ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING

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CONTENTS

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INVESTIGATING THE ABRASIVE WEAR RESISTANCE OF LOW-ALLOYED STEELS

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Annotatsiya. Ushbu maqolada 40XL va 65GL markali po'latlar abraziv yeyilish sharoitidagi ish qobiliyati va yeyilishbardoshlik xossalari tadqiq qilingan. Tadqiqotda turli mexanik ishlov berish usullaridan keyingi yuza qatlamlarining mikrostrukturasi, qattiqlik darajasi hamda yuzani abraziv muhitda yeyilish sur'ati tahlil qilindi. Shu bilan birga, termik ishlov turi va yuzani qotirish usuli abraziv ta'sirga chidamlilikni sezilarli darajada oshirishi aniqlandi.

Kalit so'zlar: abraziv yeyilish, yeyilishbardoshlik, tribologik xossalar, mexanik mustaxkamlik, metall tuzilishi, mikrostruktura, termik ishlov, sementatsiya, qattiqlik, metallgrafik tahlil, ishqalanish koeffitsiyenti, kontakt yuzalar.

Аннотация. В данной статье исследованы работоспособность и износостойкость сталей марок 40ХЛ и 65ГЛ в условиях абразивного износа. В исследовании были проанализированы микроструктура поверхностных слоев после различных методов механической обработки, степень твердости и скорость изнашивания поверхности в абразивной среде. При этом установлено, что вид термической обработки и способ упрочнения поверхности значительно повышают стойкость к абразивному воздействию.

Ключевые слова: абразивный износ, износостойкость, трибологические свойства, механическая прочность, структура металла, микроструктура, термическая обработка, цементация, твёрдость, металлографический анализ, коэффициент трения, контактные поверхности.

Abstract. This article investigates the performance and wear resistance properties of 40XL and 65GL grade steels under abrasive wear conditions. The

study analyzed the microstructure of surface layers after various mechanical treatment methods, the degree of hardness, and the rate of surface wear in an abrasive environment. Furthermore, it was determined that the type of heat treatment and the method of surface hardening significantly increase resistance to abrasive effects.

Keywords: *abrasive wear, wear resistance, tribological properties, mechanical strength, metal structure, microstructure, heat treatment, carburization, hardness, metallographic analysis, coefficient of friction, contact surfaces.*

Introduction

Abrasive wear is the main factor that reduces the service life of various machines, including agricultural machines, when parts made of metals come into contact with materials of mineral origin. Intensive wear of machine part surfaces occurs, which is attributed to the presence of an abrasive environment in the friction zone. Abrasive wear refers to the process of wear caused by cutting and crushing particles on the surface of a part [1], contact, or external influences on the resulting wear process [2].

The main patterns of wear emergence can be both qualitative and quantitative. They differ from each other depending on the wear conditions. Everything depends on the shape, hardness, and size of the abrasive particles, the degree of their fixation, the rigid scheme of the abrasive stress, and the specific pressure [3].

In abrasive wear, a significant portion of the work is expended on plastic deformation that occurs on the metal surface. The high degree of plastic deformation in abrasive wear is attributed to the various shapes of solid particles and the fact that the wear of their relative surface is directed towards the edges and ribs in different positions. While cutting or chip removal occurs in some instances, in most cases, a large part of the material slides with great forces due to surface friction, resulting in plastic deformation of the material and leaving traces, lines, scratches, and pits in a compressed state [4].

Professor Kasteskiy G.I., came to the following conclusion regarding the mechanism of wear formation in sliding friction [5]: it includes the penetration of abrasive particles into the metal friction surfaces, plastic deformations in the surface layer, and destruction of the surface layers without metal separation or by removing microchips.

In other cases, the mechanism of wear occurs through the separation of material or very fine chips or fragments of damaged material on the worn surface, the formation of scratches or dispersed particles due to plastic deformation by external pushing, and brittle separations as a result of single or multiple impacts.

Literature Review

In their study of abrasive wear in two systems - tin-lead and copper-nickel - Khrutsov M.M. and Babichev M.A. found that, from the perspective of compatibility between abrasive wear resistance and hardness, changes in wear resistance consistently corresponded to changes in the modulus of normal elasticity across all cases. The linear relationship between the characteristics of the above material is valid not only for pure

metals and alloys but also for some minerals that differ in composition, structure, and lattice bonds. However, for heat-treated steels, this relationship is not observed. In quenched and tempered carbon steels, wear resistance increases linearly with increasing hardness, while the normal modulus of elasticity remains constant. At the same time, it has been found that steels with the same wear resistance and hardness in a non-equilibrium state can have a 5-fold higher elastic modulus, i.e., when the bond strength between atoms is low [6]. In turn, abrasive wear resistance is not a definite function of the elastic modulus, as it cannot be a function of hardness either [7].

