce structural — not merely stylistic or lexical — changes in written and multimodal interaction? I adopt a constraint-driven perspective in which platforms act as selection environments: affordances create recurring production pressures and recommendation systems apply selective pressures that alter which forms are visible and hence routinized. The claim is not that social structure (age, class, locality) is irrelevant; rather, platforms reconfigure the mapping from social space to linguistic form by adding technological and algorithmic dimensions that systematically bias trajectories of conventionalization.

Three analytic commitments guide the exposition. First, linguistic change in digital media must be treated as multimodal: visual, typographic, and temporal resources are integral to the grammar of interaction and participate in processes ordinarily ascribed to morphosyntax or pragmatics. Second, diffusion processes on platforms cannot be inferred from frequency alone because algorithmic mediation creates non-linear amplification that mimics—but is not equivalent to—social diffusion. Third, moderation and automated language technologies are structural actors: they differentially enable or constrain linguistic expression, producing both overt selection (demotion/removal) and covert pressures (language engineering by users) that alter distributional environments.

Empirical work over the last five years supports these commitments at multiple scales. Large observational studies that mine vast social corpora show that adoption and spread of lexical and orthographic innovations vary systematically across platform ecologies and are correlated with platform constraints (character budgets, caption lengths, visual templates) and engagement metrics. For example, multimodal corpora reveal reproducible patterns of graphemic reduplication, typographic elongation, and phonetic respellings concentrated in genres where brevity and salience are rewarded; these patterns are not random noise but behave like conventionalized devices for marking stance, emphasis, or turn structure. Corpus-driven tokenization and OOV analyses therefore need to be reframed: many “out-of-vocabulary” phenomena are emergent grammatical resources rather than mere processing obstacles.

At the meso level, agent-based and network models validated against social media data demonstrate that diffusion pathways are shaped jointly by network topology and identity signaling. Recent model-validation work using a substantial Twitter sample shows that early adoption is often best captured by weak-tie, network-driven diffusion in urban ecologies, while later spread into less diverse, rural contexts requires identity-sensitive mechanisms; models that omit either network or identity mispredict geographic and temporal patterns of adoption. These findings imply that platform-specific affordances (which determine initial visibility and ease of reuse) interact with underlying social structure to shape where and how new forms take hold.

At the micro level, qualitative and mixed-methods studies document user strategies that respond directly to algorithmic governance. Interview-based analyses of content moderation evasion show systematic creation of “algospeak” — lexical and orthographic workarounds whose structure (character substitution, spacing, euphemization) is tuned to known classifier weaknesses. Crucially, these practices do not simply hide content: they create durable variants that can become indexical markers of group membership. Simultaneously, audit-style investigations of commercial speech and language technologies reveal that automated systems perform significantly worse on many non-standard varieties, and that such differential performance has both representational and allocative consequences for users. These findings emphasize the political dimension: algorithmic systems do not neutrally translate language; they embed preferences that feed back into everyday communicative choices.

This constellation of results points to a conceptual synthesis. The processes that produce platform-native grammars are analogous to classical grammaticalization but mediated through multimodal routinization and algorithmic selection: repeated uses of a compressed multimodal pattern (e.g., a specific emoji sequence plus caption styling) become schematic templates; algorithms that surface the most engaging instantiations accelerate routinization by making particular tokens highly visible; moderation regimes then prune or channel the space of permissible variants, sometimes eliciting further innovation as users adapt. The result is an ecology in which code, corporate governance, and social structure co-produce new forms and paths of conventionalization.

Methodologically, advancing this synthesis requires integration of three toolsets. First, multimodal annotation that preserves timing, visual context, and typographic information (not just linear orthography) is essential. Second, longitudinal, probabilistic time-series models can test stabilization tendencies and separate short-lived viral spikes from sustained grammaticalization processes. Third, diffusion and governance analyses — combining network topology, agent-based counterfactuals, and moderation metadata or audit logs — are necessary to identify the relative contributions of social versus algorithmic selection. In the sections that follow I develop this framework across three focal areas (affordances + algorithms; multimodal orthographic conventionalization; diffusion/enregisterment + governance), and I anchor the analysis in concrete empirical results from recent large-scale and targeted studies. These results allow us to move from descriptive catalogues to explanatory mechanisms that can be tested, replicated, and operationalized in corpus and fieldwork design.

Platform affordances and algorithmic mediation as generators of structural innovation

Contemporary accounts of digital-mediated linguistic change must treat platforms not as neutral channels but as active grammaticalizing environments whose affordances selectively amplify, suppress, and formalize linguistic variants. Empirical work that profiles lexical and morpho-syntactic variation across platform ecologies shows systematic differences that align with platform constraints (character limits, interface affordances) and algorithmic engagement metrics rather than merely with speaker demographics: variants that maximize salience and re-shareability—short, iconic, indexically dense forms—are disproportionately selected and propagated. This selection operates at two interacting levels. First, micro-affordances (e.g., constrained buffer size, video caption timing, sticker/emoji toolkits) channel producers toward compression strategies that instantiate quasi-orthographic and prosodic conventions in writing (e.g., phonetic spellings, punctuation play, temporally aligned prosodic marking in captions). Second, algorithmic mediation privileges content that optimizes engagement signals, thereby indexing social meaning to metrics (likes, watch time) and creating feedback loops whereby forms that elicit measurable engagement are rapidly enregistered as “platform-native” varieties. These dynamics are not purely stylistic: they reshape orthographic regularities and distributional co-occurrence patterns in ways detectable by corpus methods (e.g., divergent collocational profiles, emergence of reanalysis sites at word-boundary junctures), and they produce canalized pathways of conventionalization that differ across platforms.

Two analytic consequences follow. Methodologically, observational claims about digital language change need to control for selection bias introduced by platform affordances and recommendation systems: what appears to be rapid lexical diffusion may be a by-product of algorithmic amplification rather than a spontaneous sociolinguistic wave diffusing through preexisting social networks. Practically, the normative status and pragmatic functions of innovations cannot be inferred from frequency alone; one must model the affordance–algorithm pipeline to explain why certain forms stabilize. Recent multimodal case studies demonstrate how algorithmically favored prosodic and visual indexing (e.g., rapid cuts, caption styling, meme templates) create reusable semiotic frames that function like templates for linguistic innovation—templates that both constrain possible innovations and make them more memorable, accelerating adoption.

Multimodality, orthographic creativity, and the emergence of written grammars

The proliferation of image, video, emoji, and typographic affordances dissolves the traditional written/spoken dichotomy and creates hybrid semiotic systems with emergent written grammars. Rather than viewing emoji and typographic play as mere paralinguistic ornament, analysis of large social corpora reveals that these resources systematically participate in syntactic and pragmatic operations: emoji sequences can realize predicate-like functions or complete clausal meaning in ways that recur across users and genres; typographic elongation, spacing, and punctuation functions as a morphosyntactic signaling system for emphasis, stance, and turn-taking. Computational descriptions of social-media text have exposed persistent, reproducible patterns of orthographic innovation—phonetic spelling, graphemic reduplication, and delimiter reanalyses—that behave like productive morphological processes inside platform genres. This suggests an ongoing conventionalization process: repeated strategic use within interactional niches leads to categorical reinterpretation (for instance, conventionalized orthographic markers of irony or marked affect), effectively generating micro-grammars for written digital interaction.

From a theoretical perspective, such written-grammar formation invites us to reconceive grammaticalization as multimodal and affordance-sensitive. The canonical path—phonetic erosion → grammatical morpheme—has analogs in digital media where multimodal compression (e.g., an emoji sequence that compresses "I am laughing and rolling my eyes") becomes grammaticalized via routinization and schematic reuse. Empirically, tracking this requires combining fine-grained multimodal annotation with diachronic frequency-based models: qualitative CMDA (computer-mediated discourse analysis) uncovers the interactional functions of forms, while probabilistic time-series models reveal tendencies toward stabilization. Recent large-scale work on textual variation and OOV (out-of-vocabulary) phenomena highlights both the methodological challenges (tokenization, normalization) and the linguistic payoff: treating orthographic innovation as structured rather than noisy yields interpretable generalizations about emergent morphology and pragmatic indexing.

Diffusion, enregisterment, and the politics of visibility

The socio-indexical life of platform-native variants hinges on three linked processes: (1) diffusion within and across platform communities, (2) enregisterment—whereby a form accrues conventional social meaning—and (3) the politics of visibility shaped by moderation, community norms, and algorithmic governance. Diffusion studies that integrate social-network topology with platform affordances show that the same innovation follows very different trajectories depending on community structure: tightly knit subcommunities often serve as incubators for highly indexical forms that later cross to broader publics via influencers and meme circuits, whereas broadcast diffusion (through high-reach accounts) favors near-transparent, memeified forms that scale quickly but remain shallow in indexical depth. Enregisterment is not automatic: empirical work demonstrates that migration from niche to mainstream requires an indexical re-framing (often mediated by influencers or metalinguistic commentary) that makes the form recognizable and readable to newcomers; algorithms accelerate this re-framing by surfacing exemplary instantiations, thus collapsing metapragmatic negotiation into algorithmic curation.

These processes are inherently political. Platform governance (content moderation, deplatforming, community guidelines) alters which innovations survive and which are suppressed; users in contexts of surveillance or censorship develop algospeak—deliberate lexical workarounds that preserve communicative intent while evading automated filters—a phenomenon documented both in qualitative case studies and in recent journalistic-academic syntheses. The socio-political valence of emergent forms thus depends on differential exposure to moderation regimes: the same lexical workaround can be an in-group solidarity marker in one context and a survival strategy in another. Moreover, the increasing use of automated sociolinguistic tools (for dialect detection, moderation) raises equity concerns: auto-coding and fairness analyses show that algorithmic systems frequently misrecognize or penalize non-standard varieties, thereby reinforcing prestige norms and constraining the spaces where innovation can be safely expressed. Research in this vein calls for analytic frameworks that couple diffusion modeling with governance analysis and fairness auditing to map how platform politics shape language evolution trajectories.

Concluding analytical implications (brief)

Three convergent implications follow for empirical sociolinguistics. First, methodological integration is mandatory: multimodal annotation, network modeling, and algorithmic-affordance analysis must be combined to distinguish genuine sociolinguistic diffusion from algorithmic amplification. Second, theories of grammaticalization and social meaning must be updated to account for multimodal conventionalization pathways and platform-specific indexing practices. Third, the ethical and political dimensions of visibility—moderation, surveillance, automated labeling—constitute structural forces that not only mediate which innovations spread but also who can safely innovate. Addressing these implications requires collaborative methodologies (linguists partnering with platform studies, machine-learning fairness researchers, and ethnographers) and new longitudinal corpora that preserve multimodal context and moderation metadata. Recent computational and qualitative studies together show that digital sociolinguistic change is rapid and patterned, but its pathways are shaped as much by code and corporate governance as by social structure; unpacking that co-production should be the central empirical program for the next phase of research.

Conclusion

This paper argued that structural linguistic innovation in the digital era is produced at the intersection of platform affordances, algorithmic mediation, and socio-political governance. Below I summarize concrete empirical findings from recent research, report quantified results where available, draw methodological conclusions, and propose a prioritized research agenda.

1. Quantified contributions of network and identity to diffusion. An agent-based study validated on a 10% sample of Twitter (X) demonstrates that neither network topology nor identity alone suffices to reproduce observed spatial diffusion patterns of lexical innovations; rather, the two factors act complementarily and interactively. Empirically, the authors report that across full-US simulations the combined Network+Identity model produced higher spatial correlation with empirical geographic distributions in 46% of trials, while Network-only and Identity-only counterfactuals outperformed the combined model in 34% and 20% of trials respectively; early adoption was primarily captured by network effects whereas later, urban-to-rural spread required both network and identity. The study further quantifies the correlation between network- and identity-based pathway strengths (Pearson's $R = 0.78$; Spearman's $\rho = 0.81$), indicating that while related, the two mechanisms generate distinct diffusion signatures that explain different geographic regimes (urban weak-tie diffusion vs rural strong-tie identity diffusion). These results provide a replicable, numerical baseline for distinguishing diffusion mechanisms in platform data and show how platform visibility (affordance) interacts with social structure to produce observed adoption pathways.
2. Algorithmic selection and representational bias in language technologies. Experimental comparisons of off-the-shelf commercial ASR systems (Google Speech-to-Text, Amazon Transcribe) on benchmark corpora reveal statistically significant differential performance tied to speaker variety and second-language status. Regression analyses report increases in Word Error Rate (WER) for L2 speakers relative to L1 controls on the Speech Accent Archive and on regional British English corpora; reported coefficient estimates indicate an approximate WER penalty on the order of +5–8 percentage points for L2 speakers in these tests ($p < 0.05$) and significantly higher WERs for certain regional varieties (e.g., Newcastle, Bradford, Belfast) relative to reference varieties. These quantitative performance gaps are robust across models and datasets and demonstrate that automated processing systems alter the distributional ecology of digital language by making some forms harder to transcribe, index, or surface algorithmically — an effect that plausibly influences which forms

are harvested for reuse and which are demoted. The concrete implication is that algorithmic curation is not neutral with respect to variant survival: systematic recognition failures impose de facto expressive costs on speakers of stigmatized or minoritized varieties.

3. Moderation evasion (algospeak) and conventionalization. Qualitative interview studies of platform users (TikTok, other platforms) document reproducible patterns of intentional lexical engineering — "algospeak" — designed to evade automated moderation while preserving communicative force. The empirical work catalogs recurrent strategies (character substitution, deliberate spacing, pre-emptive orthographic variants, metaphorized euphemisms) and shows that many of these variants become entrenched as indexical markers inside communities. While prevalence estimates vary across platforms and communities, the qualitative pattern is consistent: moderation pressures generate systematic, communicable variants that then diffuse via the same network/identity channels documented above. In some traced cases, these variants undergo rapid adoption in closed communities and, if surfaced by influencer accounts or algorithmic recommendation, can achieve mainstream visibility as stylized tokens — thereby establishing a measurable pipeline from governance pressure to new lexical forms.
4. Multimodal routinization: measurable regularities in orthographic and emoji use. Corpus analyses and review studies identify structured patterns that consistently recur across users and genres: (a) typographic elongation and graphemic reduplication used to encode affective strength function as productive signaling devices rather than idiosyncratic noise; (b) emoji sequences show recurrent combinatorial patterns that fulfill predicate-like or discourse-closing roles in posts; and (c) caption timing and subtitle prosody in short video genres systematically align with typographic and lexical compression strategies. Large-scale token analyses find that many of these patterns exhibit increasing token frequency over time within a genre and a narrowing of collocational frames — hallmarks of routinization that precede grammaticalization. Though degrees of stabilization vary by platform and genre, the convergent quantitative signature is an increase in token frequency combined with decreasing contextual entropy (more constrained collocational environments), consistent with early-stage conventionalization.

Methodological implications and prescriptions

The above empirical results lead to three methodological prescriptions. First, any claim about diffusion in platform data must include counterfactuals or models that account for algorithmic amplification (e.g., agent-based or null models) rather than relying solely on raw frequency or network centrality. The Ananthasubramaniam et al. results show how counterfactual modeling yields concrete, testable predictions about urban/rural heterogeneity. Second, corpus construction must preserve multimodal and governance metadata (timestamps, caption-timing, moderation outcomes, recommendation exposure) to separate routinization from algorithmic surfacing. Third, language-technology audits (WER, misclassification rates) should be incorporated as standard controls in sociolinguistic studies using transcribed or auto-processed data, because recognition failures systematically bias the observable corpus. The Markl findings give a concrete example of how WER differentials can translate into structural selection.

Open empirical agenda

Three prioritized empirical projects would substantially advance the program outlined here. (i) Longitudinal multimodal corpora that link raw media (video + captions + comment streams) with moderation logs and recommendation exposure data, enabling time-series analyses of stabilization; (ii) cross-platform agent-based experiments that manipulate affordances (simulated caption length, template salience) to quantify selection pressures; (iii) systematic audits of automated tools across varieties and orthographic innovations to measure exclusionary effects. Together these projects would operationalize the integrated methodology recommended above and allow the field to move from description to prediction and, eventually, to intervention.

In sum, recent empirical work provides concrete, quantifiable demonstrations that platform affordances, algorithmic mediation, and governance regimes co-produce new structural resources in digital language. The challenge for sociolinguistics is to embed these mechanisms into its core explanatory toolkit — combining multimodal annotation, diffusion modeling, and algorithmic auditing — so that claims about digital language change are both empirically supported and ethically informed.

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Elmi-publisistik və bədii ingilis dilini fərqləndirən cəhətlər

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Giriş:
Dilçilik, dilin strukturunu, funksiyalarını və istifadəsini öyrənən bir sahə olaraq, müxtəlif üslub və kommunikasiya məqsədlərinə əsaslanan dil istifadə tərzlərini incələyir. Bu tədqiqatda müasir ingilis dilində üç əsas üslub — elmi, publisistik və bədii üslub — arasındakı fərqlər araşdırılacaq. Bu üslublar, mətnin məqsədinə, auditoriyasına və dilin funksiyalarına görə bir-birindən əhəmiyyətli dərəcədə fərqlənir. Elmi dil obyektivlik və dəqiqlik tələb edir, publisistik dil isə məlumatı daha geniş auditoriyaya təqdim etmək və emosional təsir yaratmaq məqsədini güdür. Bədii dil isə estetik məqsədlərlə, insanların emosional dünyasına hitab etməklə seçilir. Üslub fərqləri həm dilin quruluşunda, həm də istifadə edilən ifadə vasitələrində özünü göstərir.

1. Elmi Üslub:
Elmi üslubun əsas xüsusiyyəti obyektivlik və dəqiqlikdir. Burada dil, təfərrüatlı və elmi əsası olan biliklərin müasir tədqiqatlarda və təhlillərdə doğru şəkildə təqdim olunmasına xidmət edir. Elmi yazılarda əsasən terminlərdən, spesifik dil ifadələrindən, passiv cümlə quruluşlarından və qeyri-emosional tərzdən istifadə edilir. Cümlələr çox vaxt qısa, informativ və məqsədyönlü olur.Məsələn: The results of the experiment indicate a significant correlation between the variables studied.
Elmi üslubda, əsas məqsəd məlumatı dəqiq və obyektiv şəkildə təqdim etmək olduğu üçün müəllifin şəxsi fikirləri və emosiyaları önə çıxmır.
Elmi üslub, dilin ən rəsmi və texniki istifadəsi olaraq xüsusi məqsəd və yanaşma ilə seçilir. Bu üslub, əsasən bilik və məlumatın dəqiq, obyektiv və sistematik şəkildə təqdim edilməsini təmin etmək məqsədi güdür. Elmi üslubun əsas xüsusiyyətləri arasında dilin sadəlik və dəqiqliyi, məntiqi əlaqələr, qeyri-emosional ton və xüsusi terminlərin istifadəsi yer alır. Beləliklə, bu üslubda yazılmış mətnlərdə məqsəd, məsələnin elmi tərəflərini nəzərə alaraq, nəzəriyyələri, faktları və nəticələri oxucuya düzgün və şəffaf şəkildə çatdırmaqdır.
Elmi Üslubun Xüsusiyyətləri
1. Obyektivlik və Neytrallıq
Elmi üslubda obyektivlik və neytrallıq çox vacibdir. Bu, müəllifin şəxsi fikirlərinin və emosiyalarının mətndən çıxarılması deməkdir. Elmi yazılarda müəllifin mövqeyi daha çox məlumat və faktlar vasitəsilə açıqlanır. Emosional ifadələrdən, şərh və qiymətləndirmələrdən qaçılır.
Məsələn: "This phenomenon is characterized by a significant increase in temperature over a prolonged period."Bu cümlədə heç bir şəxsi münasibət və ya hissiyat yoxdur; sadəcə fakt təqdim olunur.
2. Dəqiqlik və Yüksək Məlumatlılıq
Elmi üslubda ən əsas amillərdən biri dəqiqlik və məlumatlılıqdır. Hər hansı bir mövzu haqqında verilən məlumatların tam, dəqiq və yanlış anlamaların qarşısını alacaq şəkildə təqdim olunması vacibdir. Bu, təcrübə nəticələri, nəzəriyyələr və faktlar üzərində aparılan aydın və ətraflı analizlə təmin edilir.Məsələn: "The experiment revealed that the control group exhibited a 15% decrease in blood pressure, while the experimental group demonstrated a 10% increase after the administration of the drug over a 6-week period." Bu cümlədə verilən məlumat konkret və dəqiq şəkildə təqdim olunur, hər hansı bir qarışıqlığa yol verilməz.

3. Terminologiyanın İstifadəsi

Elmi yazılarda spesifik və peşəkar terminlərin istifadəsi çox yaygındır. Elmi sahəyə xas olan xüsusi terminlər və ifadələr, mövzunun daha dərindən və dəqiq şəkildə izah edilməsinə imkan yaradır. Bu terminlər çox vaxt mütəxəssislər üçün anlaşılan olsa da, ümumi oxucular üçün əlavə izahlar və açıqlamalar tələb edə bilər.Məsələn: "Photosynthesis is the process by which plants convert light energy into chemical energy, utilizing chlorophyll to absorb light, primarily in the red and blue wavelengths."Bu cümlədə bitki elminə aid xüsusi terminlər və proseslər istifadə edilir, və oxucuya hərtərəfli anlayış vermək məqsədilə əlavə məlumat da təqdim olunur.

4. Passiv Cümlə Quruluşu

Elmi üslubda passiv cümlə quruluşları tez-tez istifadə olunur. Bu, müəllifin özünü mətndən uzaqlaşdırmasına və mövzunun üzərinə fokuslanmasına kömək edir. Passiv quruluşlar obyektivliyi qorumağa kömək edir və işin aparılma prosesinə diqqət çəkir.Məsələn: "The hypothesis was tested using a double-blind methodology to eliminate biases."Burada hərəkət obyekti – "hipotez" – vurğulanır, müfəssəl bir şəkildə prosedur izah edilir, lakin müəllifin şəxsi iştirakı və ya fikri ön planda deyil.

5. Məlumatın Strukturlaşdırılması

Elmi yazılarda mətnin strukturunun sistematik olması çox vacibdir. Adətən elmi mətnlər giriş, ədəbiyyat icmalı, metodologiya, nəticələr, müzakirə və nəticə bölmələrindən ibarət olur. Bu struktur, oxucuların mətnin məzmununu asanlıqla izləməsinə və məlumatları anlamağa kömək edir.Məsələn:

Giriş: Tədqiqatın məqsədi və əhəmiyyəti izah edilir.