In studies conducted by scientists mentioned in the literature, attempts were made to determine the relationship between various mechanical characteristics of solid materials, including relative wear resistance, and the strength of interatomic bonds in the lattice. It has been established that the wear resistance, hardness, and ultimate strength of pure metals and alloys correlate with the type of interatomic bond and are a linear function of the lattice stiffness coefficient "K". It has been determined that the relative wear resistance of pure metals is a linear function of the lattice stiffness coefficient "K". However, for heat-treated steel, no such correlation was found. For metals and alloys in a metastable state, wear resistance and other mechanical properties are not characterized solely by interatomic bonding forces, but also by the non-uniformity of micro and submicroscopic structures.

Sufficient curvature of the lattice significantly affects the resistance to deformation and the degradation of the crystal.

The influence of manganese, chromium, and vanadium on the mechanical properties and wear resistance of high-manganese steel was also investigated. Based on the results of testing abrasive wear resistance in conjunction with mechanical properties, no specific correlations were identified between wear resistance, hardness, strength, and other mechanical properties of the alloys under study. Alloys with high mechanical properties generally correspond to significant wear resistance. However, there are also alloys with lower wear resistance compared to those with high mechanical properties.

In the softened state, the main structural components of hypoeutectoid carbon steels consist of ferrite and pearlite. Therefore, the wear resistance of these steels is determined by the wear resistance of their structural components and their volumetric ratios [8].

Research Methodology

In this study, the abrasive wear resistance properties of 40XL and 65GL grade structural steels were determined experimentally. For the experiment, standard-sized sample blanks were prepared from 40XL and 65GL steel grades. The blanks underwent mechanical processing in accordance with GOST 9013-59 standard. Each sample measured (20×20×10) mm, and the surface was brought to a uniform degree of smoothness (Ra=0.8-1.0 μm).

To standardize the microstructure, which is one of the main factors influencing wear during heat treatment, 40XL steel was heated to 850 °C and quenched in water. 65GL steel was heated to 830 °C and quenched in oil.

Abrasive wear tests were conducted under laboratory conditions using a special 2178-S abrasion testing machine. Quartz sand (SiO_2) with a particle size fraction of 0.2-0.5 mm was used as the abrasive material.

Analysis and Results

For conducting research on the wear resistance of 40XL and 65GL grade steels depending on heat treatment regimes, we selected industrially melted steels. Samples obtained from these steels underwent various heat treatment processes. After casting, some samples underwent heat treatment without a softening operation. The remaining samples underwent a softening operation before the main heat treatment. Quenching was carried out in water and oil at different temperatures. Water quenching was performed only at temperatures not exceeding 830-850 °C. Oil quenching was carried out at temperatures of 900-1100 °C. This is explained by the fact that if we perform water quenching at temperatures of 900-1100 °C, the steel begins to crack. Therefore, quenching at these temperatures was carried out in oil. For all samples, the tempering process was conducted in the temperature range from 200 °C to 500 °C. Wear resistance testing of the samples was performed on the X4-B device. Therefore, hardening at this temperature was carried out in oil. For all samples, the tempering process is carried out in the temperature range from 200 °C to 500 °C.

Similar to 40XL grade steel, 65GL grade steel also underwent heat treatment. Samples of this steel were also prepared and heat-treated in batches. The first batch of cast samples underwent heat treatment without annealing. For the second batch, annealing was performed before quenching and tempering. In this process, samples from both batches were heated to 850 °C and quenched in water, while the remaining samples were quenched in oil at 900 °C. Wear patterns similar to those observed in 40XL steel were also noted in 65GL steel (see in Figure 4). The lowest wear was observed in samples quenched in water at 850 °C, regardless of whether they had undergone annealing or not.
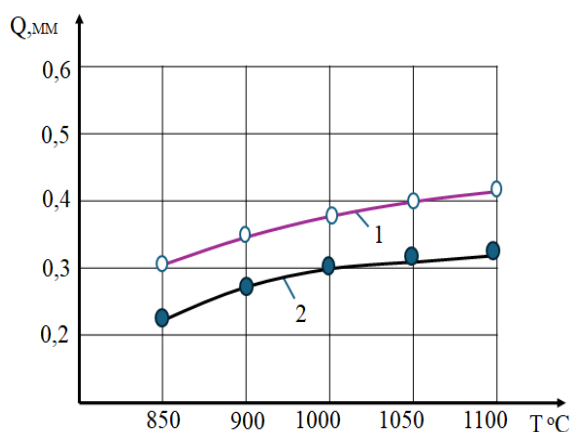
Figure 1. Change in the magnitude of abrasive wear of 65GL grade steel depending on the tempering temperature. Tempering at 200 °C: 1-heat treatment without softening; 2-heat treatment with softening.
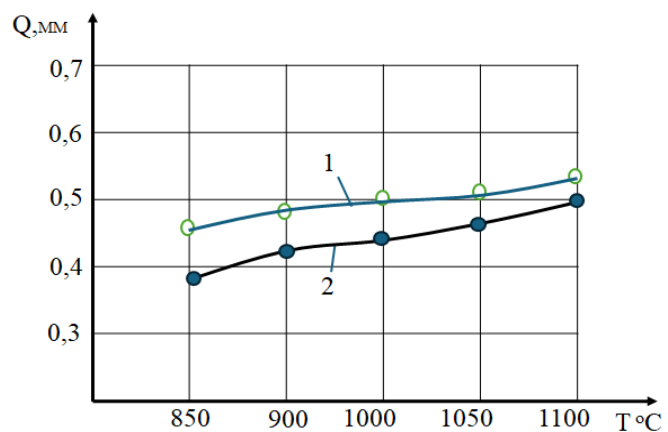
Figure 2. Changes in the magnitude of abrasive wear of 65GL steel depending on the tempering temperature. Tempering at 300 °C: 1- heat treatment without softening; 2- heat treatment with softening.

Studies conducted to determine the abrasive wear resistance of 65GL grade steel revealed that its wear curve is similar to that of 40XL grade steel. However, the wear value of samples made from 65GL grade steel is consistently lower than that of 40XL grade steel across all heat treatment regimes. Similar to 40XL grade steel, the lowest wear in 65GL grade steel is also observed at a temperature of 850 °C, which is related to the size of the austenite grains.
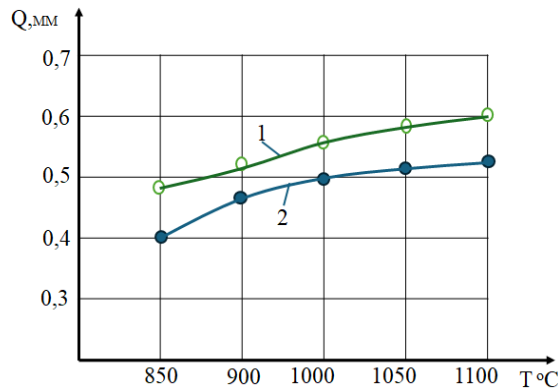
Figure 3. Change in the magnitude of abrasive wear of 65GL steel depending on the tempering temperature. Tempering at 400 °C: 1- heat treatment without softening; 2- heat treatment with softening.
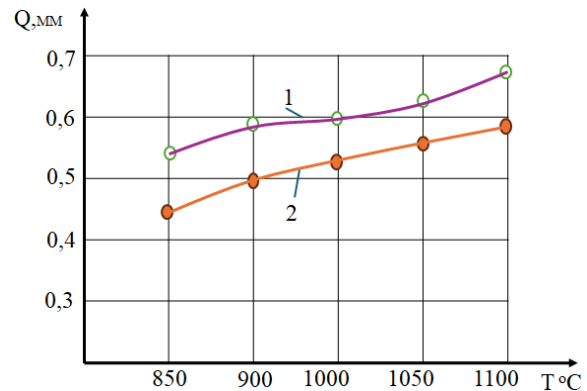
Figure 4. Change in the magnitude of abrasive wear of 65GL grade steel depending on the quenching temperature. Tempering at a temperature of 500 °C: 1-heat treatment without softening; 2-heat treatment with softening.

Conclusion

As the hardening temperature increases, starting from 900 °C, the wear of the samples gradually increases and reaches its maximum value at a hardening temperature of 1100 °C. In general, it was determined that the wear value of samples subjected to annealing during heat treatment has the lowest value compared to samples not subjected to annealing during heat treatment. Furthermore, experiments proved that the wear of 65GL grade steel in both conditions is less than that of 40XL grade steel in both conditions.

It was determined that the wear of the steels under consideration, specifically cast steel grade 65GL, is 1.4-1.5 times less than that of cast steel grade 40XL.

It was determined that the wear of samples made from heat-treated steel that underwent tempering operations is 1.3-1.4 times less compared to samples that underwent heat treatment without tempering. The wear curve characteristics of the aforementioned 65GL grade steel correspond to those of 40XL grade steel, which indicates that there is a unified mechanism for structure formation in steels during heat treatment.

Another commonality is that samples subjected to softening operations and then quenched in water at a temperature of 850 °C were found to have advantages compared to those subjected to softening operations and then quenched in oil at temperatures of 900-1100 °C.