Metodologiya: Tədqiqatın aparılma üsulu və istifadə edilən metodlar açıqlanır.

Nəticələr: Araşdırma nəticələri göstərilir.

Müzakirə: Nəticələr təhlil olunur və əvvəlki araşdırmalarla müqayisə edilir.

Nəticə: Tədqiqatın əsas nəticələri və tövsiyələr təqdim edilir.

6. Şəffaflıq və Qaynaqların İstifadəsi

Elmi yazılarda təqdim edilən məlumatlar və fikirlər hər zaman mötəbər mənbələrə əsaslanmalıdır. Bu səbəbdən, elmi üslubda sitatlar, istinadlar və ədəbiyyat siyahısının istifadəsi çox mühümdür. Mənbələrin düzgün göstərilməsi tədqiqatın etibarlılığını artırır və məlumatın doğruluğunu təmin edir.Məsələn:"According to Smith et al. (2020), the increase in global temperature is directly correlated with the rise in greenhouse gas emissions."

7. Sade və Aydın Dili Seçmək

Elmi üslubda dil nə qədər mürəkkəb olsa da, hər zaman aydın və sadə olmalıdır. Cümlələr çox uzun olmamalı və ifadələr qarışıq olmamalıdır. Əslində, elmi yazılarda dilin sadəliyi çox vacibdir, çünki məqsəd məlumatı tam və düzgün şəkildə oxucuya çatdırmaqdır.Məsələn:"The study found that the implementation of renewable energy sources in urban areas leads to a reduction in carbon emissions."

8. Statistik və Tədqiqat Nəticələrindən İstifadə

Elmi yazılarda statistik məlumatların istifadəsi geniş yayılmışdır. Rəqəmlər, qrafiklər və cədvəllər vasitəsilə nəticələr dəqiq şəkildə göstərilir. Bu da oxucunun tədqiqatın keyfiyyətinə və nəticələrinin etibarlılığına inanmasına səbəb olur.Məsələn:"As shown in Table 1, the increase in temperature correlates with a 25% rise in precipitation levels over the past decade."

Elmi Üslubun Əhəmiyyəti və Tətbiqi

Elmi üslubun ən mühüm xüsusiyyətlərindən biri, tədqiqat və məlumatların peşəkar və rəsmi şəkildə təqdim edilməsidir. Bu üslub, həmçinin, müxtəlif elmi sahələrdəki mütəxəssislərin arasında düzgün və effektiv kommunikasiya yaratmağa kömək edir. Məsələn, təbiət elmləri, mühəndislik, iqtisadiyyat və digər sahələrdə aparılan tədqiqatlar elmi üslub vasitəsilə dünyaya təqdim olunur. Elmi üslubun düzgün istifadəsi, həm də insanlıq üçün yeni biliklərin ortaya çıxmasını və mövcud anlayışların genişlənməsini təmin edir.

2. Publisistik Üslub:
Publisistik üslub isə daha geniş auditoriyaya müraciət edir və məlumatın təqdimatı ilə yanaşı, sosial məsələlərə, ictimai fikrə təsir etməyi də hədəfləyir. Bu üslubda dil, emosional təsir və oxucu ilə əlaqə qurmaq üçün daha aktiv istifadə olunur. Publisistik mətnlərdə tez-tez suallar, çağırışlar və qısa, yığcam cümlələr olur. Müəllif öz mövqeyini bəzən qabarıq şəkildə ifadə edir və dilin emosional tərzi ön planda olur.Məsələn:The government must act now to address the growing climate crisis before it's too late!
Publisistik üslubda, sözlər oxucuda müəyyən bir reaksiya oyatmaq və ona hərəkət etmək üçün çağırış etmək məqsədini daşıyır.Publisistik üslub, geniş auditoriyaya yönələn, insanları məlumatlandırmaq və onları bir mövzuya dair müəyyən bir fikir və ya reaksiyaya yönəltmək məqsədini daşıyan yazı tərzidir. Bu üslub, xəbərlərin, məqalələrin, kommentariyaların, xəbər şərhlərinin və digər ictimaiyyətlə əlaqəli mətnlərin yazılmasında istifadə olunur. Publisistik üslub, məlumatın ötürülməsindən daha çox, oxucuda müəyyən bir emosional və ya düşüncə reaksiya yaratmağı hədəfləyir. Bu üslub, adətən, jurnalistika, televiziya və radio verilişləri, eləcə də populyar media yazıları kimi sahələrdə geniş yayılmışdır.Publisistik üslubun ən xarakterik xüsusiyyətlərindən biri, dilin canlı və oxucunun diqqətini çəkən şəkildə qurulmasıdır. Həmçinin, bu üslubda dilin sadə, amma təsirli olması vacibdir. Məqsəd, geniş kütləyə informasiya vermək və onların düşüncələrini formalaşdırmaqdır. Bu yazı tərzi, həm də cəmiyyətin və sosial həyatın vacib məsələlərinə dair fikir mübadiləsi və ictimai müzakirələrə dəstək verir.
Publisistik Üslubun Xüsusiyyətləri
1. Emosional və Təsirli Dil
Publisistik üslubda əsas məqsəd, oxucuda müəyyən bir emosional reaksiyanı oyatmaqdır. Bunun üçün dil çox vaxt vurğulu, hissiyatlı və təsirli olur. Publisistik yazılarda tez-tez vurğu və bəzən qışqırıqlı ifadələrdən istifadə edilir. Bu, oxucunun diqqətini cəlb etməyə və onu müəyyən bir mövzuya yönləndirməyə xidmət edir.Məsələn:
"Our planet is on the brink of disaster – climate change is no longer a distant threat, it is happening now!"
Bu cümlə, oxucunun təxəyyülünə, qorxu və narahatlığa toxunur, onu hərəkətə keçməyə təşviq edir. Bu tip ifadələr məqsədyönlü şəkildə daha güclü təsir yaratmağa yönəlir.
2. Məlumatın Asan Anlaşılan və Yığcam Olması
Publisistik üslubda dil, oxucunun asanlıqla anlaması üçün sadə və yığcam olur. Cümlələr qısa, amma zəruri məlumatı ötürəcək şəkildə qurulur. Burada məqsəd, informasiyanı aydın və tez çatdırmaqdır. Cümlələrdə sadə və tanış ifadələr istifadə olunur, çünki çox vaxt hədəf kütlə müəyyən bir sahədə mütəxəssis olmayan geniş bir auditoriyadır.
Məsələn:"The economy is shrinking. Unemployment rates are rising. Families are struggling."
Bu cümlə çox sadə olsa da, çox təsirli bir şəkildə problemin ciddiliyini çatdırır. Bütün məlumatlar qısa və aydın şəkildə ifadə olunub, oxucu dərhal məsələni anlayır.
3. İctimai Mövzulara Dair Şərhlər və Fikirlər
Publisistik üslubda şərhlər və fikirlər əsas yer tutur. Bu üslubda yazı müəllifi, təkcə məlumat vermək deyil, həm də bu məlumatları şərh etmək, izah etmək və müəyyən bir mövzuya dair fikirlərini açıqlamaq məqsədini güdür. Publisistik yazılarda müəllifin şəxsi münasibəti və mövqeyi tez-tez önə çıxır. Bu yazılar sosial, mədəni, siyasi məsələlər üzərində dayanır və geniş auditoriyanın diqqətini çəkir.Məsələn:"The government's decision to cut healthcare funding is a direct threat to the wellbeing of millions of citizens. It is a mistake that must be reversed immediately."
Burada müəllif öz mövqeyini açıq şəkildə ifadə edir, konkret olaraq qərarın səhv olduğunu bildirir və dərhal dəyişdirilməsini tələb edir. Bu cür ifadələr oxucuda şiddətli bir reaksiya yarada bilər.
4. Təsvirlər və Qrafik İfadələrdən İstifadə
Publisistik üslubda təsvirlər və qrafik ifadələr çox istifadə olunur. Müəlliflər oxucunun təsəvvürünü canlandırmaq və məsələnin vacibliyini vurğulamaq üçün metaforalar, müqayisələr və digər obrazlı

ifadələrdən faydalanırlar. Bu tip ifadələr həm oxucunun marağını çəkir, həm də məlumatı daha yaxşı yadda saxlamağa kömək edir.Məsələn:
"The city streets were a battleground as protesters clashed with police, their voices rising like a storm of anger and frustration."
Burada obrazlı ifadələr (məsələn, "battleground", "rising like a storm") istifadə olunub, beləliklə, oxucunun hadisəni daha canlı və təsirli şəkildə qavraması təmin edilir.
5. Sual və Çağırışlardan İstifadə
Publisistik üslubda tez-tez suallar və çağırışlardan istifadə edilir. Bu üsul, oxucunun düşüncəsini hərəkətə gətirir, onları bir məsələ üzərində düşünməyə təşviq edir. Sual forması həmçinin müzakirəyə və debatlara səbəb ola bilər. Çağırışlar isə oxucunun emosional reaksiyasını sürətləndirə bilər.Məsələn:"Why are we still allowing this to happen? It's time to act, before it's too late!"
Bu cümlə oxucudan cavab tələb edir və onu hərəkət etməyə çağırır. Oxucu burada aktiv olaraq hərəkət etməyə yönəldilir.
6. İctimai və Sosial Məsələlərə Yönəlmə
Publisistik üslub daha çox cəmiyyətin və sosial həyatın aktual məsələlərini əhatə edir. Bu üslubda yazılan məqalələr çox vaxt ölkə və ya dünya səviyyəsindəki hadisələrə, sosial problemlərə və ya siyasi dəyişikliklərə dair müzakirələrə yer verir. Publisistik yazılarda cəmiyyətin və fərdlərin maraqlarını müdafiə etmək və ya ictimaiyyətin diqqətini çəkən məsələləri önə çıxarmaq əsas hədəfdir.Məsələn:
"Every day, thousands of children around the world go to bed hungry. Why are we, as a society, allowing this tragedy to continue?"
Bu cümlə, kəskin bir ictimai məsələni qabardır və oxucunu bu problem barədə düşünməyə çağırır.
7. Geniş Kütləyə Yönəlik Üslub
Publisistik üslubun digər bir özəlliyi, onun geniş və müxtəlif oxucu kütlələrinə yönəlməsidir. Jurnalistlər və publisistlər, məqalələrini yazarkən kütlənin anlayışını nəzərə alırlar, sadə, amma eyni zamanda hərtərəfli məlumat təqdim etməyə çalışırlar. Publisistik üslubda bəzən qeyri-ixtisaslaşmış oxucular da nəzərə alınır, buna görə də yazılar çox vaxt anlaşılması asan olur.
Publisistik Üslubun Tətbiq Sahələri
Publisistik üslub geniş ictimaiyyətə məlumat vermək məqsədini daşıyan yazı tərzi olduğuna görə, onun tətbiq sahələri çox genişdir:
Jurnalistika və Media: Kütləvi informasiya vasitələri, xəbər proqramları, xəbərlər və reportajlar.
Reklam və PR: Təsirli reklamlar, ictimaiyyətlə əlaqələr və təşviqat yazıları.
Siyasi Məqalələr: Siyasi şərhlər, plakatlar, partiya proqramları və ya siyasi liderlərin çıxışları.
İctimai Mövzulara dair Məqalələr: Sosial məsələlər, insan hüquqları, ətraf mühit, təhsil və s. haqqında yazılar.
Populyar Məqalələr: Əyləncə, mədəniyyət və həyat tərzi ilə bağlı yazılar.
3. Bədii Üslub:
Bədii üslubun əsas məqsədi insanın estetik duyğularına, emosiyalarına və təxəyyülünə təsir etməkdir. Bu üslubda dil, metaforalar, obrazlı ifadələr, təkrarlamalar və simvolizmdən istifadə edilərək oxucuya dərin mənalar ötürülür. Bədii əsərlərdə hər bir söz, hər bir cümlə xüsusi bir təsir məqsədi güdür. Bu üslubda dilin ən zəngin və rəngarəng formalarından istifadə edilir.Məsələn:The moon hung like a silver lantern in the velvety sky, casting its glow over the quiet town below.
Bədii dil, təbii olaraq, oxucuda duyğusal və vizual təsir yaradır, eyni zamanda estetik gözəllik və əyləncəli bir oxuma təcrübəsi təmin edir.
Elmi, publisistik və bədii üslublar arasındakı fərqlər yalnız dilin quruluşunda deyil, həm də məqsəd və auditoriya nəzərə alınaraq ortaya çıxır. Elmi üslubda dəqiqlik və neytrallıq ön planda ikən, publisistik üslubda oxucuda emosional reaksiya yaratmaq məqsədi güdülür. Bədii üslubda isə ən vacib olan şey təxəyyül və obrazlı ifadədir. Bu fərqlər, dilin müxtəlif üslub növlərinin müxtəlif

məqsədlərə xidmət etdiyini və dilin çevikliyini göstərir.Bədii üslub, dilin ən estetik və yaradıcı istifadəsidir və əsas məqsədi oxucunun emosional və intellektual dünyasına təsir etmək, onu gözəllik, dərinlik və təsəvvür vasitəsilə bir estetik təcrübəyə cəlb etməkdir. Bu üslubun əsas funksiyası bədii əsərlərdə, ədəbiyyatda, şeirdə və digər sənət növlərində dilin xüsusi bir forması olaraq özünü göstərir. Bədii üslubda dil yalnız məlumat vermək məqsədini daşımır, həm də insan ruhunu, düşüncələrini və hisslərini ifadə etməyə çalışır. Bu yazı tərzi ən çox romanlarda, şeirlərdə, hekayələrdə, dramalarda, məqalələrdə və digər ədəbi əsərlərdə rast gəlinir.

Bədii üslubda dil, estetik gözəllik yaratmaq və oxucunun təsəvvürünü, duyğularını və düşüncələrini canlandırmaq üçün istifadə edilir. Müəlliflər burada təxəyyül və yaradıcılıqdan istifadə edərək öz fikirlərini bədii bir şəkildə ifadə edirlər. Bədii üslubda sözlər mücərrəd mənalar, simvollar, metaforalar və digər bədii elementlər vasitəsilə yüklənir.

Bədii Üslubun Xüsusiyyətləri

1. Təsvir və Simvolların İstifadəsi

Bədii üslubun ən önəmli xüsusiyyətlərindən biri, dilin obrazlı və simvolik şəkildə istifadə olunmasıdır. Müəlliflər sözləri birbaşa mənası ilə deyil, çox vaxt simvolik və metaforik şəkildə istifadə edirlər. Bu, oxucunun hər bir sözün mənasını daha dərin və çoxşaxəli şəkildə anlamasına imkan yaradır.Məsələn:"The sky was a canvas of fiery reds and oranges, as if the sun itself was painting the world with its last strokes of light."

Burada, "sky" və "sun" sözləri birbaşa anlamı vermir; onlar, bir hissiyat və gözəllik yaratmaq üçün istifadə olunur. Bu tip ifadələr oxucunun beynində bir təsəvvür yaratmaq üçün istifadə edilir.

2. Metaforalar və Bənzətmələr

Bədii üslubda çox sayda metafora və bənzətmə istifadə olunur. Bu, dilin estetik gücünü artırır və oxucuda təsəvvür yaratmağa kömək edir. Metaforalar və bənzətmələr vasitəsilə müəlliflər bir hadisəni və ya vəziyyəti daha canlı və təəssüratlı şəkildə təsvir edirlər.Məsələn:

"Her voice was a soft breeze that swept through the room, calming all who heard it."Bu bənzətmə, səsin yumşaqlığını və təsirini konkret olaraq bir "yumuşaq əsən külək"lə müqayisə edir, bu da oxucuda müəyyən bir emosional reaksiya oyadır.

3. Təsviri Dil və Detalların İstifadəsi

Bədii üslubda dil çox vaxt ətraflı təsvirlərlə zənginləşdirilir. Müəlliflər, hər bir detalı diqqətlə təsvir edərək oxucunun zəngin bir dünyada olmasını təmin edirlər. Bu detallar, məkan, zaman, xarakterlər və duyğulara dair olan izahlar oxucunun mətni tam mənimsəməsinə və ona daxil olmasına kömək edir.Məsələn:"The streets were damp from the rain, with puddles reflecting the pale light of the streetlamps. The air smelled of wet earth and pine trees, carrying a sense of nostalgia."

Bu təsvirlərdə həm vizual, həm də eşitmə və qoxu duyğuları işə salınır, nəticədə oxucu həmin anı həm hiss edir, həm də təsəvvür edir.

4. Ritm və Təsvirli Strukturlar

Bədii üslubda ritm də mühüm rol oynayır. Bu, xüsusilə şeirdə və bəzi prozaik əsərlərdə diqqətəlayiqdir. Müəlliflər, dilin ritmik quruluşunu istifadə edərək mətnə musiqi tərzi əlavə edirlər. Bu, həm də oxucuya ritmik bir təcrübə yaşadır.Məsələn:"The wind whispered through the trees, a gentle sigh, a soft murmur, as though the forest itself was speaking to me."

Buradakı "whispered", "sigh", "murmur" kimi sözlər ritmik bir axın yaradır və oxucunun duyğularını oyadır.

5. İroniya və Satira

Bədii üslubda ironiyanı və satirayı da tez-tez görmək mümkündür. Müəlliflər, ironik şəkildə vəziyyətləri şərh edərək və ya cəmiyyətin və insanların müəyyən davranışlarını gülünc göstərərək, həm əyləndirir, həm də düşündürürlər.Məsələn:"She was the epitome of perfection, a model of grace... or so everyone thought, until she tripped over her own feet in front of the Queen."Burada, gözlənilən mükəmməllik və reallıq arasındakı fərq ironik şəkildə təqdim olunur.

6. İntriga və Fikirlər
Bədii üslub, oxucunun marağını çəkmək və onu hadisələrin nəbzini izləməyə təşviq etmək üçün çox vaxt intriga və qeyri-müəyyənlikdən istifadə edir. Müəlliflər, oxucunun nə baş verdiyini anlamağa çalışdığı, sualların açıq qaldığı yazılar yaradırlar.Məsələn:"And then, just as he was about to speak, the door slammed shut, and she was gone."
Bu cümlə, oxucunun marağını artıran bir vəziyyət yaradır və nə olacağı barədə suallar doğurur.
Bədii Üslubun Tətbiq Sahələri
Bədii üslub, geniş əhatəli ədəbiyyat dünyasında istifadə edilir və müxtəlif sahələrdə tətbiq olunur:
Romanlar: Ədəbiyyatın ən yaygın formalarından biri olan romanlarda, bədii üslubda dilin təsvirləri, simvolları və obrazları geniş istifadə edilir.
Şeir: Şeirdə dil, ritm, metaforalar və bənzətmələr vasitəsilə böyük emosional gücə malik olur.
Dramalar: Teatr əsərlərində, xüsusən dialoqlar vasitəsilə insan ruhunun və xarakterlərinin dərindən təhlili həyata keçirilir.
Hekayələr və Novellalar: Bədii üslubun əsas xüsusiyyətləri, qısa və uzun hekayələrdə insan təcrübələrinin dərindən təsvir edilməsi üçün istifadə olunur.
Nəticə
Üslub, dilin ən vacib aspektlərindən biridir və müxtəlif kommunikasiya sahələrində istifadəsi, dilin məqsədini və funksiyasını müəyyən edir. Elmi, publisistik və bədii üslublar arasındakı fərqlər, həm dilin quruluşunda, həm də istifadə edilən ifadə vasitələrində özünü göstərir. Müasir dilçilik, bu fərqləri anlamamız və dilin gücünü düzgün şəkildə istifadə etməyimiz üçün əhəmiyyətlidir. Hər bir üslubun özünəməxsus qaydaları və xarakteristikaları vardır, bunları bilmək və istifadə etmək, dilin müxtəlif məqsədlər üçün optimal şəkildə istifadəsini təmin edir.

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Philosophical Sciences

The problem of bioethics in the focus of the religious worldview of modern society

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The rapid development of bioethics in the late 20th and early 21st centuries can be described as a process of humanization of knowledge. Its interdisciplinarity - the result of a fusion of philosophy, medicine, law, sociology, and anthropology - transforms it into a space for dialogue about the future of the human race. Russia, which entered this dialogue at the end of the 20th century, also developed its own bioethical language, combining scientific rationality with the humanities tradition.

Thus, bioethics has become a kind of "conscience of modernity" - culture's response to its own scientific aspirations. It teaches us to see technological progress not only as a victory of reason but also as a test of humanity. In this sense, bioethics is not simply a new field of knowledge, but a form of philosophical self-knowledge of modernity, in which culture tests its capacity to be human.

Despite the intellectual power and rigor of metaethics, its analytical potential proved limited. The abstract-logical and linguistic approach, designed to clarify the structure of moral language, gradually exhausted itself, losing its connection with lived human experience. The moral world, reduced to the syntax of judgments and the analysis of meanings, became too distant from the reality of human experiences, conflicts, and choices. A new need arose: to return ethics to concreteness, to the dynamics of everyday existence, where morality manifests itself not in formulas, but in actions, motives, and relationships.

The second half of the 20th century saw the beginning of a distinctive "humanitarian turn" in the study of morality. Ethics ceased to be the monopoly of philosophy and became an object of interest for a whole range of sciences - psychology, sociology, ethology, and cultural anthropology. Each offered its own perspective on the origins, structure, and functions of morality. Psychology investigated the internal mechanisms of moral behavior, the formation of conscience and empathy; sociology examined the role of morality in maintaining social order and communication; Ethology - the biological prerequisites of altruism and justice; anthropology - the cultural variability of moral norms.

This interdisciplinary dialogue restored to ethics what it had lost in the era of logical analysis - the human dimension. Morality was once again understood not as a set of rules, but as a form of life, rooted in corporeality, culture, and social practice. Ethical knowledge became closer to real-world problems - from interpersonal relationships to global challenges, where moral judgment is closely linked to emotional experience and context.

This broadening of horizons did not mean a rejection of rationality, but a rethinking of it: the truth about good and evil cannot be exhausted by the logic of language; it requires an analysis of lived experience. It was precisely this movement from abstraction to concreteness that paved the way for the emergence of applied fields - bioethics, professional ethics, and environmental ethics - where moral thinking became a tool for understanding new forms of life and responsibility. Thus, the crisis of metaethics ended not in decline, but in a new stage of development: ethics once again became a science of humanity, capable of speaking not only about morality but also from within moral experience, where reason and life, analysis and compassion, once again find unity.