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OPTIMIZATION OF THE WORKING ORGAN PARAMETERS OF THE DISC CULTIVATOR THROUGH EXPERIMENTAL MATHEMATICAL PLANNING

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Annotatsiya. Maqolada diskli yumshatkich ishchi organlarining laboratoriya sharoitida o'tkazilgan tajribaviy tadqiqotlari natijalari keltirilgan. Tadqiqotlarda mashinaning maqbul parametrlarini aniqlash uchun tajribalarni matematik rejalashtirish usulidan foydalanildi. O'tkazilgan tadqiqotlar natijasida tuproqning uvalanish darajasi, ishlov berilgan qatlam yuzasi va hosil bo'ladigan notekisliklarning balandliklari hamda qurilmaning tortishga solishtirma qarshiligini aniqlash imkonini beradigan regressiya tenglamalari olindi va ular asosida parametrlarni bog'liqlik grafiklari qurildi.

Kalit so'zlar: disk, yumshatkich, parameter, mezon, dispersiya, agregat, tezlik, tuprop, daraja, solishtirma qarshilik, tajriba.

Аннотация. В статье представлены результаты экспериментальных исследований рабочих органов дискового рыхлителя, проведенных в лабораторных условиях. В исследованиях для определения оптимальных параметров машины использовался метод математического планирования экспериментов. В результате проведенных исследований были получены уравнения регрессии, позволяющие определить степень крошения почвы, площадь обрабатываемого слоя и высоту образующихся неровностей, а также удельное тяговое сопротивление устройства. На основе этих уравнений построены графики зависимости параметров.

Ключевые слова: диск, рыхлитель, параметр, критерий, дисперсия, агрегат, скорость, почва, степень, удельное сопротивление, эксперимент.

Abstract. The article presents the results of experimental studies on the working organs of a disc cultivator under laboratory conditions. In the research, the method of mathematical experiment planning was used to determine the optimal parameters of the machine. As a result of the conducted research, regression equations were obtained that allow determining the degree of soil crumbling, the surface area of the cultivated layer, the height of the resulting irregularities, as well as the specific draft resistance of the device. Based on these equations, graphs showing the relationships between parameters were constructed.

Keywords: disc, cultivator, parameter, criterion, dispersion, aggregate, velocity, soil, degree, specific resistance, experiment.

Introduction

Targeted scientific research is being conducted aimed at creating new samples of resource-saving technologies for processing grape inter-rows and technical means for their implementation, developing their scientific and technical foundations in order to ensure resource saving of existing machines during operation.

Research on machines and devices for tillage between rows of vineyards and orchards was conducted abroad by Vasilenko P.M., Babiy P.T., Zhilisky Ya., Gerasimov N.I., Manova L., Gogova K., Dimova S., Stoicheva V., Nankov Kh., Parkhomenko G.G., Gribanovsky P., Alyokhin A.V., Bichkov V.V., Tverdokhlebov S.A., Manayenkov K.A., Bernstein I.B., and others [1-3].

In this direction, research work was carried out in our republic by Mirzaev M.M., Akhmedov T.T., Kushnazarov Kh., Utaganov Kh.B., Ishankhodzhaeva L.A., Musurmonov A.T., and others.

Research Methodology

The optimal values of the disc cultivator's working organ parameters, studied in theoretical and single-factor experiments, were determined using the method of mathematical planning of multi-factor experiments [4, 5].

The research was conducted using the aforementioned device.

For the research, the angles of installation of the disc cultivator's working organs relative to the direction of movement and vertical axis, the transverse distance between them, and the speed of the unit were selected as factors influencing its qualitative and energy performance indicators.

Analysis and Results

Based on the aforementioned theoretical studies and single-factor experiments, the levels and intervals of change for the established factors were determined (Table 1).

Assuming that the influence of factors on the evaluation criteria is fully described by a second-degree polynomial, the experiments were conducted according to the Hartley-4 plan [4].

Table 1. Factors, their conventional designations, variation range and levels.

Factor name	Conventional designation	Range of variation	level		
			- 1	0	+1
1. Installation angle of the disc cultivator working bodies relative to the direction of movement, o	X_1	10	10	20	30
2. Installation angle of the disc cultivator working bodies relative to the vertical, o	X_2	10	5	15	25
3. Transverse distance between the disc cultivator working bodies located in one row, cm	X_3	10	20	30	40
4. Working speed, km/h	X_4	1.5	5.0	6.5	8.0

For conducting multifactorial experiments, the following were chosen as evaluation criteria: the degree of soil crumbling (Y_1, %), i.e., the proportion of fractions smaller than 50 mm; the height of irregularities formed on the surface of the treated layer (Y_2, cm) and at the bottom (Y_3, cm); and the specific draft resistance of the device (Y_4, kN/m).

To reduce the influence of soil physical and mechanical properties and existing field surface irregularities on the evaluation criteria, the experimental procedure was determined using a table of random numbers [6-10].

The plan for conducting multi-factorial experiments and their results are presented in Appendix 2.

The data obtained from the experiments were processed using the "PLANEX" program. In this process, the Cochran criterion was used to assess the homogeneity of variance, the Student's criterion to evaluate the significance of regression coefficients, and the Fisher criterion to assess the adequacy of regression models.

The experimental results were processed in the prescribed manner, and the following regression equations were obtained, adequately expressing the evaluation criteria:

- for the degree of soil crumbling (%)

$$Y_1 = 80.479 + 2.811X_1 - 1.022X_2 - 2.482X_3 + 0.892X_4 - 1.766X_1^2 + 0.478X_1X_2 - 0.635X_1X_3 + 1.063X_1X_4 - 1.314X_2^2 - 1.070X_2X_4 + 1.560X32 - 1.357X3X4 + 1.348X42; \tag{1}$$

- for the height of irregularities formed on the surface of the treated layer (cm)

$$Y_2 = 4.551 - 2.110X_1 + 1.592X_2 + 1.362X_3 - 0.762X_4 + 1.162X_1^2 + 0.343X_1X_2 + 0.586X_1X_3 + 0.563X_1X_4 + 0.174X_2^2 + 0.530X_2X_3 - 0.368 X_2X_4 + 0.574X32 - 0.828X3X4 + 0.541 X42; \tag{2}$$

- for the height of irregularities formed at the bottom of the treated layer (cm)

$$Y_3 = 3.145 - 1.390X_1 - 0.650X_2 + 1.577X_3 - 0.862X_4 + 0.395X_1^2 - 0.143X_1X_2 - 0.473X_1X_3 + 0.355X_2^2 + 0.428X_2X_3 - 0.311 X_2X_4 + 1.722X32 + 0.140X3X4 - 0.150 X42; \tag{3}$$

- for the specific draft resistance of the device (kN)

$$Y_4 = 3.961 + 0.898X_1 - 0.815X_2 - 0.762X_3 + 0.683X_4 - 0.256X_1^2 + 0.700 X_1X_2 + 0.210X_1X_3 - 0.188X_1X_4 + 0.687X_2^2 - 0.420X_2X_3 + 0.276X_2X_4 + 0.400X_3X_4 + 0.515X_4^2. \tag{4}$$

Based on the analysis of expressions (1) - (4) and the graphs constructed from them (Figures 1-3), the following can be noted:

- An increase in the installation angle of the ripper's working bodies relative to the direction of movement leads to an increase in the degree of soil crumbling and the specific draft resistance of the device, while decreasing the height of irregularities formed on the surface and at the bottom of the cultivated layer;

- With an increase in the vertical installation angle of the disc ripper's working bodies, the degree of soil crumbling and the specific draft resistance of the device decreased, the height of irregularities formed on the surface of the cultivated layer