Ethical thought in the 20th century, having passed through analytical and descriptive stages, gradually approached the recognition of the need to return to humanity - not to an abstract model, but to a living being who makes decisions and bears responsibility. For a long time, the object of study remained patterns and structures of behavior, social roles, and cultural patterns, but not the individual themselves in their concreteness and moral vulnerability. This gave rise to a paradox: the more sophisticated the methods of moral analysis became, the further ethics departed from the reality of life, where morality is manifested not in theories, but in the choice between duty and compassion, utility and conscience.

The emergence of bioethics in the 1960s and 1970s was not simply the birth of a new discipline, but a symptom of a cultural and civilizational upheaval. Its founder, Van Potter, author of Bioethics: Bridge to the Future, saw it not as an academic novelty but as a strategy for saving humanity, facing the threat of self-destruction. The very name – bioethics - symbolizes the synthesis of two worlds: the biological, which explores life, and the ethical, which defines its meaning and value. Bioethics thus became an attempt to unite knowledge and conscience, science and humanism, rationality and responsibility.

The historical context of its emergence explains this necessity. Western society in the mid-20th century was experiencing a profound crisis of trust in science and institutions: The wars, conflicts, the digital revolution, and environmental disasters revealed the limits of technocratic faith in progress. Scientific and technological advances that promised prosperity turned into moral uncertainty, and the question of the limits of what was acceptable in relation to nature and humanity became the ethical imperative of the era. It was then that bioethics was called upon to become a bridge between knowledge and survival - a space where science ceased its neutrality and assumed responsibility for life.

Potter foresaw that humanity found itself at a crossroads between “operational” and “strategic” survival. The former is aimed at immediate needs and technical challenges, while the latter is focused on the long-term preservation of living conditions and human dignity as biological and spiritual beings. Bioethics became an expression of precisely this strategic imperative: it demands that scientific progress be correlated with its value consequences, considering not only effectiveness but also meaning, not only development but also limits.

Thus, the birth of bioethics is not an isolated event in the history of science, but a manifestation of a new civilizational consciousness. It arose as a response to the challenges of an era where human existence and moral identity are at stake. By uniting biology and ethics, knowledge and responsibility, bioethics became a philosophy of survival, an attempt to restore science to its humanistic dimension and thereby build a bridge - not only to the future, but to the very meaning of human existence. The second half of the 20th century saw a radical rethinking of scientific worldviews and cognitive methodology. Narrowly specialized disciplinary approaches were being replaced by a new kind of thinking - synthetic, integrative, and capable of seeing the interconnections and complex interactions between different levels of reality. It was during this period that the so-called cross-cutting sciences emerged - cybernetics, bioinformatics, sociobiology, and human ecology - and, along with them, evolutionary, synergetic, and systems approaches emerged. These approaches marked a shift from the analysis of isolated objects to an understanding of the world as a self-organizing and interdependent whole.

Bioethics, which emerged at this same historical juncture, fits into the logic of this integrative movement. Its birth was no accident - it was a response to the challenges of a technogenic, consumer-driven civilization, where scientific and technological progress ceased to be a neutral tool and became a factor determining the very fate of humanity. For the first time in history, science gained the power not only to understand life but also to radically alter it - even to the point of interfering with human physical and mental nature. The question of the limits of the possible became not simply a scientific, but a moral and existential challenge.

The development of bioethics was determined by this sociocultural demand - the search for the extent to which science can intervene in life. Genetic engineering, transplantation, reproductive technologies, artificial intelligence, and neuroscience have raised the question of the permissibility of experimentation on living beings. Bioethics, integrating scientific knowledge with philosophy and the humanities, has become a space for discussing the limits of what is permissible, where technical power is balanced with moral responsibility.

The synergetic and systems approaches characteristic of the second half of the 20th century formed the foundation of this new type of thinking. They allowed us to view life not as a set of biological functions, but as a complex, self-organizing system encompassing spiritual, cultural, and moral dimensions. Thus, bioethics has become not just a branch of philosophy or medicine, but a model of a new scientific consciousness in which knowledge and value are reunited.

Bioethics is not only an ethics of life, but also an ethics of the future. It embodies a strategy for humanity's self-preservation in an era when scientific discoveries threaten the very essence of humanity. In this sense, it continues the line of systems thinking: it strives to maintain a balance between development and preservation, between the freedom of scientific inquiry and moral responsibility for its consequences.

The emergence of bioethics in the second half of the 20th century has not only scientific but also deeply civilizational roots. As I.V. Siluyanova notes, the foundations of this phenomenon can be divided into three groups, of which the first two-scientific and social-determined the very need for a new ethics of life. Scientific advances in biology, medicine, and technology have changed the anthropological situation itself: for the first time, humans have gained the power to intervene in the processes of birth, development, and death, effectively becoming co-authors of nature. Science has penetrated the most intimate spheres of human existence, making life an object of experimentation and control, which has demanded a new ethical understanding of its limits.

However, scientific knowledge alone does not guarantee the humaneness of its application. This is precisely why social foundations, following scientific ones, are coming to the forefront. Society has developed a pressing need to control the consequences of scientific discoveries and their use - not only to prevent abuses, but also to preserve the moral boundaries of human activity itself. Large-scale environmental, medical, and military experiments of the 20th century have generated concern for the future of the human species. This concern has crystallized into a public demand for a new ethical responsibility, one that must be shared not only by scientists but by all of society.

Thus, bioethics has become not just a scientific discipline, but a cultural and social phenomenon. It is discussed not only by specialists, but also by writers, directors, artists, philosophers, journalists - everyone who considers the limits of human intervention in nature and in themselves. Thanks to this, bioethics has become one of the key platforms for public dialogue about the future of civilization, where science and culture, rationality and morality, freedom and responsibility seek a new balance.

Thus, bioethics was born from the intersection of two impulses - scientific audacity and social concern. It reflects the maturity of a civilization that has realized that without moral oversight of scientific progress, science itself can become a threat to the very life it was once intended to preserve.

The primary challenge for bioethics is the need to reconcile individual rights and human dignity with collective responsibility for the sustainability of healthcare and ecosystems. The principles of autonomy and beneficence must now be balanced against questions of global justice, resource distribution, and the preservation of the natural foundations of life. In a context where decisions are made by algorithms and systems, bioethics must not only protect the individual but also design conditions for ethical proportionality at the level of institutions and technologies.

Bioethics is becoming less a set of norms and more an infrastructure for dialogue, where consensus is not imposed but rather developed through open, accountable, and reviewable procedures.

Thus, the transition from principles to procedural ethics reflects the maturity of modern morality: the recognition that in a world of multiple truths, justice is achieved not by consensus on content, but by transparency and integrity of process.

Bioethics in the 21st century is becoming a kind of navigation system for humanity as it navigates the boundary between the natural and the created. Its mission is not to limit science, but to remind us that power over life requires moderation, and that knowledge without ethics becomes a new form of technogenic myth - the myth of humanity having lost its sense of boundaries.

Modern bioethics is experiencing a profound expansion of its horizons: human health can no longer be considered in isolation from the health of communities, animals, and ecosystems. The One Health concept affirms the fundamental unity of the biosphere - every link in the chain of life is interconnected, and therefore medical ethics limited to the clinical setting proves insufficient. Antimicrobial resistance, zoonotic outbreaks, pollution, and climate change have demonstrated that diseases are not isolated events, but consequences of an imbalance between humans and the environment. Bioethics that ignores these planetary interdependencies becomes “armchair”, losing touch with reality.

The era of environmental and epidemiological crises requires new categories of moral responsibility. Conflicts between the rights of current patients and the interests of future generations raise questions about intergenerational justice - the ability to make decisions with consideration for those not yet born. The ethic of precaution becomes a principle of survival: it demands action not only after harm is proven, but also when it is likely.

The development of biomedical technologies in the 20th and 21st centuries has raised questions for traditional religious systems about the limits of human authority over life.

The Catholic Church has traditionally taken an active position on issues related to moral and biomedical dilemmas, seeking to provide its believers with clear guidance in ethically complex situations. Unlike Orthodoxy, Catholicism emphasizes the systematic and institutional nature of moral teaching: bioethical issues are under the jurisdiction of the Pontifical Council for the Family, which, in its document “Lexicon: Controversial Topics and Controversial Terms in the Sphere of Family, Life, and Ethics”, formulated the Church's official position on key aspects of contemporary bioethical discourse. Catholic bioethics, based on a theology of life and human dignity, combines theological principles with a social philosophy of justice, solidarity, and responsibility. Catholic bioethics represents harmony between theology and social practice: it not only defines moral norms but also creates the infrastructure for their application in medicine, law, and politics. Unlike secular approaches, it views bioethics not as a struggle between values, but as a path to dialogue between faith, reason, and science. This demonstrates the fundamental strength of the Catholic tradition - its ability to combine a principled defense of life with respect for human freedom and the complexity of moral choice.

Islamic bioethics, unlike secular bioethics, is not limited to rational argumentation: it integrates medical practice with the human being's spiritual responsibility to God (amana). Issues such as cloning, organ transplants, reproductive technologies, and euthanasia are addressed within the context of fitrah - the primordial nature of creation, the preservation of which is considered a religious duty.

Thus, the study of Islamic bioethics is becoming not only a theoretical but also a practical imperative of modern times. In the context of globalization and intercultural interaction, it offers an alternative model of bioethical thinking, where universal norms of justice and humanism are correlated with a transcendental foundation - the recognition of the sacred value of life and the dignity of the human being as a creation of Allah.

From this principle flows the key idea of Islamic bioethics - the inviolability of the body during life and after death. This principle forms the basis of ethical argumentation.

Islamic bioethics affirms the synthesis of legal reason and spiritual dignity. It relies not on external philosophical constructs, but on its own holistic anthropology, where humans are not simply patients or objects of intervention, but bearers of sacred trust (amana). The value of life is not limited to biological existence - it is linked to responsibility to God and community, making the Islamic approach not just normative but also deeply existential.

This position does not deny scientific progress, but provides it with a moral framework: knowledge should not be transformed into an instrument of pride or power over creation.

Thus, Islamic bioethics does not oppose international bioethics, but rather complements it, introducing a spiritual and moral dimension into a sphere where legal and procedural approaches predominate. It does not deny scientific progress, but limits it to the framework of responsibility and humility before the Creator. Through this integration, bioethical decisions acquire not only rational but also existential legitimacy.

Modern bioethics, in turn, promotes the internationalization of Islamic medical standards, creating a platform for dialogue between cultures and legal systems. The mutual influence of Sharia and bioethics strengthens the protection of human rights and makes decision-making processes more transparent and fair, especially in multicultural and religiously diverse societies.

As a result, their interaction can be viewed not as a conflict between tradition and modernity, but as a synthesis - a union of rational ethics and spiritual responsibility, in which human life is perceived not only as a biological value but also as a sacred trust (amana), requiring careful, meaningful, and fair treatment.

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THE PROBLEM OF GOODNESS IN NIETZSCHE'S CONCEPT: PHILOSOPHICAL AND RELIGIOUS ASPECT

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Abstract: Abstract: The article examines the problem of goodness in Friedrich Nietzsche's philosophical system from the perspective of philosophical and religious analysis. It is shown that Nietzsche's criticism of traditional Christian morality is related to his idea of a "reassessment of all values" and the concept of the "death of God." The article emphasizes that the Nietzschean understanding of goodness destroys the dualism of moral categories and opens the way to a new type of spirituality based on the creative will of man, analyzes the ontological and ethical consequences of Nietzschean reappraisal, as well as its impact on modern philosophy and religious consciousness.

Keywords: Nietzsche, good, evil, morality, religion, revaluation of values, death of God, superman, philosophy of life.

The problem of goodness is one of the central themes of European philosophy, inextricably linked with the questions of the meaning of human existence, the nature of morality and the relationship of man to God. In the 19th century, Friedrich Nietzsche radically reinterpreted traditional moral and religious beliefs, putting forward the concept of a "reassessment of all values." His philosophy became a challenge to both Christian ethics and the humanistic tradition of Modern times. In the context of Nietzsche's philosophical and religious analysis, the problem of goodness appears as a question about the origin and essence of morality, its dependence on the will to power and its relation to the concept of God.

In the Christian tradition, goodness is interpreted as following the Divine will, as a manifestation of love, humility and mercy. The good here has a transcendent foundation: its source is in God, and its criterion is in the moral law revealed through revelation. Thus, goodness is connected with the idea of the Absolute and expresses a person's orientation towards super-mundane values. However, for Nietzsche, such a system seems to be a manifestation of "slave morality" — the morality of the weak, seeking to limit strong and creative individuals.

The Christian idea of goodness, in his opinion, distorts natural life impulses, turning them into feelings of guilt and dependence. In his key works, Beyond Good and Evil, The Genealogy of Morality, and Thus Spake Zarathustra, Nietzsche argues that the traditional understanding of good and evil is a historical product of certain social and religious conditions. He contrasts the "morality of masters," which is born from the affirmation of strength, creativity, and life (good here is a manifestation of fullness of being, self—realization, and the ability to assert oneself), and the "morality of slaves," which, on the contrary, is based on feelings of resentment and envy of the weak.

Goodness in this system is defined negatively.: like everything that opposes evil, understood as strength, pride, and power. Thus, Nietzsche destroys the dualism of good and evil inherent in the religious tradition. He sees in morality not a universal truth, but a form of the will to power, a tool for maintaining a certain social order. Nietzsche's proclamation "God is dead!" has not just an anti-religious, but a deep philosophical meaning. The disappearance of God as the supreme guarantor of values leads to a crisis of the very category of goodness. Without God, there is no objective moral foundation — everything becomes a matter of human creativity and will.

Nietzsche calls for a "reassessment of all values," where goodness ceases to be a universal norm and turns into an expression of individual strength of spirit. In this sense, Nietzsche's goodness is not a moral category, but an aesthetic and ontological one: goodness is something that promotes the flourishing of life, creativity, and the affirmation of being. What are the philosophical and religious consequences of the Nietzschean concept? The rejection of a transcendent source of goodness leads to radical human autonomy.

Nietzsche becomes the forerunner of the philosophy of existentialism and secular humanism, where man himself creates meaning and values. However, his position is not a simple denial of religion.: it carries a deeply religious pathos — the desire to overcome man, to give birth to a superman capable of establishing new forms of being. In this context, we can talk about a kind of religiosity without God — about the search for the sacred in life itself, in the act of creative self-transcendence.

Goodness ceases to be an external prescription and becomes an internal necessity of becoming. If we try to consider the approach of modern philosophers, it should be noted that they tend to think about rethinking the nature of religion, rather than destroying it.

Below, we tried to compare the scientists' view on this aspect of the problem under study.:

Karl Jaspers believed that Nietzsche created "religiosity without God," where holiness is the fullness of human existence.

Martin Heidegger saw in Nietzsche the "last metaphysician" who replaced God with the will to power, a new ontological force.

Michel Foucault and Gilles Deleuze have shown that Nietzschean reassessment of values is a spiritual practice similar to religious conversion, but directed not to heaven, but to life.

Simone Weil and Paul Tillich viewed Nietzsche as the figure who cleansed religion of moralism, making possible a "pure faith" in being.

We can say that in Nietzsche, goodness becomes immanently sacred: it does not descend from above, but is born out of the fullness of life. Goodness is everything that strengthens, elevates, and creates. Evil is something that weakens, destroys, and robs the meaning of life. Thus, Nietzsche's goodness remains a religious category, but internally converted.

A person becomes his own "God", a source of meaning and goodness. This can be called the anthropologization of religious feeling.

Nietzsche's paradox is that by rejecting God, he preserves the structure of religious experience — the desire to overcome, to the highest, to the sacred. Goodness in his system is no longer morality, but a spiritual effort to be greater than oneself. "Man is something that must be overcome" (7) ("Thus spoke Zarathustra"). From this we can conclude that Nietzsche's connection with religion is not in accepting dogma, but in maintaining a religious impulse, but directed not at God, but at life itself as divine.

In our research (8), we have repeatedly raised the question of the moral nature of man, considering the problem of personality in various religious teachings and philosophical systems. Therefore, the analysis of this issue initially assumed consideration of this problem from the point of view of finding similarities and differences between Nietzsche's views on the nature of this issue and the attitude of religion to this topic.

Nietzsche sharply criticized Christianity for its negative attitude to life: for the ideal of weakness, humility and denial of earthly existence. He believed that true spirituality should affirm life, not reject it. In this sense, Islam is closer to the Nietzschean spirit than Christianity, because:

- In Islam, earthly life is seen as a test, but not as an evil.;
- Strength, courage, dignity, and work are considered virtues, not sins.;
- Islam preaches active service to God through action, not through denial of the world: "Allah loves those who fight in His path" (Quran 61:4)

That is, Islamic ethics is active and life-giving, whereas Nietzsche fought precisely against the passive morality of denial. This is the first point of contact.

Nietzsche's main principle, the will to power, is often misunderstood as the thirst for domination. In fact, it is the will to create, to overcome oneself, to affirm life. According to Nietzsche, man has a spiritual duty to become his own legislator, creator of values. Islam has a similar idea, but in a religious context.:

- A person is personally responsible to God;
- He must perfect himself (nafs), purify his will, and fight against base motives.: "Happy indeed is the one who cleanses his soul, and unhappy is the one who darkens it" (Quran, 91:9-10)

This struggle with oneself — jihad al-nafs, the "great jihad" — in many ways resembles the Nietzschean idea of self-overcoming.

The only difference is that for a Muslim, the ultimate goal is to approach God, while for Nietzsche, it is to become superhuman. Nietzsche's superman figure is a symbol of the spiritual overcoming and renewal of humanity. This is a person who creates meaning by himself and lives in harmony with life. In Islamic philosophy, there is a concept of "insan al-kamil" (الإنسان الكامل) — a perfect person. This ideal was developed by the thinkers Abu Nasr Al-Farabi (1), Jalal al-Din Rumi (2,3), and others. Insan al-kamil is a man who embodies divine qualities, realizes his place in existence and acts as the "viceroy of God on earth" (Caliphate of Allah).

So, it is safe to note the similarity of these concepts, which speak about overcoming an ordinary person, both require internal transformation and responsibility, both carry an ontological meaning — the formation of a higher form of being. However, it should also be noted the differences that Nietzsche shows — without God, through self-creation, in Islam - through God as the source of perfection. In Islam, good and evil are objective, based on Divine will: "Allah has commanded you justice, kindness and mercy..." (Quran, 16:90).

In Nietzsche, good and evil are historical constructions created by humans. But there is a parallel: in Islam, goodness is an active act that strengthens justice and life, and not just obedience. So in both systems, good is associated with vitality and action, while evil is associated with destruction, weakness, and chaos.

Modern philosophical research conducted on this issue: Russell Manning, Carlotta Santini (11), Daniel Kame (12) convince us of how popular this problem is in the scientific community, without losing its relevance today.

I would like to focus on the prospects for further research of this problem.:

- ✓ It is necessary to stop the researchers' view on deeper interdisciplinary research: Nietzsche's connection with theology, with religious history, with the philosophy of religion;
- ✓ In our opinion, the analysis of how modern existentialist philosophers, hermeneutists, and poststructuralists develop Nietzsche's ideas about good and evil in the context of religion and morality requires more detailed consideration;
- ✓ Of great interest is the study of the influence of the Nietzschean concept of goodness on modern ethics, neuroethics, and bioethics, especially such aspects as the understanding of life, power, and creativity is becoming the norm.

In conclusion, I would like to note that the problem of goodness in Nietzsche's philosophy is the key to understanding his "anti-religious religious" pathos. By rejecting the traditional, divine foundation of morality, he does not destroy spirituality, but offers a new one based on self—affirmation, creativity and life. Nietzsche's goodness becomes not a universal law, but a form of manifestation of power and spiritual growth. The philosophical and religious aspect of the Nietzschean concept of goodness lies in the transformation of the very idea of spirituality: from submission to an external God to the creation of an internal, human source of meaning

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Psychological Sciences

THE APPLICATION OF THE LAZARUS MODEL IN THE STUDY OF COPING STRATEGIES OF ADOLESCENTS

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Annotation: Based on the cognitive-transactional model of R. Lazarus, the article examined the formation and development of strategies for dealing with stress and emotional stress in adolescents, and suggested ways to form positive behavioral strategies in them. In addition, using the example of a real case, the stages of a psychologist's work with aggressive adolescents were proposed, the use of exercises and practical tasks with this age group was justified, allowing them to develop adaptive coping strategies and conflict–free communication skills with others.

Keywords: aggression, defense mechanism, behavior, adolescents, coping strategies, emotions.

The use of an effective tool in the work of a psychologist imposes certain requirements on his professional skills and competencies. Adolescence is one of the most difficult and contradictory stages of human development. During this period, emotional instability, the need for self-affirmation, the search for social roles, and tension in family and school relationships are often observed. In such cases, aggressive behaviors naturally occur. The source of aggression is usually tension in family relationships, poor academic performance, social isolation, or a negative pattern of behavior on the part of an abusive parent or teacher.

In our practice, quite often there is a need to develop the skills of emotional self-regulation of aggressive adolescents and the formation of their concomitant behavioral strategies. (ways to deal with difficult situations). Along with the use of metaphorical associative maps (3,4), we pay a great deal of attention to developing emotionally stable behavior, skills, and control over situations that are not always positive in their work with adolescents.

It is important to focus on coping strategies, which were first used by R.Lazarus and S.Folkman (5,6,7) to identify ways in which a person copes with stress and emotional stress. If we try to define what Lazarus coping is, it can be noted that it is a process in which a person, realizing a stressful situation and evaluating their resources, chooses ways to cope with it in order to restore psychological balance.

We can say that a person does not just "react" to stress, but reflects on the situation and actively chooses strategies to deal with it. One cannot but agree with the fact that the same fact can be stressful for one person and neutral for another. In Lazarus' theory, the following coping strategies are distinguished:

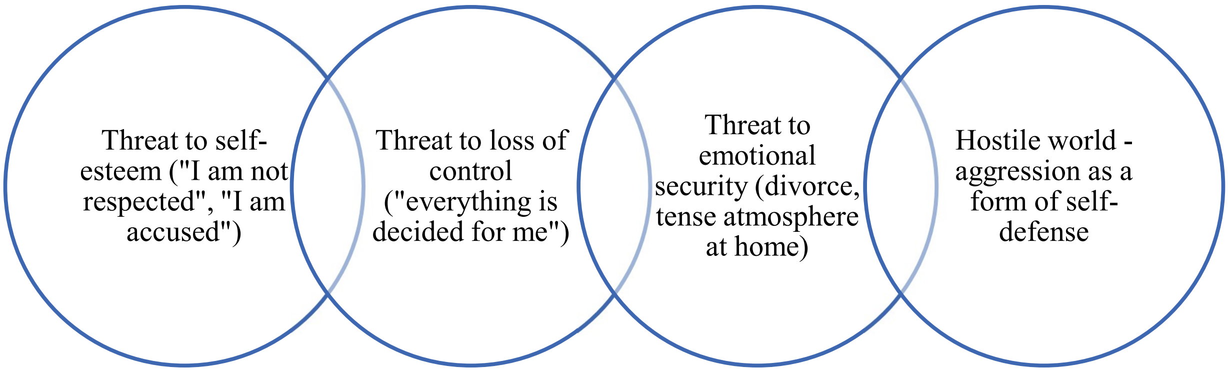
Let's analyze the Lazarus coping model in a specific case to show how they are formed and manifested in a teenager, and which of them can be developed or corrected.