increased, while the height of irregularities formed at its bottom decreased;
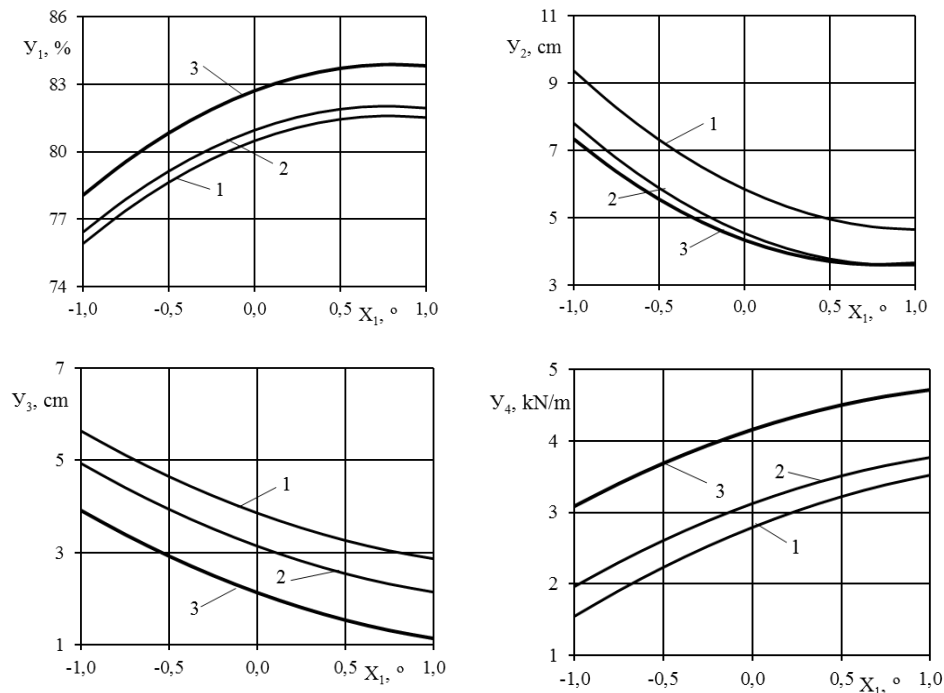
Figure 1. The influence of the installation angle of the ripper's working bodies relative to the direction of movement on the criteria Y_1, Y_2, Y_3 and Y_4. 1, 2 and 3 correspond to x_4 being -1, 0 and 1 respectively.
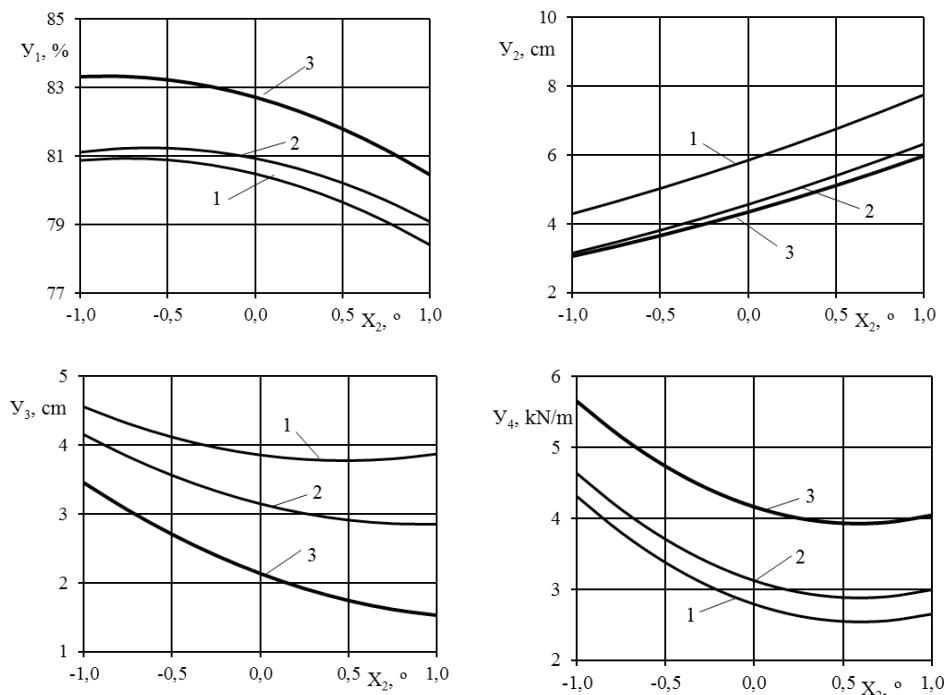
Figure 2. The influence of the vertical installation angle of the ripper's working bodies on the criteria Y_1, Y_2, Y_3 and Y_4. 1, 2 and 3 correspond to X_4 being -1, 0 and 1 respectively.

- As the transverse distance between the working bodies of the disc cultivator located in one row increases, the degree of soil crumbling decreases, the height of irregularities formed on the surface and at the bottom of the cultivated layer increases, the specific draft resistance of the device first increases, then decreases;

Conclusion

An increase in the speed of the unit leads to an improvement in all the agrotechnical indicators of the device, namely, an increase in the degree of soil crumbling, a decrease in the height of irregularities formed on the surface and at the bottom of the cultivated layer, and an increase in the specific draft resistance of the device.

To, the regression equations (1) - (4) were solved jointly on a PC Pentium IV computer using the Excel program's "solution search" function for speeds of 5-8 km/h. When solving the regression equations jointly, the following criteria were adopted: Y_1 criterion, i.e., the amount of fractions smaller than 50 mm should not be less than 80%, Y_2 and Y_3 criteria, i.e., the heights determine the parameter values that ensure the required work quality with minimal energy consumption of irregularities formed on the surface and at the bottom of the treated layer should not exceed 5 and 3 cm, respectively, and Y4 criterion, i.e., the draft resistance of the device should have a minimum value. The results are presented in Table 2.

Table 2. Optimal values of the disc cultivator working bodies.

V (X_4)		a (X_1)		β (X_2)		m (X_3)	
Encoded	Natural, km/h	Encoded	Natural, degree	Encoded	Natural, degree	Encoded	Natural cm
1	8	0.0745	20.7450	0.1247	16.2470	0.1944	31.9445
0	6.5	0.1762	21.7622	0.2718	17.7180	-0.0928	29.0724
-1	5	0.5340	25.3400	0.4927	19.9270	-0.2394	27.6061

Therefore, to ensure the required work quality with minimal energy consumption at operating speeds of 5-8 km/h, the working components of the disc cultivator in the combined machine should be installed at an angle of 20-25° relative to the direction of movement, 16-19° relative to the vertical, and the transverse distance between them should be within the range of 27-31 cm.

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VIBRATION PATTERNS OF THE MESH SURFACE OF A RICE SORTING MACHINE IN RELATION TO THE STIFFNESS COEFFICIENTS OF ITS ELASTIC ELEMENT

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Annotatsiy. Ushbu maqolada qayishqoq elementli mushtumchali mexanizm bilan jihozlangan saralash mashinasining to'rli yuzasini qayishqoq elementni bikirlik koeffisiyentini hisobga olgan holda tebranish qonuniyatlarini tahlili keltirilgan. O'tkazilgan tadqiqotlar natijasida mushtumcha tarkibidagi qayishqoq elementning bikirlik koeffitsiyenti, guruch saralash mashinasi mushtumchali mexanizmi koromislosini tebranish burchagi tezligini o'zgarish qonuniyatlari, tebranish qonuniyatlarini aniqlovchi ifodalar hamda to'rli yuzasining og'ish burchagi va og'ish tezliklarini ekssentrisitet qiymatiga bog'liqlik grafiklari keltirilgan.

Kalit so'zlar: saralash mashinasi, mushtumchali mexanimz, qayishqoq element, koromislo, to'rli yuza, qonuniyat, tebranish burchagi, guruch, uzunlik, maksimal, turtkich, grafik, tebranish chastotasi.

Аннотация. В данной статье представлен анализ закономерностей колебаний сетчатой поверхности сортировочной машины, оснащенной кулачковым механизмом с упругим элементом, с учетом коэффициента жесткости упругого элемента. В результате проведенных исследований приведены коэффициент жесткости упругого элемента в кулачке, закономерности изменения скорости угла колебания коромысла кулачкового механизма рисосортировочной машины, выражения, определяющие закономерности колебаний, а также графики зависимости угла наклона сетчатой поверхности и скорости наклона от значения эксцентриситета.

Ключевые слова: сортировочная машина, кулачковый механизм, упругий элемент, коромысло, сетчатая поверхность, закон, угол колебаний, рис, длина, максимальный, толкатель, график, частота колебаний.

Abstract. This article presents an analysis of the patterns of vibration of the mesh surface of a sorting machine equipped with a cam mechanism with an elastic element, taking into account the stiffness coefficient of the elastic element. As a result of the conducted research, the stiffness coefficient of the elastic element in the cam, the laws of change in the angular velocity of the rocker arm of the cam mechanism of the rice sorting machine, expressions determining the laws of vibration, as well as graphs of the dependence of the angle of inclination of the mesh surface and the velocity of inclination on the eccentricity value are presented.

Keywords: sorting machine, cam mechanism, elastic element, rocker arm, mesh surface, pattern, vibration angle, rice, length, maximum, pusher, graph, vibration frequency.

Introduction

Currently, manufacturing processes are developing at a rapid pace. This necessitates conducting research aimed at developing cam mechanisms for machines with high kinematic capabilities and reliable operation in technological processes. It is crucial to develop designs and calculation methods for cam mechanisms used in the transmission systems of rice sorting machines, which accelerate the technological process. In particular, developing improved designs for the active working parts of machines and equipment used in grain processing enterprises is of great importance. Additionally, creating effective designs of cam mechanisms with elastic elements that provide the necessary oscillatory motion to the working components is becoming increasingly significant [1-3].

Based on the foregoing, we theoretically studied the laws of vibration of a rice sorting machine equipped with a cam mechanism with an elastic element, which provides oscillatory movement of the mesh surface [4-8].

Research Methodology

The laws of vibration of the vibrating mesh surfaces of the rice sorting machine were determined based on formula (1), taking into account the maximum deformation values of the elastic element in the eccentric cam mechanism. In this case, when the elastic element is not taken into account, $\dot{\varphi}_3$ when $\Delta r=0$ and $\Delta\alpha=0$, the rules for the oscillation of the mesh surface (rocker arm, pusher), obtained by numerical solution, were obtained for its various lengths. Figure 1 shows the laws of oscillation of the mesh surface of the rice sorting machine [9-14].