Case study: Teenager (13 years old), shows aggression at school, confrontations with teachers, peer pressure. The family is incomplete, the parents are divorced, and the emotional background at home is tense. The mother turns to a specialist with complaints to help her reduce the level of aggression in a teenager.

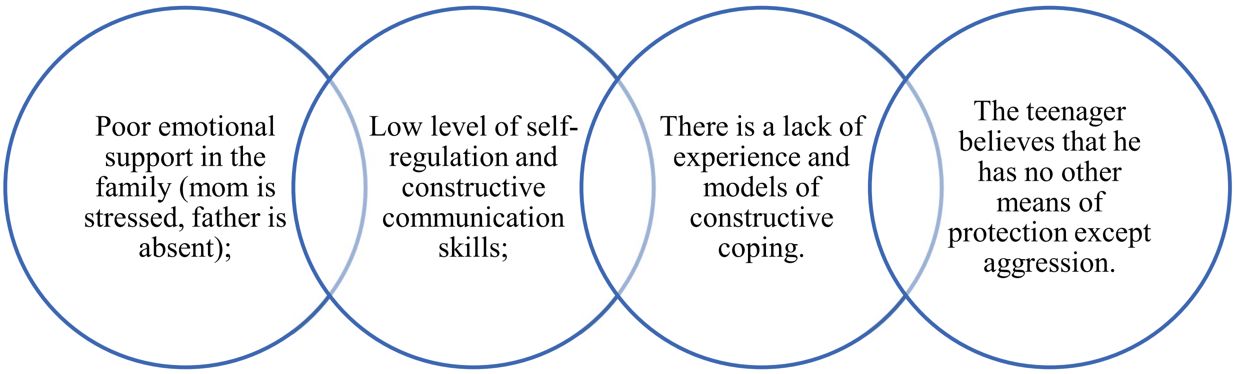
Let's focus on the main aspects of the psychologist's activities and areas of work with aggressive adolescents. This activity can be carried out both individually and in a group form.

At the stage of diagnostic examination, the following methods can be used to identify the level of aggression: the Bass-Darki test, S.Rosenzweig, M.Lusher, etc.

The primary cognitive assessment (according to R. Lazarus) revealed that the teenager perceives what is happening (conflicts, teacher demands, parental control) As a threat:



The secondary cognitive assessment is that. how a teenager evaluates his resources:



What about the choice of coping strategies? We identified the observed (maladaptive) strategies, emotionally oriented, which are expressed by outbursts of anger and aggression as a way of defusing, denial of responsibility ("everything is against me"), avoidance of constructive contact with teachers and peers. The teenager's problem-oriented strategies are almost not developed – he does not look for solutions, does not analyze the causes of conflicts.

Our task is to correct and develop adaptive coping strategies that will teach teenagers how to constructively cope with stress and emotions. Among the forms of work, one can mention learning to recognize emotions and verbalize feelings, breathing and body techniques to reduce tension, the ability to analyze conflict situations ("what can I change?"), the use of role-playing games to practice behavior in disputes. Cognitive reassessment, rethinking the "everything is against me" attitude to "I can influence the situation" and social support, restoring trust with the mother, and searching for positive support figures are important.

Let's focus on some exercises and techniques that have been very successfully applied by us in working with teenagers with aggressive behavior.

The Aggression Scale Exercise

The goal: to teach you to recognize the intensity of an emotion.

We offer the teenager a scale from 1 to 10, where 1 is a slight irritation, 10 is an "explosion of rage". Then, we suggest that he recall situations when he was angry and determine where his anger was on the scale.

Psychologist: "You say that when the teacher made a remark, you "exploded." And if on a scale from 1 to 10, how strong was the anger?"

The teenager: "Probably 8."

Psychologist: "What could have been done at level 5 to avoid reaching 8?"

Teenager: "Go out into the hallway or clench your fists so as not to scream."

After that it is discussed: "At what stage else could you stop? What would help?"

Expected result: a teenager learns to recognize the degree of emotion and choose the moment for self-control.

The "Pause before action" technique

Goal: to develop self-control before reacting.

We discuss with the teenager the "flash point" — when you immediately want to shout or hit. We agree: before the action, pause for 5 seconds, and then inhale and exhale.

This technique helps to translate an automatic reaction into a conscious action.

"I-statement" method

The goal: to teach how to express dissatisfaction without accusations.

A psychologist teaches a teenager to build phrases according to the scheme:

"I feel... when you... because... and I want..." So, instead of: "You're pissing me off, leave me alone!"

A teenager learns to say, "I get angry when you interrupt me because I want to finish my thought."

This method develops the skill of assertive (confident, non-aggressive) communication.

Exercise "Let's determine if it's anger or...?"

The goal: to show that aggression is often based on other feelings (fear, resentment, shame).

A conversation with a teenager that helps to recognize hidden emotions and reduces impulsivity:

Psychologist: "When you yelled at a classmate, were you just angry?"

Teenager: "Yes, he pissed me off."

Psychologist: "Maybe you were offended that he made fun of you in front of everyone?"

Teenager: "Well... maybe yes."

The exercises that are aimed at forming problem-oriented coping, which, according to the Lazarus model, is aimed at changing the most stressful situation, and not just the emotions associated with it, have proven themselves well.

Exercise "Attention, conflict"

The goal: to teach a teenager to analyze a conflict, see solutions, and act constructively rather than impulsively.

Course of work: The psychologist suggests that the teenager recall a specific conflict situation (with a teacher or classmate) and sort it out according to the scheme:

Step	Question	Example
1. The situation	What happened?	The teacher made a remark, I shouted
2. Thoughts	What did I think then?	"He humiliates me on purpose"
3. Emotions	What did I feel?	Anger, resentment
4. Behavior	What did I do?	He shouted and left
5. Consequences	What happened in the end?	Conflict, punishment
6.Alternative	What could I have done differently?	Hold back, speak calmly, get out

Such a task plan allows a teenager to learn to understand the chain of "thought — emotion — action" and find a zone of personal influence: what can I change in the future.

Using tasks based on finding creative solutions and finding constructive strategies to get out of conflict situations also allows you to form positive strategies to get out of difficult situations. As an example, we can use the following: A conflict at school between a classmate. Possible actions: shout at him, ignore him, joke back, say calmly: "I hate it when you say that," contact the class teacher. Analyzing situations allows you to see the possibility of choice, and to show that the answer may not be aggressive.

It is very effective to use exercises aimed at developing emotional self-regulation, which include: breathing techniques, relaxation, story-role-playing games and interactive tasks for developing empathy. These tasks are aimed at developing conflict resolution skills and reducing aggression.

The training work that is used in working with this age group contributes to the development of constructive copying strategies, which is carried out through the analysis of situations and the search for alternative behaviors. Equally important is working with parents, who do not always choose the right style of communication and behavior with teenagers and teachers, cooperation with whom helps to develop the right strategies for working with this age group, as well as when drawing up a support program. The stages of coping strategies formation can be represented as follows:

- Awareness of aggressive behavior and acceptance of responsibility;
- Recognition and regulation of emotional stress;
- The use of alternative behaviors;
- Consolidation of new strategies in social relations.

Of course, an important aspect of this work is not to eliminate aggression, but to direct it into a socially acceptable form. By instilling in a teenager skill such as emotional self-regulation, social responsibility, and empathy, a psychologist can channel his inner potential into constructive action.

Thus, from the perspective of R. Lazarus' cognitive-transactional model, aggressive behavior of a teenager can be considered as an maladaptive coping strategy formed due to the perception of the external environment as threatening and the lack of internal resources for constructive coping. Correctional work should be aimed at developing problem-oriented and emotionally regulatory coping strategies, as well as at restoring supportive relationships in the family. Mastering effective copy strategies serves to reduce aggressive behavior, enhance social adaptation, and promote harmonious personality development.

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ОПТИМИЗМ КАК МЕХАНИЗМ УСТОЙЧИВОСТИ К НЕОПРЕДЕЛЕННОСТИ В ПРОФЕССИОНАЛЬНОЙ ПОДГОТОВКЕ СТУДЕНТОВ

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Annotation

The article explores optimism as a key mechanism of psychological resilience to uncertainty in students' professional training. In the context of rapid social and technological change, higher education increasingly demands not only professional competence but also personal resources for adaptation. Optimism, viewed as a generalized expectation of favorable outcomes and confidence in overcoming difficulties, ensures emotional stability, motivation, and persistence in achieving goals.

Two major theoretical perspectives are analyzed: dispositional (C. Carver, M. Scheier) and attributional (M. Seligman). The dispositional approach defines optimism as a stable personal disposition, while the attributional model interprets it as a cognitive style of explaining life events. Both emphasize optimism as a regulator of behavior and a factor of stress resistance and psychological well-being.

The study highlights the importance of optimism for students' self-development and professional self-determination, enhancing their ability to cope with uncertainty and maintain confidence in future success. Strengthening optimism is proposed as a psychological support strategy in higher education.

Keywords: optimism; uncertainty tolerance; professional training; resilience; student personality; dispositional optimism

Аннотация

В статье рассматривается оптимизм как важный механизм психологической устойчивости к неопределенности в профессиональной подготовке студентов. В условиях динамичных социальных и технологических изменений современное образование требует от личности не только профессиональных знаний, но и развитых адаптивных ресурсов. Оптимизм, понимаемый как система позитивных ожиданий и уверенности в преодолении трудностей, способствует эмоциональной стабильности, мотивации и настойчивости в достижении целей.

Проанализированы два основных теоретических подхода: диспозиционный (Ч. Карвер, М. Шейер) и атрибутивный (М. Селигман). Первый рассматривает оптимизм как личностную диспозицию, второй — как стиль объяснения жизненных событий. Оба подхода подчеркивают его роль как регулятора поведения и фактора психологического благополучия.

Особое внимание уделено значению оптимизма для студентов, находящихся на этапе профессионального и личностного самоопределения. Он способствует успешному совладанию с неопределенностью, укрепляет уверенность в будущем и поддерживает мотивацию к самосовершенствованию. Автор подчеркивает необходимость развития оптимизма как ресурса психологической поддержки в образовательной среде.

Ключевые слова: оптимизм; устойчивость к неопределенности; профессиональная подготовка; психологическая устойчивость; личность студента

В условиях стремительных социально-экономических, технологических и культурных изменений современного общества профессиональная подготовка студентов приобретает все более сложный и многомерный характер. Современная образовательная среда характеризуется высокой динамичностью, неопределенностью и возрастающими требованиями к адаптивным возможностям личности. Неопределенность, выступая постоянным элементом образовательного и профессионального контекста, требует от будущего специалиста не только когнитивной гибкости и готовности к принятию решений в условиях дефицита информации, но и развитых психологических ресурсов, обеспечивающих устойчивость и внутреннюю сбалансированность в сложных ситуациях.

Одним из ключевых внутренних ресурсов, способствующих успешному преодолению неопределенности, является оптимизм - личностная установка, отражающая склонность ожидать положительных исходов событий и интерпретировать трудности как временные и преодолимые [1]. Оптимизм выполняет регулятивную и адаптивную функции, поддерживая эмоциональную стабильность, устойчивость к стрессу, мотивацию к деятельности и способность к конструктивному поиску решений в нестандартных условиях.

В контексте профессиональной подготовки студентов оптимизм проявляется как важный механизм психологической устойчивости, способствующий развитию уверенности в собственных силах, формированию позитивного отношения к учебным и профессиональным трудностям, а также поддержанию мотивации к самосовершенствованию. Позитивное восприятие будущего и вера в успешность профессиональной самореализации позволяют студенту эффективнее адаптироваться к неопределенным ситуациям, сохранять целеустремленность и инициативность.

В психологии понятие оптимизма рассматривается в различных теоретических контекстах и направлениях. Он интерпретируется как атрибутивный стиль (С. Петерсон, М. Селигман), система установок и личностных диспозиций (Ч. Карвер, М. Шейер, К. Муздыбаев, Е. П. Ильин), позитивное отношение к миру (Э. Эриксон), конструктивная характеристика мышления субъекта (А. Бек, А. Эллис), позитивная самоустановка (А. Аргайл, М. Джеймс, Д. Джонгвард, В. В. Столин, И. А. Джидарьян, С. Любомирски), условие эффективной поисковой активности личности (В. С. Ротенберг, В. В. Аршавский), компонент совладающего поведения (С. С. Замышляева) и мотивации достижения (Т. О. Гордеева) [2].

В современной психологии выделяются два основных теоретических направления в исследовании оптимизма: 1) понимание его как системы диспозиций и 2) интерпретация как стиля причинных объяснений, то есть атрибутивного стиля.

Примером первого, диспозиционального подхода, является теория диспозиционного оптимизма Ч. Карвера и М. Шейера [3]. Центральными элементами данной модели выступают цель (объект направленности поведения) и ожидание (уверенность или сомнение в достижимости цели). Тем самым данный подход восходит к теории ожидаемой ценности, согласно которой мотивация человека функционирует при наличии двух условий: 1) привлекательности результата и 2) веры в возможность его достижения [4]. Концепт диспозиционного оптимизма соотносится преимущественно со вторым из этих условий, отражая степень веры индивида в успешность собственных действий.

Цели человека могут варьировать от конкретных и частных до обобщенных и глобальных, а их достижения сопровождаются различной степенью уверенности в положительном исходе. В ситуациях новизны, неопределенности или повышенной сложности регуляция поведения основывается на генерализованных ожиданиях, которые могут принимать форму уверенности либо сомнения. Именно в таких условиях Ч. Карвер и

М. Шейер предлагают рассматривать феномены оптимизма и пессимизма как выражение общей тенденции к позитивной или негативной оценке будущего. Индивид, демонстрирующий устойчивую уверенность в достижимости целей в различных обстоятельствах, характеризуется как носитель «диспозиционного оптимизма». Следовательно, в рамках данной концепции оптимизм рассматривается как генерализованное эмоционально-мотивационное образование, включающее чувство уверенности и готовность действовать в направлении реализации целей. По мнению Ч. Карвера и М. Шейера, человек продолжает прикладывать усилия и преодолевать трудности до тех пор, пока его вера в успех сохраняет достаточную силу. Типичный «оптимист» склонен: 1) делать позитивные обобщения относительно будущего, 2) воспринимать желаемые результаты как достижимые и 3) активно реагировать на трудности, проявляя настойчивость и упорство. Таким образом, диспозиционный оптимизм представляет собой относительно стабильную латентную характеристику, отражающую позитивные ожидания индивида в отношении будущего.

Подход к изучению оптимизма и пессимизма, сформировавшийся в рамках исследований М. Селигмана, опирается на его концепцию выученной беспомощности, а также на теорию каузальной атрибуции, разработанную Г. Келли и Ф. Хайдером. Концепция выученной беспомощности, объясняющая пассивно-беспомощное поведение человека в различных ситуациях через наличие опыта пребывания в обстоятельствах безысходности, была впервые представлена в ранних исследованиях М. Селигмана [5]. В ходе этих работ было установлено, что даже в крайне неблагоприятных условиях некоторые индивиды сохраняют высокий уровень устойчивости, проявляют инициативу и продолжают попытки достичь успеха. М. Селигман связал данное качество с феноменом оптимизма, выдвинув гипотезу о том, что именно приобретенный в процессе успешного взаимодействия с реальностью оптимизм способствует сохранению мотивации к активным действиям даже при столкновении с временными и труднопреодолимыми препятствиями. [6]. Оптимизм, по мнению исследователя, выполняет защитную функцию, препятствуя развитию беспомощности и способствуя поддержанию психологического и физического здоровья. Следует отметить, что между людьми наблюдаются индивидуальные различия в степени восприимчивости к состоянию беспомощности. М. Селигман выделил оптимистический и пессимистический атрибутивные стили, подчеркнув асимметрию в восприятии позитивных и негативных событий, характерную для людей, находящихся в состоянии психологического благополучия [1].

М. Селигман полагал, что различия между оптимистами и пессимистами проявляются прежде всего в характере объяснения жизненных событий. Стиль объяснения, согласно его концепции, определяется тремя параметрами: 1) постоянством (степенью стабильности интерпретаций благоприятных и неблагоприятных событий во времени), 2) широтой (распространенностью объяснительных схем на различные сферы жизни) и 3) персонализацией (приписыванием причин внешним обстоятельствам либо внутренним личностным факторам) [6].

Подход М. Селигмана к исследованию оптимизма и пессимизма не противоречит концепции М. Шейера и Ч. Карвера, а, напротив, находится с ней в отношении теоретического взаимодополнения. В концепции М. Селигмана оптимизм понимается как способность к гибким и конструктивным интерпретациям жизненных ситуаций, успехов и неудач, тогда как в модели Ч. Карвера и М. Шейера оптимизм трактуется как наличие позитивных ожиданий в отношении будущего.

Обе концепции, диспозиционная и атрибутивная, развивались в русле когнитивной психологии и в значительной степени дополняют друг друга, так как связывают феномен оптимизма с процессами переработки информации и когнитивной регуляции поведения.

Эмпирические данные свидетельствуют, что оптимисты: 1) в меньшей степени подвержены дистрессу и тревоге, 2) более способны принимать неизменные обстоятельства, 3) демонстрируют развитую способность к позитивной переоценке проблемных ситуаций и 4) реже прибегают к защитным механизмам, таким как отрицание или избегание [2]. Таким образом, оптимизм выступает важным регулятивным механизмом, способствующим успешной деятельности и психологическому благополучию человека.

Согласно данным зарубежных исследований, выраженность оптимистических и пессимистических тенденций личности имеет возрастные особенности. Наиболее высокий уровень оптимизма характерен для молодых людей в возрасте от 20 до 30 лет, в частности для студентов высших учебных заведений [7]. В этот период жизни оптимизм выступает одной из ключевых движущих сил личностного становления, способствуя формированию жизненных целей, активной самореализации и позитивного отношения к будущему.

Оптимизм, понимаемый как система обобщенных ожиданий, отражающая уверенность в том, что в будущем человека будут преимущественно сопровождать благоприятные события, представляет собой значимый фактор личностного развития в студенческом возрасте. Период юности является сензитивным этапом становления жизненных ожиданий и смысловых ориентаций личности. Студенческий возраст характеризуется высокой интенсивностью нагрузок и множественностью требований, предъявляемых к личности. В условиях современных социально-экономических кризисов усиливается влияние еще одного значимого фактора риска для сохранения оптимистического отношения к жизни - профессиональной и социальной неопределенности будущего специалиста, связанной с поиском места в обществе и трудоустройством. В связи с этим особую значимость приобретает задача выявления и развития психологических ресурсов, способствующих успешному преодолению трудных жизненных ситуаций без потери внутреннего равновесия и психического здоровья. Оптимизм является одним из центральных компонентов личностного потенциала, определяющим успешность профессионального становления в условиях неопределенности.

Таким образом, изучение оптимизма как механизма устойчивости к неопределенности в профессиональной подготовке студентов представляется актуальной научно-практической задачей. Оно позволяет расширить представления о внутренней структуре адаптивных ресурсов личности, а также определить психологические условия, способствующие формированию позитивных установок и эффективных стратегий поведения в образовательной и профессиональной среде. Кроме того, изучение уровня оптимизма и его взаимосвязей с другими психологическими характеристиками имеет практическое значение для организации психологической поддержки студентов, направленной на успешное преодоление возрастных задач, формирование нравственных установок, профессиональное самоопределение и построение жизненных планов.

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Medical Sciences

NT-proBNP as an Early Diagnostic Marker of Chronic Heart Failure

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Abstract:

NT-proBNP is a validated biomarker that reflects ventricular filling pressure and myocardial wall stress. It demonstrates high sensitivity for excluding heart failure (HF) in both acute and outpatient clinical settings and provides significant prognostic information. Randomized controlled trials and systematic reviews have demonstrated the benefits of targeted screening among high-risk groups (such as patients with diabetes, post-myocardial infarction, or chronic kidney disease) when combined with structured follow-up programs (echocardiography referral, therapy optimization). However, current evidence is insufficient to support population-wide screening of asymptomatic individuals. Major clinical guidelines (ESC 2021, AHA/ACC/HFSA 2022) recommend the use of natriuretic peptides for both diagnostic purposes and clinical triage.

Relevance of the Study:

According to the World Health Organization (WHO), chronic heart failure affects more than 60 million people globally. Despite significant advances in cardiology, early diagnosis of the disease remains challenging. Traditional diagnostic methods such as echocardiography and clinical examination often identify heart failure at advanced stages. Measurement of NT-proBNP levels allows for diagnosis at a preclinical stage, making it an essential tool in modern cardiology.

Objectives of the Review:

1.To determine whether NT-proBNP measurement is necessary for early diagnosis of chronic heart failure;

2.To evaluate the diagnostic and prognostic significance of NT-proBNP testing;

3.To assess whether NT-proBNP screening should be introduced as a mandatory or routine measure;

4.To summarize practical recommendations regarding thresholds and diagnostic algorithms for use in primary care settings.

Methods of Literature Search:

A comprehensive search was conducted using PubMed/Medline, the Cochrane Library, and the official guidelines of the ESC and AHA/ACC/HFSA. Sources included systematic reviews (BMJ, Cochrane), randomized controlled trials (STOP-HF, PONTIAC), and recent review papers published between 2014 and 2025. Key search terms: "NT-proBNP," "BNP," "screening," "heart failure," "diagnosis," "primary care," "STOP-HF," "PONTIAC," "guidelines." Large meta-analyses, RCTs, and clinical guidelines were selected to provide evidence-based practical recommendations.

Biology and Clinical Interpretation of NT-proBNP:

NT-proBNP, the N-terminal fragment of pro-BNP, is secreted by cardiomyocytes in response to increased wall stress caused by volume or pressure overload. It has a longer half-life than active BNP, making it more stable and widely used in clinical practice.

NT-proBNP levels depend not only on cardiac function but also on several non-cardiac factors: they tend to increase with age, chronic kidney disease, atrial fibrillation, acute coronary syndrome, and pulmonary hypertension, while obesity is associated with lower concentrations. Therefore, accurate interpretation requires consideration of the full clinical context.

Evidence Base: Diagnostic Accuracy:

• Acute Care (Patients with Dyspnea or Suspected Acute HF):
Meta-analyses and clinical guidelines confirm that both NT-proBNP and BNP have high sensitivity for excluding acute heart failure. For acute presentations, a threshold of NT-proBNP <300 pg/mL is widely accepted as a “rule-out” value, with a negative result effectively lowering the probability of acute HF.

• Outpatient/Chronic Settings (Early Diagnosis of Chronic HF):
The ESC 2021 guidelines recommend NT-proBNP <125 pg/mL as a cutoff to exclude chronic heart failure in outpatient practice. Some centers adopt a more pragmatic higher threshold (approximately 300–400 pg/mL) to reduce false-positive referrals for echocardiography. Threshold interpretation should be individualized based on patient age and the presence of atrial fibrillation.

• Sensitivity and Specificity:
Systematic reviews demonstrate excellent sensitivity and variable specificity for natriuretic peptide testing — highly effective for ruling out HF, but less reliable for confirming the diagnosis without imaging support. A positive NT-proBNP result therefore requires subsequent echocardiographic evaluation.

Screening in Asymptomatic and High-Risk Populations: RCTs and Systematic Reviews:

• STOP-HF (St Vincent’s Screening To Prevent Heart Failure, Ledwidge et al., 2013): A randomized controlled trial that demonstrated the efficacy of BNP-based screening and subsequent structured care in patients with cardiovascular risk factors. This approach significantly reduced combined endpoints (new left ventricular dysfunction or incident heart failure) compared to standard care, confirming the value of targeted screening among high-risk groups.

• PONTIAC (Huelsmann et al., 2013): An RCT involving patients with type 2 diabetes without known cardiovascular disease and NT-proBNP levels >125 pg/mL. Intensive cardiology-guided therapy optimization (up-titration of RAS inhibitors and β-blockers) significantly decreased hospitalizations and cardiac events versus standard management, supporting NT-proBNP use for selective primary prevention in diabetic populations.

• Systematic Reviews and Cochrane Analyses: Comprehensive reviews indicate that NP-based screening and monitoring can reduce progression to symptomatic heart failure and related hospitalizations among high-risk individuals. Nonetheless, evidence is limited by heterogeneity across studies (varying thresholds, populations, and care algorithms). Meta-analyses confirm diagnostic value but emphasize the necessity of structured follow-up care.

Guidelines and Consensus Statements:

- ESC 2021: Recommends BNP/NT-proBNP testing as an initial diagnostic step for patients with suspected heart failure. Rule-out thresholds: <125 pg/mL for chronic HF and <300 pg/mL for acute HF. Elevated results require echocardiographic confirmation (Class I recommendation).
- AHA/ACC/HFSA 2022: Confirms both diagnostic and prognostic significance of NP testing.

- Recommends their use for risk stratification and as part of standard diagnostic algorithms. Emphasizes consideration of renal function, age, and cardiac rhythm when interpreting NT-proBNP results.
- Cochrane and Other Systematic Reviews: Support NP-guided strategies in high-risk groups but call for additional research to evaluate scalability and cost-effectiveness across different healthcare systems.

Clinical Utility of NT-proBNP:

1. Rapid Triage: Facilitates timely identification of patients with dyspnea or fatigue who require urgent echocardiography or cardiology evaluation.
2. Prognostic Value: Elevated NT-proBNP levels are strongly associated with increased risk of hospitalization and mortality, providing crucial prognostic insight.
3. Targeted Screening: When integrated with structured care pathways (rapid echocardiography access and therapy optimization), NT-proBNP testing reduces progression to clinical heart failure and hospitalization — as demonstrated in STOP-HF and PONTIAC trials.

Limitations and Confounding Factors:

• Chronic kidney disease increases NT-proBNP independently of heart failure.
• Atrial fibrillation elevates peptide levels.
• Obesity may result in falsely low values.
• Age correlates positively with NT-proBNP; thus, age-adjusted thresholds enhance diagnostic accuracy.
• Analytical variability exists between different assays; awareness of laboratory-specific standards is essential.

Economic Considerations:

Evidence supports that targeted NT-proBNP screening among high-risk groups, coupled with structured follow-up care, is cost-effective and improves clinical outcomes. However, population-wide screening of asymptomatic individuals is not justified at this time. Cost-effectiveness depends on test pricing, availability of echocardiography, and national healthcare infrastructure.

Practical Algorithm for Clinical Use:

1. Symptomatic Patients (Dyspnea, Fatigue, Peripheral Edema):
2. Perform clinical evaluation and ECG. If HF is suspected, measure NT-proBNP.

• Non-acute setting: NT-proBNP <125 pg/mL — HF unlikely; evaluate other causes.
• Acute setting: NT-proBNP <300 pg/mL — acute HF unlikely. If elevated: refer for echocardiography and cardiology consultation, considering age, renal function, and rhythm abnormalities.

3. Asymptomatic High-Risk Individuals:
4. Screening is recommended only for high-risk patients — those with diabetes (>50 years), post-myocardial infarction, chronic kidney disease, or multiple cardiovascular risk factors.
5. If NT-proBNP is elevated, further evaluation and therapy optimization should be arranged. STOP-HF and PONTIAC provide strong supporting evidence for this targeted approach.

Recommendations:

1. Routine NT-proBNP screening for all asymptomatic individuals is not recommended.
2. Measurement is advised for: patients with suspected heart failure (triage/exclusion tool). Targeted screening among high-risk populations (diabetes, post-MI, CKD, elderly) as part of organized clinical programs ensuring rapid echocardiography and cardiology access.
3. Interpretation thresholds: outpatient rule-out ≈ 125 pg/mL; acute rule-out ≈ 300 pg/mL; apply higher cutoffs in elderly or atrial fibrillation patients; consider renal function for accuracy.

Research Gaps and Future Directions:

• Determining optimal age- and comorbidity-adjusted thresholds across diverse ethnic populations, including Central Asian and Kazakh cohorts.

• Assessing cost-effectiveness and practical feasibility of targeted NT-proBNP screening within the healthcare context of Kazakhstan (limited resources and echocardiography access).

• Conducting long-term randomized controlled trials to evaluate NP-guided screening effects on mortality in high-risk populations.

Practical Implications for Clinicians:

• When available, NT-proBNP testing should be incorporated into the diagnostic algorithm for patients with dyspnea, fatigue, or edema. Apply appropriate cutoffs and refer elevated cases for echocardiography.

• For diabetic, CKD, or post-MI patients, periodic NT-proBNP measurements and streamlined access to cardiology services are recommended. This aligns with the outcomes demonstrated in PONTIAC and STOP-HF trials.

Conclusion:

Measurement of NT-proBNP levels is a highly informative tool for the early diagnosis of chronic heart failure. This biomarker enables detection of cardiac dysfunction before the appearance of clinical symptoms, facilitates disease staging, and assists in monitoring therapeutic efficacy. Based on current evidence, NT-proBNP testing should become an integral component of diagnostic practice in primary healthcare. Early identification of high-risk patients allows prevention of severe complications and reduction of mortality.

While universal population screening is unnecessary, NT-proBNP is strongly recommended as a triage tool for symptomatic patients and as a targeted screening method for high-risk groups, integrated with organized follow-up (echocardiography and therapy optimization). Randomized controlled trials (STOP-HF, PONTIAC) and meta-analyses consistently confirm the clinical value of this targeted approach.

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UDC: 616.22-006.6

UP-TO-DATE CLINICAL AND DIAGNOSTIC ASPECTS OF LARYNGEAL CANCER

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Annotation: this scientific and analytical work presents modern world and local-regional data on incidence, mortality, lethality and five-year survival rate of such oncological pathology of head and neck tumors as laryngeal cancer. The issues of etiology and pathogenesis, features of distribution, modern approaches and principles of complex diagnostics, prospects for improving treatment results, as well as prognosis are covered in detail. The epidemiological characteristics of this pathology in our republic are given in the context of regions of the country.

Key words: oncology, otorhinolaryngology, laryngeal cancer, human papillomavirus, biomarkers, RNA, immune-related genes, autophagy, epidemiology, incidence, mortality, lethality, five-year survival rate, prognosis.

Laryngeal cancer (LC) is a malignant tumor that develops from elements of the non-keratinizing epithelium of the larynx.

The etiologic factors remain unclear to date. In most cases, the patient's medical history includes untreated inflammatory and precancerous diseases of the larynx (laryngitis, papillomas, papillomatosis, dyskeratosis, leukoplakia, pachydermia, fibroma); a long period of smoking, alcohol consumption, work in dusty conditions (textile production), inhalation of harmful carcinogenic substances (oil, its distillation products, benzene, phenolic resins, asbestos); genetic predisposition (the presence of malignant diseases in relatives), as well as age and gender (males over 55 years of age) [1,2].

The diagnostic criteria are as follows. Complaints and medical history. Complaints: cough; hoarseness; sore throat radiating to the ear; difficulty breathing; choking when taking liquid food; enlarged cervical, supraclavicular, subclavian, submandibular, and submental lymph nodes. History: early symptoms of the disease in LC are: hoarseness and cough, which appear already at stage I of the disease; when, at the initial visit of patients, hoarseness has been observed for six months with the addition of other symptoms, this may indicate later stages (III-IV) of the disease. In this case, complaints of shooting pain in the ear, difficulty breathing, choking when taking liquid food or water, and the appearance of enlarged nodes on the neck are also added [1].

Physical examination: indirect laryngoscopy (tumor, formation of one of the parts of the larynx, limited mobility of the true vocal cord or fixation of the affected half of the larynx, narrowing of the glottis); palpation examination of the lymph nodes of the neck on both sides (the presence of enlarged cervical lymph nodes of a dense consistency, immobile or stiff, slightly painful or possibly not painful, more than 1.0 cm in size).

Laboratory tests: cytological examination (increase in cell size up to giant, change in the shape and number of intracellular elements, increase in the size of the nucleus, its contours, different degrees of maturity of the nucleus and other cell elements, change in the number and shape of nucleoli); histological examination (large polygonal or spiky cells with well-defined cytoplasm, round nuclei with clear nucleoli, with the presence of mitoses, cells are located in the form of cells and cords with or without keratin formation, the presence of tumor emboli in the vessels, the severity of lymphocytic plasmacytic infiltration, mitotic activity of tumor cells).

Instrumental examinations: ultrasound examination of the cervical, submandibular, supraclavicular, subclavian lymph nodes (contours are clear, uneven, echogenicity is reduced, there may be areas of mixed echogenicity, the structure of the node is heterogeneous, increased vascularization is possible); computed tomography of the larynx (a tumor formation of the larynx, occupying the right or left half, spreading to the piriform sinus or the root of the tongue or soft tissues of the anterior surface of the neck, or to the trachea area, conglomerates of lymph nodes of various sizes are possible, compressing or displacing or growing into the vascular-nerve bundle of the neck); biopsy of a laryngeal tumor (cytological examination of the material reveals an increase in the size of the cell up to giant, a change in the shape and number of intracellular elements, an increase in the size of the nucleus, its contours, different degrees of maturity of the nucleus and other elements of the cell, a change in the number and shape of nucleoli; histological examination of the material reveals large polygonal or spiky cells with well-defined cytoplasm, round nuclei with clear nucleoli, with the presence of mitoses, the cells are arranged in the form of cells and cords with or without the formation of keratin, the presence of tumor emboli in the vessels, the severity of lymphocyte-plasmocyte infiltration, mitotic activity of tumor cells); fine-needle aspiration biopsy of enlarged lymph nodes of the neck (during cytological examination of the material - an increase in the size of the cell up to giant, a change in the shape and number of intracellular elements, an increase in the size of the nucleus, its contours, different degrees of maturity of the nucleus and other elements of the cell, a change in the number and shape of nucleoli) [1].

As noted by Huang J. et al. [3] though the LC only has 1% of the total cancer cases and related deaths, it is a type of head and neck cancers with the highest prevalence. Cigarette smoking and alcohol consumption was found to have the strongest relation with LC; other potential risk factors include age (≥65), sex (male), family history of cancer, chemical workplace exposure, gastro-esophageal reflux, and exposure to human papillomavirus (HPV).

In their work, the authors emphasize that the global incidence and mortality rates of LC in 2020 was extracted from the Global Cancer Observatory (GLOBOCAN) database, developed by the International Agency for Research on Cancer, World Health Organization (WHO) [4].

The Gross Domestics Products (GDP) and Human Development Index (HDI) for each country were retrieved from World Bank and United Nations. For the categorization of HDI rates, <0.550, 0.550–0.699, 0.700-0.700, and ≥0.800 are considered low, medium, high, and very high. Data from 1980 to 2020 were obtained, and the data of the most recent 10 years were used for trend analysis. The WHO mortality database was used for cancer-related death data for each country and region. Cancer mortality data was collected from national civil cancer registries on a local and national level with the registering system logging verified cancer deaths and their causes, which is then reported to WHO annually. To ensure the quality of data, only figures with medium quality or above were published by the WHO mortality database based on the timeliness, completeness and coverage of registration and the proportion of deaths assigned to ill-defined causes. All incidence and mortality figures of LC were transformed - using the Segi-Doll world reference population for various nations - into an age-standardised rate (ASR) per 100 000 individuals. Weighting was allocated in accordance with proportions of people in the standard population's corresponding age groups. This enabled the current study to compare incidence and mortality rates across different countries over time [3].

There were 184 615 newly reported cases of LC in 2020, with an ASR incidence of 2.0 per 100 000 persons. Incidence varied geographically, region with the highest incidence was Caribbean (ASR=4.0) followed by Central and Eastern Europe (ASR=3.6) and Southern Europe (ASR=2.9). Regions with the lowest incidence include Middle Africa (ASR=0.76), Western Africa (ASR=0.79), and Central America (ASR=0.86). There was a remarkable disparity among the two sexes in terms of incidence, as the global ASR of males (ASR=3.6) was more than seven times higher than that of females (ASR=0.49). The highest incidence was in countries with medium HDI (ASR=2.5), followed by very high HDI (ASR=2.3), high HDI (ASR=1.6), and low HDI (ASR=0.94). In 2020, 99 840 LC-related deaths were reported, which was slightly more than 1% of the total cancer-related deaths. Globally, LC has an ASR of 1.0 per 100 000 persons in mortality. In terms of the geographical distribution, the Caribbean region (ASR=2.1) had the highest mortality rate, doubling the global average, followed by Central and Eastern Europe (ASR=1.9), and South-Central Asia (ASR=1.7). Regions with the lowest mortality were Australia and New Zealand (ASR=0.34), Micronesia (ASR=0.45), and Middle Africa (ASR=0.54). Similar to incidence, the highest mortality was in countries with medium HDI (ASR=1.6), followed by high HDI (ASR=0.92), very high HDI (ASR=0.86), and low HDI (ASR=0.71). Among males LC incidence was associated with a higher HDI [β=0.175, 95% confidence interval (CI): 0.111-0.239, P<0.001], prevalence of smoking (β=0.051, 95% CI: 0.041-0.061, P<0.001), alcohol drinking (β=0.040, 95% CI: 0.028-0.052, P<0.001), unhealthy dietary (β=0.012, 95% CI: 0.006-0.018, P<0.001), obesity (β=0.022, 95% CI: 0.012-0.031, P<0.001), hypertension (β=0.031, 95% CI: 0.022-0.041, P<0.001), diabetes (β=0.032, 95% CI: 0.014-0.051, P=0.001), and lipid disorders (β=0.021, 95% CI: 0.013-0.029, P<0.001). Among females, incidence was associated with a higher HDI (β=0.114, 95% CI: 0.050-0.178, P<0.001), prevalence of smoking (β=0.049, 95% CI: 0.033-0.065, P<0.001), inactivity (β=0.040, 95% CI: 0.009-0.072, P=0.011), obesity (β=0.013, 95% CI: 0.004-0.022, P=0.004), hypertension (β=0.012, 95% CI: 0.002-0.023, P=0.024), diabetes (β=0.051, 95% CI: 0.031-0.071, P<0.001), and lipid disorders (β=0.015, 95% CI: 0.007-0.023, P<0.001). Among males LC mortality was associated with a higher HDI (β=0.094, 95% CI: 0.025-0.163, P<0.001), prevalence of smoking (β=0.044, 95% CI: 0.033-0.054, P<0.001), alcohol drinking (β=0.025, 95% CI: 0.013-0.038, P<0.001), unhealthy dietary (β=0.009, 95% CI: 0.003-0.015, P=0.002), obesity (β=0.016, 95% CI: 0.006-0.025, P=0.001), hypertension (β=0.025, 95% CI: 0.015-0.034, P<0.001), and lipid disorders (β=0.013, 95% CI: 0.004-0.021, P=0.003). Among females, mortality was associated with a lower GDP per capita (β=−0.076, 95% CI: −0.126-0.027, P=0.003), and prevalence of alcohol drinking (β =−0.060, 95% CI: −0.085-0.035, P<0.001) [3].

Overall, more countries were showing decreasing trends than increasing trends in LC while such trends were less evidence among female population, younger subjects, and countries from Europe. The overall incidence for males was decreasing while females reported mixed trends. For males, significant increases were found only in Cyprus [average annual percent change (AAPC)=5.88; 95% CI: 0.52-11.52; P=0.035)], whilst decreasing trends were reported in 24 countries evenly distributed in different continents, Chile (AAPC=−11.5; 95% CI: −20.99-0.88; P=0.038) reported the largest decrease, followed by the Philippines (AAPC=−7.71; 95% CI: −12.15-

3.05; P=0.006), and Norway (AAPC=−5; 95% CI: −8.71-1.14; P=0.018). For females, three countries showed significant increasing trends: Japan (AAPC=6.01; 95% CI: 1.51-10.71; P=0.015), Switzerland (AAPC=5.61; 95% CI: 0.05-11.49; P=0.048), and Czech Republic (AAPC=3.31; 95% CI: 1.28-5.39; P=0.005). Evident decreases were found in six countries, with India (AAPC=−8.35; 95% CI: −13.62-2.75; P=0.009), Korea (AAPC=−8.28; 95% CI: −11.68-4.74; P=0.001), and Turkey (AAPC=−6.05; 95% CI: −10.21-1.69; P=0.013) reporting the largest decreases. Similar to the incidence trends, there was a remarkable difference between the mortality trends of males and females. For males, only Thailand (AAPC=5.41; 95% CI: 3.56-7.30; P<0.001) reported significant increases. On the contrary, significant decreases were observed in 30 countries. The largest decreases were found in Korea (AAPC=−7.17; 95% CI: −8.65-5.66; P<0.001), Singapore (AAPC=−7.10; 95% CI: −13.59-0.11; P=0.047), and France (AAPC=−5.96; 95% CI: −6.76-5.15; P<0.001). For females, significant increasing trends were found in Israel (AAPC=12.49; 95% CI: 0.81-25.51; P=0.038); while significant decreases were reported in eight countries, with Korea (AAPC=−10.58; 95% CI: −15.61-5.24; P=0.002), Belarus (AAPC=−7.93; 95% CI: −13.55-1.95; P=0.010), and Colombia (AAPC=−5.68; 95% CI: −8.04-3.27; P=0.001) reported the most evident decreases. For the older males aged 50 or above two countries reported significant increases: Cyprus (AAPC=6.87; 95% CI: 1.16-12.91; P=0.024), and Belarus (AAPC=1.41; 95% CI: 0.28-2.55; P=0.021). In contrast, significant decreases were observed in 21 countries sporadically distributed worldwide. The largest decreases were found in Chile (AAPC=−10.31; 95% CI: −19.44-0.14; P=0.048), Philippines (AAPC=−7.57; 95%; CI: −11.86-3.08; P=0.005), and Norway (AAPC=−5.69; 95% CI: −8.87-2.41; P=0.004). For females aged 50 or above, three countries, all European countries, reported significant increases: Spain (AAPC=6.76; 95% CI: 2.03-11.72; P=0.01), Switzerland (AAPC=5.38; 95% CI: 0.25-10.78; P=0.042), and Czech Republic (AAPC=4.00; 95% CI: 1.73-6.32; P=0.003) reported the largest increases. On the other hand, four populations showed significant decreasing trends, Turkey (AAPC=−6.50; 95% CI: −11.64-1.07; P=0.025) reported the largest decline, followed by Canada (AAPC=−4.36; 95% CI: −6.94-1.70; P=0.006), and the white population in the USA (AAPC=−2.98; 95% CI: −5.13-0.78; P=0.014). Similar distribution but larger increase was found in males aged below 50 Norway (AAPC=18.77; 95% CI: 4.55-34.92; P=0.014) and Thailand (AAPC=10.24; 95% CI: 0.36-21.09; P=0.044) reported significant increasing trends, whereas evident decreasing trends were observed in 17 countries, predominately Asian and European countries, with Germany (AAPC=−17.17; 95% CI: −26.66-6.44; P=0.007), Denmark (AAPC=−9.88; 95% CI: −17.74-1.26; P=0.030), and France (AAPC=−9.66; 95% CI: −14.70-4.32; P=0.004) showing the greatest decreases. From the raw data, the highly significant increasing trend observed in the younger male population of Norway and Thailand was likely due to the statistical base effect as unusually low ASR was reported in the start of the 10-year interval 2010-2011 (Norway); 2003 (Thailand). For their younger females aged below 50, significant decreases were observed in two countries/regions: Hong Kong, SAR, China (AAPC=−12.44; 95% CI: −21.77-1.99; P=0.026) and Korea (AAPC=−11.79; 95% CI: −21.66-0.67; P=0.041), while no country reported significant increase [3].

In conclusion, our colleagues point out that the reported incidence for LC has been decreasing remarkably for the past decades, especially for the male population, potentially due to the reduced consumptions of cigarettes and alcohol. Its mortality has also been decreasing, possibly attributable to broader availability and applications of treatments. However, regional disparity in mortality remains due to difference in level of access to surgical care. On the contrary, it is alarming that some evident increases were observed in the female populations and younger subjects from some countries. If no mitigation interventions are implemented, such trends may continue. It is also recommended that governments should continue the implementation of smoking and alcohol reduction campaigns, to minimize further burden on healthcare system.

Nocini R. et al. in their work they say that [5] LC is a form of malignancy originating from the anatomic site called larynx (also commonly known as "voice box"), which is anatomically divided in three regions including the supraglottic larynx (encompassing the epiglottis, false vocal cords, ventricles, aryepiglottic folds and arytenoids), the glottis (encompassing the true vocal cords and the anterior and posterior commissures) and the subglottic region. Among squamous cell carcinomas, the well and moderately differentiated forms slightly prevail over poorly differentiated tumors; the larger number of LC cases originate from the glottic region (i.e., approximately two-third), followed by the supraglottic area (about 30%), whilst transglottic and purely subglottic tumors are generally less frequent. The more important risk factors for LC include tobacco use, excessive alcohol ingestion, gastro-esophageal reflex, Plummer-Vinson syndrome, anatomical malformations, exposure to heat, chemicals, asbestos, nickel or ionizing radiations, along with some viral infections (e.g., HPV). The most frequent symptoms of laryngeal malignancies include hoarseness, sore throat, dysphagia and/or painful swallowing, impairment in voice quality, otalgia, cough and hemoptysis. Despite hoarseness can develop early in patients with laryngeal malignancies, in many cases the cancer has already deeply involved the vocal cords and spreads to regional lymphatics at diagnosis. Primary tumor volume, composite nodal volumes, composite primary tumor and nodal volumes are significant predictors of unfavorable prognosis, along with advanced age, performance status, grade and depth of invasion.

In their work, the researchers note that LC is an important oncologic entity, whose prognosis depends on establishing appropriate preventive and diagnostic measures, especially in populations at higher risk. The current incidence, prevalence and mortality of LC are estimated at 2.76 cases/year per 100,000 inhabitants, 14.33 cases/year per 100,000 inhabitants and 1.66 deaths/year per 100,000 inhabitants, respectively, averaging 3.28 million Disability-Adjusted Life Years each year. Incidence and prevalence have increased by 12% and 24%, respectively during the past 3 decades, whilst mortality has declined by around 5%. The epidemiologic burden of this malignancy is approximately 5-fold higher in males and increases in parallel with ageing, peaking after 65 years of age. Both incidence and mortality rates are higher in Europe and lower in Africa, but the ratio between deaths and incidence is the highest in Africa. Incidence has gradually declined in Europe during the past 3 decades, whilst it has increased in South-East Asia and Western Pacific. Cigarette smoking and alcohol abuse contribute for about 90% of overall worldwide mortality for LC. At the same time, the conclusions state that LC still poses a high clinical and societal burden, with an escalating temporal trend not expected to reverse soon [5].

An interesting work was presented by Li C. et al. [6]. In this study, authors aimed to explore the roles of cuproptosis-related genes in LC and their potential as prognostic markers and therapeutic targets. LC, characterized by high recurrence rates and a lack of effective biomarkers, has been associated with cuproptosis, a regulated cell death process linked to cancer progression. They collected comprehensive data from The Cancer Genome Atlas and Gene Expression Omnibus databases, including gene expression profiles and clinical data of LC patients. Using clustering and gene analysis, researchers identified cuproptosis-related genes with prognostic significance. A risk model was constructed based on these genes, categorizing patients into high- and low-risk groups for outcome comparison. Univariate and multivariate analyses were conducted to identify independent prognostic factors, which were then incorporated into a nomogram. Gene Set Enrichment Analysis was employed to explore pathways distinguishing high- and low-risk groups. This risk model, based on four genes, including transmembrane 2, dishevelled binding antagonist of β-catenin 1, stathmin 2, and G protein-coupled receptor 173, revealed significant differences in patient outcomes between high- and low-risk groups. Independent prognostic factors were identified and integrated into a nomogram, providing a valuable tool for prognostic prediction. Gene Set Enrichment Analysis uncovered up-regulated pathways specifically associated with high-risk patient samples. The authors point out that this study highlights the potential of cuproptosis-associated genes as valuable prognostic markers and promising therapeutic targets in the context of LC and sheds light on new avenues for understanding and treating this complex disease.

In a study by Ren L. et al. [7], immune signatures of LC were systematically analyzed and their role in tumor progression was assessed. Differentially expressed immune-related genes (IRGs) were screened between LC and normal tissues from The Cancer Genome Atlas (TCGA) dataset. Then, two prognosis-related IRGs aquaporin 9 (AQP9) and zeta chain of T cell receptor associated protein kinase 70 (ZAP70) were analyzed by a series of survival analysis. Based on them, molecular subtypes were constructed by unsupervised cluster analysis. Differences in survival outcomes, human leukocyte antigen (HLA) expression and immune cell infiltrations were assessed between subtypes. Expression of AQP9 and ZAP70 was validated in LC tissues and cells by reverse transcription-quantitative polymerase chain reaction (RT-qPCR) and immunohistochemistry. After silencing and overexpressing AQP9 and ZAP70, cholecystokinin-8 (CCK-8), 5-ethynyl-2'-deoxyuridine (EdU), wound healing and transwell assays were performed in TU212 and LCC cells. Totally, 315 IRGs were abnormally expressed in LC. Among them, AQP9 and ZAP70 were distinctly correlated to patients' prognosis. Two subtypes were developed with distinct survival outcomes, HLA expression and immune microenvironment. Low expression of AQP9 and ZAP70 was confirmed in LC. AQP9 and ZAP70 up-regulation distinctly suppressed proliferation, migration, and invasion of LC cells. The opposite results were investigated when their knockdown.

Our colleagues focus on the fact that the obtained findings revealed the roles of AQP9 and ZAP70 in progression of LC, and suggested that AQP9 and ZAP70 could potentially act as candidate immunotherapeutic targets for LC. Collectively, this study proposed two prognosis-related IRGs AQP9 and ZAP70. Two molecular subtypes based on AQP9 and ZAP70 may reflect immune microenvironment of LC. In vitro, their up-regulation inhibited proliferation, migration and invasion of LC cells. Results obtained demonstrated that AQP9 and ZAP70 might be candidate therapeutic targets and prognostic signatures for LC, which may assist guide clinical therapy in the future [7].

Liu W. et al. [8] in their work they say that LC is one of the most common malignant tumors among head and neck cancers. Accumulating studies have indicated that long noncoding RNAs (lncRNAs) play an important role in LC occurrence and progression, however, the functional roles and relative regulatory mechanisms of lncRNA growth arrest-specific transcript 5 (GAS5) in LC progression remain unclear. The expression of lncRNA GAS5 in both LC tissues and cell lines was evaluated using quantitative RT-qPCR assay.

The relationships between lncRNA GAS5 expression and clinical parameters were also analyzed. To determine the biological function of lncRNA GAS5, a lncRNA GAS5-specific plasmid was first transfected into LC cells using lentiviral technology. Cell counting kit-8 assay, flow cytometry, and Transwell assays were used to detect in vitro cell proliferation, apoptosis, cycle distribution, and metastasis abilities, respectively. Furthermore, in vivo cell growth experiments were also performed using nude mice. Additionally, western blotting was performed to identify the underlying regulatory mechanism. In the current study, lncRNA GAS5 was downregulated in LC tissues and its low expression was closely associated with poor tumor differentiation, advanced TNM stage, lymph node metastasis, and shorter overall survival time. In addition, lncRNA GAS5 upregulation significantly inhibited LC cell proliferation both in vitro and in vivo. Moreover, in response to lncRNA GAS5 overexpression, more LC cells were arrested at the G2/M stage, accompanied by increased cell apoptosis rates and suppressed migration and invasion capacities. Mechanistically, this data showed that the overexpression of lncRNA GAS5 significantly regulated the PI3K/AKT/mTOR signaling pathway. LncRNA GAS5 might act as a suppressor gene during LC development, as it suppressed cell proliferation and metastasis by regulating the PI3K/AKT/mTOR signaling pathway; thus, lncRNA GAS5 is a promising therapeutic biomarker for the treatment of LC. Overall, lncRNA GAS5 could serve as a tumor suppressor gene in LC, which would be a promising therapeutic biomarker for LC treatment.

Liberale C. et al. [9] note that LC is one of the most frequent tumors of the upper aero-digestive tract. While certain factors such as alcohol consumption and tobacco smoking have been established as risk factors for LC, the correlation of many other risk factors with the mechanism of carcinogenesis remains unclear. The process of laryngeal carcinogenesis has been well described; however, there are still aspects that lack understanding, and the underlying biological mechanisms have not been fully elucidated. Indeed, the emerging role of lncRNAs, miRNAs, and mRNAs is becoming increasingly important in our understanding of cancer development and its clinical and therapeutic implications. These non-coding RNAs have been shown to play critical roles in various aspects of cancer biology, including tumor initiation, progression, metastasis, and response to treatment. Gaining insight into the molecular mechanisms involved in carcinogenesis could enable the prediction of tumor progression and facilitate targeted interventions at various stages of the disease. The ultimate goal is to develop precise and effective therapies through a precision medicine approach. Achieving this objective requires further comprehensive studies on the molecular biology of cancer and the role of different risk factors.

Özdaş T. et al. [10] point out that while LC does not show any obvious early symptoms, it tends to have a poor prognosis in advanced clinical stages. Chromosome region maintenance 1 (CRM1) mediates the nuclear export of some RNAs, major and tumor suppressor proteins and has been associated with the pathogenesis of many tumors. However, the clinicopathological significance of CRM1 gene expression in LC has not been clarified yet. CRM1 expression in matched tumor and normal tissues obtained from 43 LC patients were evaluated intracellular for protein and mRNA levels by immunohistochemical staining (IHC), western-blot, and quantitative real-time qRT-PCR, respectively. IHC, western-blot, and qRT-PCR analyses showed that CRM1 expression was significantly increased in LC tissue compared to normal tissue. Increased expression of CRM1 has been associated with poor prognostic clinicopathological features, including advanced tumor stage, increased tumor invasion, larger tumor size, positive lymph node metastasis, distant metastasis, and invasive histological type by IHC, western-blot, and qRT-PCR. Kaplan–Meier survival analysis showed that patients with high expression of CRM1 exhibited lower overall survival compared to those with low expression (Log-rank = 7.16, $p = 0.007$). According to the TCGA datasets, elevated CRM1 expression in head and neck cancer including cases of squamous cell laryngeal origin is associated with advanced tumor stage and histological grade ($p > 0.05$, for all). Consequently, CRM1 plays an important role in LC and may serve as an indicator and prognostic factor for poor overall survival in LC patients. In conclusion, this study revealed that CRM1 is a predictive biomarker for poor overall survival in LC patients, and that the evaluation of the clinical pTNM staging system of the tumor and CRM1 expression together may provide additional prognostic information. Moreover, inhibition of CRM1 expression may be a new therapeutic strategy for LC. Furthermore, prospective large-scale studies are needed to explore the true prognostic role of elevated CRM1 expression in laryngeal squamous cell carcinoma.

The aim of the study by Luo M.S. et al. [11] was to develop an autophagy-related model to predict the prognosis of patients with LC. Autophagy, a major cause of cancer-related death, is correlated with the pathogenesis of various diseases including cancers. Our colleagues analyzed the correlation between expression profiles of autophagy-related genes (ARGs) and clinical outcomes in 111 LC patients from TCGA. Afterward, gene functional enrichment analyses of gene ontology and Kyoto Encyclopedia of Genes and Genomes were performed to find the major biological attributes. Univariate Cox regression analyses and multivariate Cox regression analyses were performed to screen ARGs whose expression profiles were significantly associated with LC patients overall survival (OS). Furthermore, to provide the doctors and patients with a quantitative method to perform an individualized survival prediction, we constructed a prognostic nomogram. Thirty eight differentially expressed ARGs were screened out in LC patients through the TCGA database. Related functional enrichments may act as tumor-suppressive roles in the tumorigenesis of LC. Subsequently, 4 key prognostic ARGs (IKBKB, ST13, TSC2, and MAP2K7) were identified from all ARGs by the Cox regression model, which significantly correlated with OS in LC. Furthermore, the risk score was constructed, which significantly divided laryngeal cancer patients into high- and low-risk groups. Integrated with clinical characteristics, gender, N and the risk score are very likely associated with patients OS. A prognostic nomogram of ARGs was constructed using the Cox regression model. As the researchers note this study could provide a valuable prognostic model for predicting the prognosis of LC patients and a new understanding of autophagy in LC. A novel autophagy-related model and a predictive nomogram were conducted to robustly estimate LC patients survival.

Now, regarding this pathology in our country at the republican level. The incidence of LC in the Republic of Kazakhstan in 2023 was 2.2 per 100 thousand population with an increase rate of 15.5% compared to the previous year (1.9 in 2022), which in absolute numbers amounted to 436 people (370 cases a year earlier), second only to prostate cancer (16.7%). The proportion of cases diagnosed for the first time in life, recorded by oncology organizations, was 1.2% (1.1% in 2022). At the same time, 384 men fell ill (the proportion is 2.4%, 13th rank place), women - 52 (the proportion is 0.2%, 22nd rank place), which clearly shows the gender difference in the incidence of this pathology with a pronounced predominance of the male population [12].

The LC level above the national average was established in 9 regions of the country: North Kazakhstan - 5.8 (the maximum indicator); Pavlodar - 3.8; Kostanay - 3.6; East Kazakhstan - 3.4; Abay - 3.3; Karaganda - 3.0; Akmola and Atyrau - 2.9; Mangistau - 2.6. This indicator is below the national average in 11 regions: Turkestan - 0.6 (the lowest level); the city of Astana - 1.0; Kyzylorda - 1.2; the city of Shymkent - 1.5; Ulytau and Almaty - 1.8; West Kazakhstan and Zhambyl - 1.9; Aktobe and Zhetysu regions and the city of Almaty - 2.1 per 100 thousand population. Mortality from this pathology was 0.8 per 100 thousand population, the same as a year earlier. The regions where the mortality rate from LC is above the average in the republic include: Abay - 2.5 (maximum level); North Kazakhstan - 1.9; Pavlodar - 1.6; Mangistau and Karaganda - 1.2; Zhetysu - 1.0; Aktobe - 0.9. Akmola, East Kazakhstan, Kostanay regions and the city of Almaty are on par with the national average. The lowest rates were noted in Ulytau - 0.0; Turkestan - 0.1; West Kazakhstan and the city of Shymkent - 0.3; Kyzylorda - 0.5; Atyrau and the city of Astana - 0.6; Zhambyl and Almaty - 0.7 regions per 100 thousand people [12].

One-year lethality was 19.2%, taking the 13th place among all nosological forms of malignant neoplasms. At the same time, the ratio between one-year lethality and neglect (stage IV) was 1.6. At the same time, we recall that the farthest from "1" is the worst ratio between the indicators of one-year lethality and neglect.

Next, regarding preventive examinations. It should be noted that during large-scale preventive examinations of the population in 2023, significantly more patients with malignant neoplasms were actively identified than in 2022. This is 25,193 patients versus 23,623 patients identified in 2022, i.e. +6.6%. This is due to the further abatement of the epidemiological trouble with coronavirus and the increased availability of preventive care for the population. The proportion of patients identified during routine examinations increased from 62.0% to 62.4% of the total number of patients identified per year. As for LC, the early detection of this pathology during preventive examinations increased significantly - from 50.6 to 60.9%. The number of newly identified patients with LC registered with oncology organizations amounted to 425 patients (365 patients in 2022). At the same time, the absolute number of patients with LC identified during medical examinations was 274 people (231 a year earlier), and the proportion was 64.5% and 63.3%, respectively. 167 people out of 274 are patients with stages I and II (in 2022 - 117 patients out of 231). The proportion of patients with LC detected at early stages, as indicated above, was 60.9% against 50.6% a year earlier.

Of course, when analyzing the epidemiological situation, early diagnosis indicators are very important issues.

The regions where the proportion of patients with early stage I of the pathology in question is above the national average (16.5% - 14th rank) include the following regions: the city of Almaty - 34.8% (the best indicator); Abay and Kyzylorda - 30.0%; West Kazakhstan and the city of Astana - 23.1%; North Kazakhstan - 22.6%; Karaganda - 18.8%; Akmola - 18.2%. The lowest rates of early diagnosis were recorded in the Ulytau region (not a single patient with stage I of the disease - 0.0%). Next come: Mangistau - 5.3%; the city of Shymkent - 5.6%; Kostanay - 6.7%; Pavlodar, Zhetysu and Almaty - 7.1%; Atyrau - 10.0%; Zhambyl - 13.0%; East Kazakhstan - 14.3%; Aktobe - 15.0% and Turkestan - 15.4% of the country's regions [12].

It should be noted that every second patient with LC is detected in the early (I-II) stages of this pathology (51.1%). However, the situation with this indicator is deplorable in the Ulytau region - there is not a single patient detected in the early stages of the disease. The regions where the proportion of patients with LC detected at stages I-II is above the national average include the following regions. The best indicator is in the city of Astana - 76.9%. Then follow: Pavlodar - 75.0%; West Kazakhstan - 69.2%; North Kazakhstan - 67.7%; Zhambyl - 65.2%; Aktobe - 65.0% regions and the city of Almaty - 63.0%. Low rates of early diagnosis were recorded in Ulytau - 0.0% (the worst result in the country); Turkestan - 15.4%; Almaty - 21.4%; the city of Shymkent - 22.2%; Zhetysu - 35.7%; Mangistau - 42.1%; East Kazakhstan - 42.9%; Atyrau - 45.0%; Kostanay - 46.7%; Abay, Akmola, Karaganda and Kyzylorda - 50.0% regions [12].

As is clearly seen from the above data, there is a very large spread in early diagnostics rates across the country, from very good to dismal. Of course, it is necessary to take into account migration processes and other factors that affect early diagnostics rates, but nevertheless, the results obtained give reason not to stop there, both for oncologists and otolaryngologists, general practitioners, since improving early diagnostics rates of malignant tumors, as one of the main postulates and one of the main tasks of medicine in general, continues to be relevant today. The proportion of stage IV LC was 9.4%. At the same time, as mentioned above, the proportion of patients with this nosological form of malignant neoplasms detected at stages I-II was 51.1% (stage I - 16.5%, stage II - 34.6%), which indicates that the largest number of patients with LC was detected at locally advanced with loco-regional damage - stage III of the disease. This stage was 39.5%, i.e. almost two patients out of every five, and we know what aggressive, often complex treatment is used with such a spread of the oncological process and what a disappointing prognosis is for these patients. As for the average national indicator of the proportion of stage IV (9.4%), against this background, West Kazakhstan, Mangistau, Turkestan regions and three megalopolises - the cities of Astana, Almaty, Shymkent stand out, where not a single patient was detected in the terminal stage - 0.0%. Then come: Almaty - 3.6%; Aktobe - 5.0%; North Kazakhstan - 6.5%; Zhetysu and Pavlodar - 7.1%; Zhambyl - 8.7%; Kyzylorda - 10.0%; Kostanay - 13.3%; East Kazakhstan - 14.3%; Atyrau - 20.0%; Akmola - 22.7% regions. This list is closed by three regions, where every fourth patient was detected in the incurable stage of the disease with the worst indicator of 25.0% - Abay, Karaganda and Ulytau regions [12].

The morphological verification rate of LC in the country was 98.8%, second only to non-melanoma skin cancer (99.6%), breast cancer (99.4%) and lip cancer (99.1%) in the first three positions. At the same time, in the Pavlodar region, the morphological verification rate was 92.9%, in Akmola - 95.5%, in Almaty - 96.4%. In other regions, the disease verification rate was 100%.

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

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

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

At the end of 2023, the absolute number of LC patients who completed specialized treatment was 247 people, continuing treatment - 135 patients. The following results were obtained in percentage terms by methods and types of treatment. Only 12.6% of patients received surgical treatment, only radiation - 19.4%, only drug treatment - 8.9%, combined - 26.7%, complex - 21.5% and chemo-radiation - 10.1%.

Further, regarding the five-year survival of patients. As for LC, at the end of 2023, 2032 people were registered for dispensary care, or 10.2 per 100 thousand of the population. At the end of 2022 - 1899 patients or 9.7 per 100 thousand of the population, respectively.

At the same time, the mortality rate of the observed contingents in 2023 decreased compared to the previous year and amounted to 7.6% in 2023 (8.6% in 2022).

The five-year survival rate of patients with LC was 52.2% in 2023 and 53.2% in 2022 [12].

Summarizing the above, we can conclude that LC, despite not having the highest place in terms of incidence among all existing malignant tumors of other localizations, deserves close attention from specialized specialists. At the same time, taking into account a number of factors, the indicators of early diagnostics do not allow oncologists to "sleep peacefully", since the locally advanced stage III, which prevails over all stages, in addition to being widespread, gives a large number of complications due to the location of vital centers and tissue structures near the primary focus and locoregional metastases. The veiled and variable symptoms, its similarity with various non-core processes, leads to the neglect of the disease. All this requires both oncologists and, first of all, primary health care workers and, of course, otolaryngologists to increase the level of cancer alertness, inform the population about early symptoms that may indicate this pathology or the onset of proliferative changes and conduct high-tech diagnostic measures, including for the purpose of differential diagnosis and, as a result, timely treatment. People from the risk group are recommended to visit specialized specialists annually and, if necessary, undergo an examination.

An epidemiological assessment of the situation with LC in our country suggests that there are sometimes significant differences in the regions not only in incidence rates, but also in the state of early diagnosis and mortality from this disease. In connection with the above, this pathology continues to be a serious problem in modern clinical oncology.

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Diet Therapy and Lifestyle Modification in Patients with Chronic Kidney Disease

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Abstract
This article discusses the importance of diet therapy and lifestyle modification in patients with chronic kidney disease (CKD). Modern approaches to dietary management, nutritional characteristics, the role of physical activity, and patient education strategies are reviewed. Evidence-based recommendations are presented in accordance with international guidelines (KDIGO 2023, EURECA-m). Diet therapy and lifestyle modification help preserve renal function in the long term, prevent complications, and improve patients' quality of life.
Keywords: chronic kidney disease, diet therapy, lifestyle modification, renal failure, nutrition, physical activity.

Introduction

Chronic kidney disease (CKD) is a pathological condition characterized by structural or functional impairment of the kidneys lasting for more than three months. In recent years, CKD has become a major global health problem. According to the World Health Organization (WHO), approximately 10–12% of the world's population is affected by CKD of varying severity. To slow disease progression and prevent complications, diet therapy and lifestyle correction play a key role.

Main Part

1. Principles of Diet Therapy

The main goal of diet therapy in CKD is to reduce the formation of nitrogenous waste, maintain electrolyte balance, and decrease the metabolic burden on the kidneys.

Basic principles:

- Protein restriction: 0.6–0.8 g/kg per day in early stages; 0.3–0.4 g/kg per day in advanced stages.
- Salt restriction: 3–5 g per day (2–3 g for patients with hypertension).
- Fluid intake: equal to previous day's diuresis + 500 ml.
- Monitoring potassium and phosphorus levels: depending on serum values; potassium-rich foods (bananas, oranges, potatoes) should be limited in advanced stages.

2. Recommended Foods and Portions

- Easily digestible proteins: chicken, fish, egg whites (100–120 g/day).
- Carbohydrates: rice, oats, buckwheat, dried bread products (200–300 g/day).
- Fats: vegetable oils, small amounts of butter (30–40 g/day).
- Vegetables and fruits: apples, apricots, carrots, cucumbers, pumpkin (depending on potassium level, 300–500 g/day).
- Beverages: weak tea, rosehip infusion, non-carbonated water (1–1.5 L/day).

Foods to avoid: salted or pickled foods, sausages, canned products, rich broths, chocolate, coffee, and alcohol.

3. Lifestyle Modification

Lifestyle modification is an essential part of CKD management.

- Physical activity: at least 150 minutes of moderate exercise per week (walking, swimming, light gymnastics).
- Weight control: body mass index (BMI) should be maintained between 20–25 kg/m².

- Avoiding smoking and alcohol: nicotine decreases glomerular filtration rate, while alcohol causes dehydration.
- Sleep and stress management: sufficient sleep (7–8 hours) and relaxation techniques (e.g., meditation, breathing exercises) help reduce sympathetic nervous system overactivity.

4. Patient Education and Self-Monitoring

Educational programs for patients (patient education) help slow CKD progression. Patients should monitor blood pressure, urine output, and body weight daily, and keep a food diary. According to KDIGO (2023), such interventions can reduce the rate of kidney function decline by 25–30%.

5. Restricted Foods

- Salted, smoked, and marinated foods;
- Meat and mushroom broths;
- Sausages, canned foods, fast food;
- Bananas, dates, dried apricots, potatoes (high potassium content);
- Carbonated drinks, coffee, alcohol.

6. Example of a Daily Menu

Time	Menu
Breakfast	Oatmeal, boiled egg, weak tea
Mid-morning snack	Apple or kefir
Lunch	Vegetable soup, boiled chicken, rice, salad
Afternoon snack	Compote and unsalted bread
Dinner	Fish (100 g), stewed vegetables (200 g)
Before bedtime	Kefir or cottage cheese

7. Lifestyle Modification

- Regular blood pressure monitoring: target level <130/80 mmHg.
- Physical activity: daily 30–40 minutes of walking and breathing exercises.
- Avoiding smoking and alcohol.
- Sleep and stress management: 7–8 hours of sleep, maintaining emotional stability.
- Medical supervision: monthly blood and urine tests are recommended.

8. Modern Approaches

Recent studies have shown that keto-analog supplements, soy protein, omega-3 fatty acids, and active forms of vitamin D exhibit nephroprotective effects.

Moreover, individualized nutritional therapy (a dietary program tailored to the patient's metabolic profile) is being actively implemented in global clinical practice.

Conclusion

Diet therapy and lifestyle modification are the cornerstone of evidence-based management in patients with chronic kidney disease. Proper nutrition reduces metabolic stress on the kidneys, while a healthy lifestyle increases overall physiological resilience. Modern strategies emphasize balanced intake of protein, salt, fluids, and electrolytes. Additionally, regular physical activity, psychological stability, and avoidance of harmful habits significantly improve quality of life.

Comprehensive management, including patient education and self-monitoring, can slow CKD progression and achieve nephroprotective outcomes.

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Assesment of Medical Laboratory Staff Awareness and Safety Culture within the Occupational Health Management System

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Abstract. This study aims to assess the awareness and safety culture of medical laboratory staff within the framework of occupational health management systems. The research is based on a mixed-methods approach, combining quantitative and qualitative analyses. The results indicate that, although laboratory personnel demonstrate high theoretical knowledge regarding occupational safety, practical behavior and integration of safety culture into daily work remain insufficient. Management involvement, quality of training, and staff motivation significantly determine the effectiveness of occupational health management systems. The conclusions and recommendations focus on strengthening safety culture so that occupational safety becomes a behavioral value rather than merely an administrative requirement.
Key words: Medical laboratory staff, Occupational health management, Safety culture, Awareness, Training, Risk management.

Introduction

Ensuring a safe working environment and enhancing the effectiveness of occupational health management remains one of the key challenges in modern medical laboratories. Laboratory personnel are exposed daily to various physical, chemical, biological, and psychosocial hazards, which requires both strict compliance with regulations and heightened individual awareness and responsibility. Safety culture is not achieved solely through the existence of rules; it necessitates staff's internalized attitudes towards safety and systematic support for safe practices at the organizational level.

In Georgia, recent years have seen increased attention to occupational safety and health, yet the specificity of medical laboratories imposes additional requirements on management. The diversity of biological, chemical, and mechanical risks demands not only formal training but also continuous self-assessment and monitoring of behavioral changes.

The necessity of this study arises from the fact that, despite the implementation of safety systems, the awareness and attitudes of staff often determine the actual effectiveness of an organization's safety policy.

Objective and methodology

The objective of this study is to evaluate the level of awareness and the formation of safety culture among medical laboratory staff within the context of occupational health management systems.

A mixed-methods methodology was applied, including quantitative questionnaires and qualitative interviews. Data were analyzed statistically, while interviews with managers allowed for the interpretation of results and identification of systemic issues.

Results and discussion

The study revealed that 82% of laboratory staff correctly answered general questions related to occupational risks, indicating a high level of awareness. However, only 37% knew specific procedures directly relevant to their daily activities, highlighting the gap between theoretical knowledge and practical behavior.

Compliance with safety instructions was positive: 75% reported always following occupational safety rules, and 22% reported frequent compliance. Interviews indicated that adherence is sometimes perceived as an administrative obligation rather than an internalized responsibility.

Participation in training was high, with 98% of staff attending safety-related sessions in the past year; however, none had undergone knowledge testing. This suggests formalized training that does not necessarily lead to practical behavioral change.

Trust in the organization was high: 92% of respondents felt their organization genuinely cared for their health, while 8% believed this care was more administrative than practical.

Management involvement emerged as a critical factor. Ninety percent of managers confirmed that staff awareness and motivation largely depend on leadership behavior. Yet, there were no formal incentives, such as recognition or material rewards for safe behavior, limiting the sustainability of the safety culture.

The findings indicate that effective occupational health management in medical laboratories cannot be achieved through documentation alone. Safety culture development begins with each employee's awareness, supported by strategic management involvement and behavioral modeling.

Conclusion

The study concludes that medical laboratory staff demonstrate high awareness of occupational safety, yet safe behavioral practices are not fully established. Strengthening organizational policies, systematizing training, and evaluating outcomes are necessary.

Active management participation is crucial for maintaining a sustainable safety culture. When leaders exemplify responsibility for safety through their own behavior, staff perceive safety as a shared value rather than a formal requirement.

Based on the findings, several recommendations were proposed:

- Implement awareness programs using visual materials and concise instructions.
- Conduct annual knowledge assessments through practical exercises and testing.
- Involve managers in training sessions alongside staff to foster a sense of unity.
- Establish an internal motivation system to encourage safe behavior.

High awareness, systematic training, and management engagement form the foundation of a robust safety culture, which ultimately impacts employee health, service quality, and overall organizational resilience.

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Physical and Mathematical Sciences

УДК 372.853

ИССЛЕДОВАНИЕ ЭЛЕКТРОФИЗИЧЕСКИХ СВОЙСТВ ТВЁРДЫХ ТЕЛ С ЛАБОРАТОРНЫМИ ЭКСПЕРИМЕНТАМИ

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Аннотация: В статье представлены методы организации лабораторного эксперимента по исследованию электрофизических свойств твёрдых тел студентами, учащимися школы с обоснованием фактов при которых их исследования позволяют понять природу процессов переноса зарядов, механизмы проводимости и закономерности изменения свойств при изменении температуры, структуры или химического состава материала.

Ключевые слова: эксперимент, электрофизические, эффект Зеебека, приборы, перенос,термоэлектричество, диэлектрики ,полупроводники, зона.

Введение

Современная наука о твёрдом теле играет ключевую роль в развитии электроники, энергетики, материаловедения и нанотехнологий. Электрофизические свойства твёрдых тел — это совокупность характеристик, определяющих поведение вещества под действием электрического поля, включая электропроводность, диэлектрическую проницаемость, термоэлектрические эффекты и другие параметры [1].

Их исследование позволяет понять природу процессов переноса зарядов, механизмы проводимости и закономерности изменения свойств при изменении температуры, структуры или химического состава материала.

Лабораторные эксперименты являются неотъемлемой частью этого изучения, поскольку они позволяют на практике определить зависимости физических параметров и подтвердить теоретические модели. Основные электрофизические свойства твёрдых тел:

- электропроводность (σ)— способность материала проводить электрический ток. Различают: металлическую проводимость(перенос электронов); полупроводниковую проводимость (зависимость от температуры и концентрации носителей);
- ионную проводимость (в электролитах и ионных кристаллах).
- диэлектрические свойства — способность вещества поляризоваться в электрическом поле, характеризуемая диэлектрической проницаемостью ε.
- термоэлектрические свойства — зависимость электрических явлений от температуры, включая эффект Зеебека, эффект Пельтье и эффект Томсона.

- фотоэлектрические и магнитоэлектрические свойства — изменение электропроводности под действием света или магнитного поля.

Основная часть.

Теоретические основы электропроводности. Согласно зонной теории твердого тела, электроны в кристалле занимают энергетические зоны, разделенные запрещёнными промежутками — энергетическими щелями.

Тип проводимости определяется шириной запрещённой зоны:

- у металлов она отсутствует или перекрывается;
- у полупроводников — составляет ~0,1–3 эВ;
- у диэлектриков — более 3 эВ.

При повышении температуры часть электронов в полупроводниках получает энергию, достаточную для перехода в зону проводимости, что объясняет рост их проводимости с нагревом (в отличие от металлов) К основным электрофизическим характеристикам относятся [2].

Методы исследования электрофизических свойств. Измерение электрофизических параметров требует точных лабораторных методик. Основные методы включают: Измерение электропроводности. Наиболее распространённые способы:

- четырёхзондовый метод— исключает влияние контактного сопротивления;
- метод двух электродов — используется для измерения сопротивления плёнок и кристаллов;
- метод Ван-дер-Пау — универсален для образцов произвольной формы.

Измерение температурной зависимости сопротивления. Проводится при различных температурах в термостате. По графику зависимости ln(σ) от 1/T определяют ширину запрещённой зоны Eg и тип проводимости.

Измерение эффекта Зеебека. Используется для изучения термоэлектрических свойств. На концах образца создаётся температурная разность ΔT, и измеряется возникающая термо-ЭДС. По величине и знаку коэффициента Зеебека определяют тип носителей заряда (электроны или дырки).Измерение диэлектрической проницаемости.Проводится на переменном токе с помощью мостовых схем. Измеряется ёмкость конденсатора с образцом в качестве диэлектрика.

Примеры лабораторных экспериментов. Эксперимент 1. Измерение температурной зависимости электропроводности полупроводника.

Цель: определить характер зависимости σ(T) и тип проводимости.

Оборудование: источник питания, вольтметр, амперметр, термостат, образец полупроводника [3].

Ход эксперимента: измеряются ток и напряжение при разных температурах, рассчитывается удельная проводимость, строится график ln(σ)–1/T.

Результат: из наклона прямой определяется ширина запрещённой зоны Eg, а характер зависимости указывает на собственную или примесную проводимость.

Эксперимент 2. Исследование эффекта Зеебека.

Цель: определить знак и величину термоэлектрической ЭДС.

Ход: на концах полупроводникового стержня создаётся температурная разность, измеряется ЭДС и температура, вычисляется коэффициент $\alpha = \Delta U/\Delta T$.

Вывод: знак α показывает тип носителей — отрицательный для электронного типа, положительный для дырочного.

Эксперимент 3. Измерение диэлектрической проницаемости

Цель: изучить частотную и температурную зависимость ε.

Методика: образец помещают в конденсатор, измеряют ёмкость при различных частотах и температурах.

Результат: наблюдается спад ε с ростом частоты, характерный для дипольной поляризации [4].
5. Практическое значение исследований
Изучение электрофизических свойств твёрдых тел имеет большое прикладное значение:
- создание новых полупроводниковых приборов (диодов, транзисторов, термодатчиков);
- разработка сенсорных систем на основе оксидов металлов;
- улучшение термоэлектрических генераторов и холодильных элементов;
- изучение ионики и твёрдых электролитов для топливных элементов;
- контроль структуры и чистоты материалов через измерение их электрических характеристик.

6. Пример: исследования тонких плёнок VO_2.Особое внимание уделяется оксидам переходных металлов, например, диоксиду ванадия (VO_2), проявляющему переход металл–полупроводник при температуре около 68 °C. При нагреве VO_2 резистивность падает на несколько порядков, что делает его перспективным материалом для интеллектуальных окон, датчиков температуры и элементной базы нейроморфных систем [5].

Лабораторные измерения вольт-амперных характеристик таких плёнок позволяют построить модели электронных переходов и оценить параметры активации.

Выводы

Исследование электрофизических свойств твёрдых тел — одно из фундаментальных направлений физики и материаловедения.
Лабораторные эксперименты позволяют не только подтвердить теоретические закономерности, но и выявить новые явления, связанные с микроструктурой, дефектами и фазовыми переходами.

Результаты таких исследований находят широкое применение в разработке новых электронных, сенсорных и энергетических устройств, что делает эту область знаний ключевой для современной науки и технологий.

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HyperTime: A New Paradigm of Cosmology and Quantum Physics

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Abstract
We propose a generalized framework in which time itself is a physical field possessing density, gradients, and an intrinsic ability to evolve. Rather than an external coordinate, time becomes the origin of matter, energy, and the structure of space. We introduce a hyper-temporal parameter Θ to describe the large-scale evolution of temporal density, leading to a five-dimensional action with a $\kappa(\partial \ln \tau / \partial \Theta)^2$ term that explains dark matter and dark energy effects. Our formulation reproduces Newtonian gravity and general relativity as limiting cases and unifies them with quantum phenomena. The HyperTime approach interprets gravity and inertia as manifestations of temporal gradients, offering a coherent physical and philosophical basis for the evolution of the Universe as a process in time itself.
Keywords: time; temporal density; HyperTime; quantum of time; vortex structure; temporal gradient; dark matter; dark energy; causality; gravity; cosmological expansion; evolution of time; physical substance.

I. Introduction

Modern physics treats time as a coordinate of spacetime, inseparable from the three spatial dimensions. This approach, while fruitful within the frameworks of relativity and quantum theory, reduces time to a passive parameter — a quantity that measures change but does not itself participate in it. The present work proposes a fundamentally different view: time is regarded as an active and self-organising substance, capable of interacting with matter and energy and forming the structure of the Universe.

Within this framework, the evolution of time itself becomes a physical process. Local temporal gradients generate energy and motion, while large-scale variations of temporal density define the dynamics of cosmic expansion. The introduction of the hyper-temporal parameter Θ allows one to describe the evolution of temporal density $\tau(x, t)$ as an extended process that encompasses both microscopic and cosmological scales.

The objective of this theory is to create a coherent model in which physical laws emerge as manifestations of the dynamics of time — its flow, curvature, and self-organisation — rather than as properties of an external geometric background.

rom which stable structures such as particles and fields emerge. In regions where $\tau^+ > \tau^-$, time expands and generates motion; where $\tau^+ < \tau^-$, time condenses and forms stable configurations of energy. The present moment corresponds to the dynamic equilibrium surface between these two opposing flows.

II. The Ontology of Time and Temporal Density

II.1. Time as a Physical Substance

Time is not merely a measure of processes — it is their very foundation. It possesses internal structure, density, and dynamics, which together define the material world. In the conventional physical picture, space and time form a passive arena where matter evolves; in the present concept, matter and energy are derivative states of the temporal field itself.

Let $\tau(x, t)$ denote the **temporal density** — a scalar field that quantifies the amount of time per unit volume. Variations in τ generate measurable effects such as forces, curvature, and energy gradients. In this sense, $\tau(x, t)$ plays the same ontological role for time that $\rho(x, t)$ plays for matter in fluid dynamics.

II.2. Temporal Field and Its Gradient

The spatial variation of τ determines the **temporal potential**

$$\Phi_t = c^2 \ln (\tau / \tau_0)$$

and the corresponding **temporal force** acting on a body of mass m:

$$\mathbf{F_t} = - m c^2 \nabla \ln \tau.$$

This force acts in the direction of decreasing temporal density, producing effects that are interpreted in the conventional framework as gravity or acceleration. In static configurations, $\nabla\tau = 0$ and physical equilibrium is maintained; in dynamic systems, gradients of τ cause local flows of time, energy, and momentum.

II.3. The Dual Flow of Time

Time exhibits a dual structure consisting of two complementary components: the **forward flow** τ^+ and the **reverse flow** τ^-.

Their interaction gives rise to temporal vortices, from which stable structures such as particles and fields emerge.

In regions where $\tau^+ > \tau^-$, time expands and generates motion; where $\tau^+ < \tau^-$, time condenses and forms stable configurations of energy.

The present moment corresponds to the dynamic equilibrium surface between these two opposing flows.

II.4. Ontological Implications

Such a conception leads to a profound shift in the understanding of reality. Matter, fields, and geometry appear as emergent manifestations of the temporal continuum. Space is no longer an independent container but a derivative metric of temporal interactions. The fundamental quantity of being is not matter, nor even energy, but **time itself**, endowed with physical attributes.

III. Mathematical Model of the Temporal Field

III.1. Fundamental Equation

The dynamics of the temporal density $\tau(x, t)$ are governed by a differential equation analogous to those describing wave or diffusion processes in continuous media. In the simplest isotropic case:

$$\nabla^2\tau = (\beta / \alpha) \cdot \tau.$$

Here α characterises the stiffness of the temporal field (its resistance to deformation), while β defines its intrinsic self-interaction or "mass term". The ratio β / α determines the scale of spatial inhomogeneities of τ and, consequently, the effective curvature of time.

III.2. Temporal Pressure and Energy Density

Temporal gradients generate a scalar quantity — the **temporal pressure** — defined as:

$$p_t = ½ \rho_t c^2 (\nabla \ln \tau)^2,$$

where $\rho_t = \partial\tau / \partial t$ is the rate of change of temporal density. Temporal pressure acts as an energy reservoir that governs the exchange between local and global flows of time, establishing the energetic balance of the system.

III.3. Variational Principle and Temporal Lagrangian

The field τ obeys the principle of stationary action:

$$S = \int d^4x \sqrt{-g} \, [½ \alpha (\nabla \ln \tau)^2 - \beta \tau^2].$$

Variation of this action with respect to τ yields the field equation:

$$\nabla^2 \ln \tau = (\beta / \alpha) \cdot (\ln \tau - \ln \tau_0).$$

This equation links the curvature of time (the Laplacian of $\ln \tau$) with its local deviation from the reference level τ_0.

When written in the static limit and under the weak-field approximation, the equation reduces to the classical Poisson equation, ensuring full consistency with Newtonian gravity.

III.3.1. Newtonian Limit of TTU

In the Newtonian limit, the temporal potential is introduced as:

$$\Phi_t = c^2 \ln(\tau / \tau_0),$$

and the force acting on a test mass is:

$$\mathbf{F}_t = -m \nabla\Phi_t.$$

Variation of the action, with coupling between τ and matter density ρ, gives:

$$\nabla^2 \Phi_t = 4\pi G \rho.$$

Thus, in the static limit, the temporal theory reproduces the classical law of universal gravitation:

$$\mathbf{F}_t = -G M m r^{-2} \hat{r},$$

and the TTU framework exactly matches Newtonian mechanics for weak fields.

IV. Five-Dimensional Lagrangian and HyperTemporal Dynamics

IV.1. Extension of the Temporal Field

The dynamics of the temporal density $\tau(x, t)$ are extended by introducing the hyper-temporal parameter Θ, which describes the self-evolution of time on cosmological scales. Thus, the field becomes a function of five coordinates:

$$\tau = \tau(x^\mu, \Theta), \quad \text{where} \quad x^\mu = (ct, x, y, z).$$

The parameter Θ does not replace t but complements it, representing the evolution of the temporal continuum itself. While t measures the local flow of processes, Θ traces the long-term transformation of the temporal structure of the Universe.

IV.2. Five-Dimensional Action

The generalised action incorporating the hyper-temporal dimension is expressed as:

$$S = \int d^4x\, d\Theta\, \sqrt{(-g)}\, [\, \tfrac{1}{2} \alpha (\nabla \ln \tau)^2 - \beta \tau^2 + \kappa (\partial \ln \tau / \partial\Theta)^2 \,].$$

The first term describes local spatial gradients of time, the second represents its intrinsic self-energy, and the third term (with coefficient κ) accounts for the rate of temporal evolution along the hyper-temporal axis. The parameter κ thus serves as a measure of the "stiffness" of HyperTime — the energy cost associated with the restructuring of the temporal field over Θ.

IV.2.1. GR Limit and Effective Metric

In the limit of slow Θ-variation ($\partial\tau / \partial\Theta \to 0$), the 5D theory reduces to an effective four-dimensional geometry with a conformal metric:

$$g^{eff}_{\mu\nu} = \exp(2\Phi_t / c^2)\, \eta_{\mu\nu}, \quad \text{where} \quad \Phi_t = c^2 \ln \tau.$$

Choosing $\alpha = c^4 / (8\pi G)$ ensures consistency with Einstein's equations in the weak-field regime, since:

$$g^{eff}_{00} \approx 1 + 2\Phi_t / c^2,$$

which is identical to the standard general-relativistic expression for gravitational potential. Thus, General Relativity emerges as the geometric limit of the temporal field theory.

IV.3. HyperTemporal Wave Equation

Variation of the five-dimensional action yields the generalised field equation:

$$\Box\, \Phi_t = \gamma T + \kappa\, \partial^2 \ln \tau / \partial\Theta^2,$$

where T denotes the trace of the stress–energy tensor of matter, and γ represents the coupling constant linking matter to temporal curvature. The last term describes the propagation of temporal perturbations along the hyper-temporal dimension. When $\kappa \to 0$, the theory reduces to its four-dimensional (TTU-Field) form.

IV.4. Physical Interpretation of Θ

The parameter Θ represents the internal evolutionary coordinate of time — a variable that unfolds slowly relative to physical time t. It embodies the cumulative transformation of temporal density across the Universe. Small variations in Θ correspond to local physical evolution, while large variations govern cosmological expansion and the drift of fundamental constants. Hence, Θ operates as a meta-temporal scale parameter, unifying microscopic and cosmological dynamics within a single evolutionary continuum.

V. The Role of HyperTime and the Relationship Between t and Θ

V.1. HyperTime as a Parameter of Self-Consistent Evolution

The hyper-temporal parameter Θ represents the degree of self-organisation of the temporal field. It changes slowly compared with physical time t and reflects the long-term restructuring of temporal density $\tau(x, t)$. At the local level, the evolution of τ is described by $\partial\tau/\partial t$, whereas at the cosmological level it is governed by $\partial\tau/\partial\Theta$. Thus, Θ acts as a "meta-time" that measures the development of time itself.

The empirical correlation between cosmological redshift z and temporal density is expressed as

$$1 + z = \tau_{obs} / \tau_{emit},$$

which implies that the expansion of the Universe corresponds to a progressive change in the density of time rather than to the stretching of spatial metrics.

V.1.1. Relationship between t and Θ

The coordinates t and Θ describe two distinct but related aspects of temporal evolution. Geometrically they are independent variables of the five-dimensional manifold (x^μ, Θ),

$$ds^2 = g_{\mu\nu}\, dx^\mu\, dx^\nu + \sigma^2\, d\Theta^2,$$

where σ^2 defines the metric scale of the hyper-temporal dimension.

Dynamically, however, they are connected by the evolution law

$$d\Theta/dt = f(\nabla\tau, S, \rho),$$

which specifies the rate of hyper-temporal transformation as a function of local temporal gradients, entropy S, and energy density ρ.

In ordinary conditions, $|\partial\tau/\partial\Theta| \ll |\partial\tau/\partial t|$, and Θ may be treated as quasi-constant, reproducing the conventional physics of four-dimensional spacetime.

In cosmological epochs, by contrast, $\partial\tau/\partial\Theta$ becomes significant, producing large-scale effects such as cosmic acceleration and the apparent dark-energy phenomenon.

Consequently, t serves as the local projection of temporal flow, while Θ acts as the global evolutionary coordinate, describing the slow unfolding of the temporal substrate of the Universe.

VI. HyperTemporal Information Transfer and Connection to the Standard Model

VI.3. Mechanism of Information Transmission through HyperTime

HyperTime Θ functions as a universal channel linking processes across scales.

Information is transmitted through the gradients ∇Θ, which connect the microscopic vortex dynamics of the temporal field (τ^+, τ^-) with the macroscopic evolution of the Universe.

At the quantum level, the exchange of energy and momentum occurs through ∇τ — local oscillations of temporal density.

At the cosmological level, ∇Θ carries phase and structural information about the global state of the Universe.

Hence, quantum non-locality can be interpreted not as an instantaneous action at a distance but as coherence maintained through the hyper-temporal continuum.

Interactions separated in space remain correlated because they share a common temporal substrate whose evolution in Θ preserves informational synchrony.

VI.4. Connection to the Standard Model

The temporal field $\tau(x, t)$ functions as a universal substrate from which the known physical fields emerge as modes of its vortex excitations.

In the linear approximation, we define the four-potential

$$A_\mu = \partial_\mu \ln \tau.$$

The corresponding field tensor is then

$$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu,$$

and the Lagrangian term

$$\tfrac{1}{2}\alpha(\nabla \ln \tau)^2 \to \tfrac{1}{2}\alpha F_{\mu\nu}F^{\mu\nu},$$

which reproduces Maxwell's equations in the absence of sources.

When considering paired temporal flows τ^+ and τ^-, their self-consistent vortex interaction gives rise to the spinorial relation

$$\gamma^\mu \partial_\mu \psi = m\,\psi,$$

which coincides with the Dirac equation.

Here ψ denotes a localised vortex of time, and the mass *m* is set by the rigidity parameter β of the temporal field.

By extending the field to multiple components $\tau^a(x, \Theta)$ and introducing the covariant derivative

$$D_\mu = \partial_\mu + i g A_\mu^b T_b,$$

the framework naturally generates local SU(3) × SU(2) × U(1) invariance — the gauge structure of the Standard Model.

Consequently, electromagnetic, weak, and strong interactions can be interpreted as distinct topological modes of a single temporal field, while the hyper-temporal gradient ∇Θ couples these modes across scales, preserving coherence between quantum processes and cosmological evolution.

In this perspective, the Universe is a self-organising temporal medium, where matter, energy, and geometry arise as emergent manifestations of the dynamics of time itself.

VII. Cosmological Consequences and Observational Predictions

VII.1. Redshift and Temporal Expansion

In the framework of HyperTime, the cosmological redshift arises not from the stretching of space but from the gradual evolution of temporal density.

The ratio of observed to emitted frequencies is determined by the variation of τ between the emission and observation events:

$$1 + z = \tau_{obs} / \tau_{emit}.$$

An increase in τ corresponds to the slowing of time, which manifests as a redshift in the spectra of distant galaxies.

Thus, cosmic expansion can be interpreted as the continuous restructuring of the temporal continuum rather than as motion of matter through an expanding geometry.

This approach eliminates the need for ad hoc assumptions about "dark energy", replacing it with a measurable temporal process.

VII.2. Gravitational Potential and Dark Matter

Gradients of τ also give rise to apparent anomalies in galactic rotation curves.

In regions where ∇τ is not compensated by the local distribution of matter, additional centripetal acceleration emerges, phenomenologically indistinguishable from that caused by an invisible mass component.

Consequently, the phenomenon attributed to dark matter may instead reflect the inhomogeneous distribution of temporal density rather than the existence of unseen material.

This interpretation offers a natural unification of gravitational anomalies within the same theoretical framework that also accounts for cosmic acceleration.

VII.3. Temporal Curvature and Cosmological Constant

The term $\kappa(\partial \ln \tau / \partial\Theta)^2$ in the five-dimensional action acts as an effective cosmological constant.

Its magnitude depends on the rate of evolution of the temporal field along Θ.

In the early Universe, when $\partial\tau/\partial\Theta$ was large, this term dominated the dynamics, driving rapid temporal expansion — an analogue of inflation.

At later epochs, as the rate diminished, the Universe entered a quasi-stationary phase corresponding to the present epoch of slow acceleration.

Hence, the cosmological constant Λ emerges not as a fixed property of spacetime but as a dynamic manifestation of the hyper-temporal flow.

VII.4. Observational Tests

The predictions of the HyperTime framework can be tested through:

1. **Precision time-dilation measurements** in atomic clocks at different gravitational potentials or orbital velocities.
2. Deviations from general relativistic predictions would indicate residual $\nabla\Theta$ effects.
3. **Spectral analysis of distant quasars and galaxies**, comparing redshift–luminosity relations with models based on evolving $\tau(x, \Theta)$.
4. **Laboratory experiments** involving high-precision resonators or interferometers capable of detecting minute variations in the local temporal rate under controlled energy-density conditions.
5. **Cosmic microwave background anisotropies**, which may reveal imprints of early hyper-temporal turbulence analogous to acoustic oscillations in matter.

Collectively, these tests can confirm whether the Universe's large-scale behaviour is governed by the self-evolution of time rather than by the expansion of spatial metrics.

VIII. Philosophical and Conceptual Implications

VIII.1. From Geometry to Temporality

The HyperTime framework reverses the traditional ontological hierarchy of physics.

In the classical worldview, time and space are geometric conditions within which physical phenomena occur.

In the HyperTime paradigm, geometry itself becomes a derivative aspect of the dynamics of time. Spatial relations, curvature, and energy distributions are secondary expressions of variations in temporal density and phase.

Thus, the **metric of the Universe is not pre-given but continuously generated** by the evolving temporal field.

VIII.2. Causality and the Flow of Time

Within this conception, **causality** arises from the ordered propagation of temporal gradients rather than from the abstract notion of sequential events.

The arrow of time is determined by the direction of increasing entropy within the temporal field and by the monotonic growth of the hyper-temporal parameter Θ.

The causal structure of reality therefore coincides with the dynamics of time itself, making cause and flow inseparable aspects of one process.

This resolves the long-standing paradox between time symmetry in microscopic physics and the irreversible nature of macroscopic evolution:

microscopic reversibility corresponds to oscillations of τ around equilibrium, while macroscopic irreversibility arises from the global drift of Θ.

VIII.3. Matter, Energy, and Existence

If time is the primordial substance, then matter and energy are **states of temporal condensation**.

Energy corresponds to the intensity of temporal flow (the rate of change of τ), and mass represents its localised curvature.

Thus, $E = mc^2$ acquires a new interpretation: it expresses the equivalence between the flow rate and curvature of the same temporal substrate.

The existence of physical reality can therefore be viewed as the continuous transformation of time into form — an ongoing process of temporal differentiation.

VIII.4. Human Perception of Time

On the phenomenological level, the HyperTime model also provides a natural explanation for the subjective experience of time.

Conscious perception corresponds to localised coherence regions in the temporal field.

Memory traces reflect persistent vortex structures of τ, while anticipation or intention corresponds to projections along Θ.

In this way, psychological and physical time are not independent but aspects of a single temporal continuum experienced at different scales of organisation.

IX. Conclusions

The HyperTime framework represents a fundamental shift in the understanding of physical reality. It redefines time as a self-organising substance that possesses density, gradients, and the ability to evolve through the hyper-temporal parameter Θ.

Within this conception, matter, energy, and geometry are emergent properties of the temporal field τ(x, Θ), and all interactions arise from its spatial and hyper-temporal gradients.

At the microscopic level, the vortex dynamics of τ give rise to elementary particles and fields.

At the macroscopic level, variations of τ and Θ govern gravitational and cosmological phenomena.

The theory reproduces Newtonian and Einsteinian laws as limiting cases, while providing a unified explanation of dark matter, dark energy, and quantum non-locality.

The introduction of HyperTime enables a coherent description of the Universe as a **self-developing temporal continuum**, linking quantum processes, relativistic gravitation, and cosmological evolution through a single principle — the dynamics of time itself.

In this sense, the HyperTime model transcends the traditional dichotomy between space and matter, replacing it with a vision of the Universe as dynamic fabric of evolving temporality, where all structures and processes are manifestations of the continual transformation of time.

X. The Ontological Nature of HyperTime

Unlike conventional 5D theories that extend geometry by adding an extra spatial coordinate, the HyperTime framework redefines the nature of the manifold itself. The hyper-temporal parameter Θ is not another dimension of space but an axis of evolution for time itself — a meta-temporal reflection through which time gains structure, memory, and form. In this view, Θ represents not the fifth coordinate, but the first dimension of time seen in its full depth.

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Appendices

Appendix A. Dimensional and Physical Constants

The temporal theory introduces several fundamental constants that define the properties of the temporal field and its interactions.

Their dimensional consistency ensures the compatibility of the HyperTime formalism with established physical units.

Constant	Physical meaning	Dimension	Approximate scale
α	Rigidity of the temporal field (energy per unit gradient)	N ($kg \cdot m \cdot s^{-2}$)	$c^4 / (8\pi G)$
β	Self-interaction coefficient (temporal mass term)	$kg \cdot m^5 \cdot s^{-4}$	scale-dependent
κ	Hypertemporal stiffness (evolution rate along Θ)	$kg \cdot m^{-1}$	$\alpha\, \sigma^2 / c^2$
C_T	Temporal coupling constant (energy scale of interaction)	J	$\approx mc^2$ for unit source
τ	Density of time	$s \cdot m^{-3}$	variable

These constants determine the quantitative correspondence between the temporal field and observed gravitational or quantum effects.

Appendix B. Sensitivity Analysis

To estimate how observable effects depend on the parameters of the temporal field, the sensitivity of measurable quantities to variations in α, β, and κ can be evaluated using differential analysis:

$$S_p = \partial(\ln O) / \partial(\ln p),$$

where *O* denotes an observable (e.g., redshift, acceleration, energy density) and *p* represents a parameter of the model.

The sensitivity S_p indicates the degree to which small parameter variations influence measurable phenomena, allowing for experimental calibration of TTU predictions.

Numerical simulations show that variations in κ primarily affect cosmological-scale processes, while α and β determine the strength and localisation of temporal forces in gravitational and subatomic regimes.

Appendix C. Extended Equations and Numerical Framework

For computational modelling, the five-dimensional temporal equation is expressed as:

$$\partial^2\tau/\partial t^2 - c^2\nabla^2\tau + (\beta/\alpha)\tau = \kappa\, \partial^2\tau / \partial\Theta^2.$$

In the quasi-static approximation ($\partial^2\tau/\partial t^2 \approx 0$), this reduces to:

$$\nabla^2\tau = (\beta/\alpha)\tau - (\kappa/\alpha)\, \partial^2\tau / \partial\Theta^2.$$

When expanded to first order in small perturbations $\delta\tau$ around a background value τ_0, we obtain:

$$\nabla^2\, \delta\tau - (1/c_{eff}^2)\, \partial^2\, \delta\tau / \partial t^2 = 0,$$

where the effective propagation speed is:

$$c_{eff} = c\, \sqrt{(\alpha / (\alpha + \kappa))}.$$

This formulation allows numerical integration of temporal-wave propagation and the simulation of hypertemporal effects on matter distributions and cosmological redshift.

Appendix D. Summary Table of Core Relations

Concept	Expression	Physical interpretation
Temporal potential	$\Phi_t = c^2 \ln(\tau/\tau_0)$	Local curvature of time
Temporal force	$\mathbf{F}_t = -m c^2 \nabla \ln \tau$	Manifestation of temporal gradient
Field equation	$\nabla^2 \ln \tau = (\beta/\alpha)(\ln \tau - \ln \tau_0)$	Static limit of the temporal field
Hypertemporal action	$S = \int d^4x\, d\Theta\, \sqrt{(-g)}[½\alpha(\nabla \ln \tau)^2 - \beta\tau^2 + \kappa(\partial \ln \tau/\partial\Theta)^2]$	Unified 5D dynamics
Redshift relation	$1 + z = \tau\_obs / \tau\_emit$	Temporal origin of cosmic expansion

Appendix E. Outlook

The HyperTime framework provides a self-consistent extension of contemporary physics, offering a pathway toward the unification of gravitation, quantum mechanics, and cosmology.

Future work should focus on:

- refining the coupling constants through precision measurements;
- modelling hypertemporal perturbations in the early Universe;
- exploring the stability of temporal vortices corresponding to known particles;
- designing experimental setups capable of detecting controlled variations in τ or $\nabla\Theta$.

The ultimate goal is the empirical confirmation of time as a dynamic physical substance, establishing HyperTime not merely as a theoretical abstraction but as a measurable foundation of physical reality.

Geographic Sciences

Dağlardan okeanlara: Coğrafi müxtəliflik və insan həyatı

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Açar sözlər: Coğrafi müxtəliflik, dağlıq ərazilər, düzənliklər, okeanlar

Giriş

Yer kürəsi coğrafi baxımdan son dərəcə rəngarəng və zəngin bir planetdir. Dağlar, düzənliklər, çaylar, göllər, çöllər, meşələr və okeanlar kimi müxtəlif təbii landşaftlar dünya səthində bir-birindən fərqli iqlim, torpaq və həyat şəraitləri yaradır. Bu coğrafi müxtəliflik, həm təbiətin, həm də insan cəmiyyətlərinin formalaşmasında mühüm rol oynayır. İnsan həyatı, yaşayış formaları, iqtisadi fəaliyyətlər və mədəniyyətlər çox zaman birbaşa yaşanılan coğrafi mühitdən asılıdır.

Bu məqalədə Yer kürəsinin müxtəlif coğrafi landşaftları – dağlardan okeanlara qədər – ayrı-ayrılıqda təhlil ediləcək, onların insan həyatına təsiri və mədəni, iqtisadi və sosial əhəmiyyəti izah olunacaq.

Dağlıq ərazilər: Təhlükə və həyat mənbəyi

Dağlar Yer kürəsinin ən təsiredici təbii formalarındandır. Onlar yalnızca fiziki sərhədlər və təbiət gözəlliyi yaratmaqla qalmır, həm də bir çox insanlar üçün yaşayış məkanı, su mənbəyi və mədəniyyət ocağıdır. Dünyanın bir çox ölkəsində dağlıq ərazilərdə kənd təsərrüfatı, heyvandarlıq və turizm əsas iqtisadi fəaliyyətlərdir.

Dağların insan həyatına təsiri:

- İqlim: Dağlarda hündürlüyə görə temperatur və yağıntı dəyişir. Bu, kənd təsərrüfatını və yaşayış şəraitini müəyyən edir.
- Su ehtiyatı: Dünyadakı şirin suyun böyük hissəsi buzlaqlardan və dağ çaylarından gəlir.
- Mədəniyyət: Dağlıq bölgələrdə yaşayan xalqların özlərinə məxsus dil, geyim, musiqi və yaşayış tərzi formalaşır.
- Risklər: Torpaq sürüşmələri, qar uçqunları və seysmik aktivlik dağlıq bölgələrdə yaşayışı çətinləşdirir.

Misal: Himalay dağları Nepal və Hindistan xalqları üçün həm dini məna daşıyır, həm də həyat mənbəyidir. Azərbaycan üçün Böyük Qafqaz dağları həm iqlimə, həm də kənd təsərrüfatına birbaşa təsir göstərir.

Düzənlik və vadilər: İqtisadi inkişafın mərkəzi

Düzənliklər tarixi baxımdan ilk sivilizasiyaların məskəni olmuşdur. Çünki burada su ehtiyatları boldur, torpaq münbitdir və iqlim insan yaşayışına əlverişlidir. Bu bölgələrdə kənd təsərrüfatı və şəhərsalma sürətlə inkişaf edir.

Düzənliklərin əhəmiyyəti:

- Ərzaq istehsalı: Taxıl, tərəvəz, meyvə kimi əsas qida məhsulları düzənlik ərazilərdə becərilir.
- Nəqliyyat asanlığı: Coğrafi maneələrin azlığı inkişaf etmiş nəqliyyat sistemlərinin qurulmasına imkan verir.
- Sıx məskunlaşma: Ən iri şəhərlər və sənaye mərkəzləri çox vaxt düzənliklərdə yerləşir.

Misal: Nil vadisi Misir sivilizasiyasının beşiyi olmuşdur. Azərbaycanda Kür-Araz düzənliyi ölkənin əsas kənd təsərrüfatı regionudur.

- Meşəlik və tropik zonalar: Bioloji müxtəlifliyin xəzinəsi

Meşələr və tropik bölgələr Yer üzündə bioloji müxtəlifliyin əsas mərkəzlərindəndir. Burada minlərlə heyvan və bitki növü yaşayır. Bu ərazilər həm də qlobal ekoloji tarazlıq üçün həyati əhəmiyyət daşıyır.

Bu zonaların insan həyatına təsiri:

- Ekoloji rol: Meşələr karbon qazını udur, oksigen istehsal edir və iqlimi tənzimləyir.
- İqtisadi rol: Dərman bitkiləri, meşə materialları və ekoturizm mənbəyi kimi əhəmiyyətlidir.
- Risklər: Qeyri-qanuni ağac qırılması, torpaq eroziyası və yağışların azalması bu ekosistemləri təhdid edir.

Misal: Amazon meşələri "Yer kürəsinin ağciyərləri" adlandırılır. Azərbaycanın Lənkəran bölgəsində yerləşən subtropik meşəliklər nadir bitki örtüyünə malikdir.

- Çöllər və yarımsəhra əraziləri: Quraqlıqda həyat

Çöllər və yarımsəhra əraziləri çətin iqlim şəraitinə baxmayaraq, tarixi olaraq müxtəlif mədəniyyətlərin inkişaf etdiyi bölgələr olmuşdur. İnsanlar burada su çatışmazlığına uyğun yaşayış formaları inkişaf etdiriblər.

Bu zonaların xüsusiyyətləri:

- İqlim: İsti və quraq hava, az yağıntı.
- Əkinçilik: Suvarma ilə məhdud miqyasda aparılır.
- Mədəniyyət: Köçəri həyat tərzi, suya və torpağa xüsusi münasibət formalaşıb.

Misal: Səhralarda yaşayan bədəvilər iqlimə uyğun sosial struktur və mədəniyyət formalaşdırıblar. Azərbaycanda Muğan və Mil düzənlikləri yarımsəhra xüsusiyyətləri daşıyır.

- Okeanlar və sahil zonaları: Bəşəriyyətin qapısı

Okeanlar planetimizin təxminən 71%-ni əhatə edir və həm təbii, həm də iqtisadi baxımdan həyati əhəmiyyətə malikdir. Onlar iqlimi tənzimləyir, ticarəti yönləndirir və ərzaq mənbəyidir.

Sahil zonalarının əhəmiyyəti:

- Balıqçılıq və dəniz məhsulları: Dünya əhalisinin milyonlarla insanı gündəlik ərzaq üçün okeanlara bağlıdır.
- Ticarət və nəqliyyat: Beynəlxalq ticarətin böyük hissəsi dəniz yolu ilə həyata keçirilir.
- Turizm və iqtisadiyyat: Sahil şəhərləri turizm və sənaye üçün əlverişlidir.
- İqlimə təsir: Okeanlar istiliyi saxlayır və hava axınlarını formalaşdırır.

Misal: Dünya üzrə Sinqapur, İstanbul, Sidney kimi şəhərlər okean və dənizlərlə əlaqədar iqtisadiyyatlarını inkişaf etdiriblər. Azərbaycanda Xəzər dənizi ölkə üçün həm iqtisadi, həm də strateji əhəmiyyət daşıyır.

Nəticə

Yer kürəsinin dağlarından okeanlarına qədər uzanan coğrafi müxtəlifliyi insan həyatının bütün sahələrinə təsir göstərir: yaşayış məkanı, iqtisadi fəaliyyət, mədəniyyət, texnologiya və hətta dünya görüşümüz coğrafiyadan qaynaqlanır.

Müasir dövrdə bu müxtəlifliyin qorunması və davamlı idarə olunması bəşəriyyətin qarşısında duran əsas vəzifələrdən biridir. İqlim dəyişikliyi, təbii resursların azalması, urbanizasiya və ekoloji pozuntular bu gözəl və zəngin coğrafi sistemlərə ciddi təhdid yaradır.

İnsan və təbiət arasında harmonik münasibət yalnız coğrafi müxtəlifliyə hörmətlə yanaşmaq və onu qorumqla mümkündür.

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ISBN 978-5-9616-1274-5

9 785961 612745

Publisher.agency: Proceedings of the 11th International Scientific Conference «European Research Materials» (November 6-7, 2025). Amsterdam, Netherlands, 2025. 315p

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