Analysis of the observed patterns shows that, when disregarding the elastic element of the cam, the angular velocity of the rocker arm changes according to a harmonic law.

$$\alpha = \arccos\frac{e^2 - r^2 + l_3^2 + l_4^2 - 2el_4\cos\varphi_1}{2l_3\sqrt{e^2 + l_4^2 - 2el_4\cos\varphi_1}} + arctg\frac{e\sin\varphi_1}{l_4 - e\cos\varphi_1};$$

(1)

$$\varphi_2 = \arccos\frac{e^2 + r^2 - l_3^2 + l_4^2 - 2el_4\cos\varphi_1}{2r\sqrt{e^2 + l_4^2 - 2el_4\cos\varphi_1}} + arctg\frac{e\sin\varphi_1}{l_4 - e\cos\varphi_1};$$

In this case, $\dot{\varphi}_3$ the values vary from $\pm18{,}4$ s^{-1} to $\pm11{,}3$ s^{-1} depending on the eccentricity values. Across variants, the oscillation frequency of the rocker arm remains constant when taking into account the maximum deformation of the cam's elastic element. Specifically, for Δr=3.5 mm, a mesh surface representing the patterns of change in the angular velocity of the cam mechanism's rocker arm was obtained based on changes in its length. These patterns are presented in Figure 2. In this study, the length of the rocker arm l_3 was varied from 0.96×10^{-3} m to 1.3×10^{-3} m.
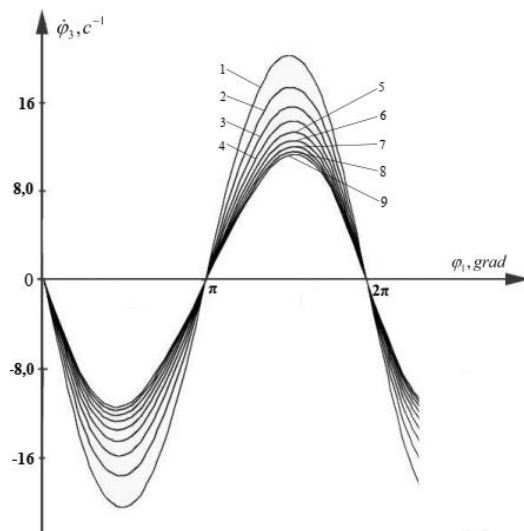
when Δr=0
1-l_3=1,3×10^{-3} m;
2-l_3=1,26×10^{-3} m;
3-l_3=1,22×10^{-3} m;
4-l_3=1,185×10^{-3} m;

Figure 1. Laws of vibration of the mesh surface of a rice sorting machine.
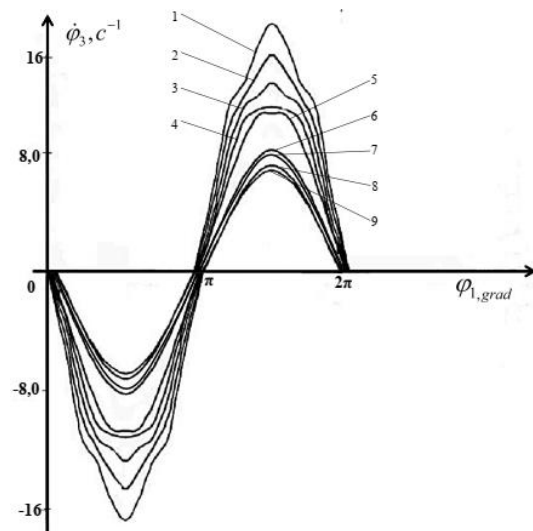
where Δr=3.5 mm
5-l_3=1,15×10^{-3} m;
6-l_3=1,02×10^{-3} m;
7-l_3=1,0×10^{-3} m;
8-l_3=0,98×10^{-3} m;
9-l_3=0,96×10^{-3} m.

Figure 2. Laws of change in the angular velocity of the rocker arm of the cam mechanism of the rice sorting machine.

The law of rocker arms oscillation, i.e., the shape of the graphs, changes sufficiently at Δr=3.5 mm (Figure 2). The change in the angular velocity of the mesh surface ensures sufficient angular acceleration and variation in its linear acceleration depending on the distance from the rice. As a result, the sorting of rice is intensified due to additional impulse forces.

It should be noted that Figure 3 shows graphs of the patterns of change in the angular displacement and velocity of the mesh surface of the rice sorting machine (pusher-rocker) depending on time, obtained at different Δr values.

As a result of processing the above-mentioned laws of motion, graphs of the relationship between parameters were constructed. In particular, Figure 4 shows graphs of the dependence of the angle of inclination and the velocity of inclination of the mesh surface of the rice sorting machine on the maximum deformation of the elastic element and the eccentricity value.

$e=22\times10^{-3}$ m

$e=27,5\times10^{-3}$ m
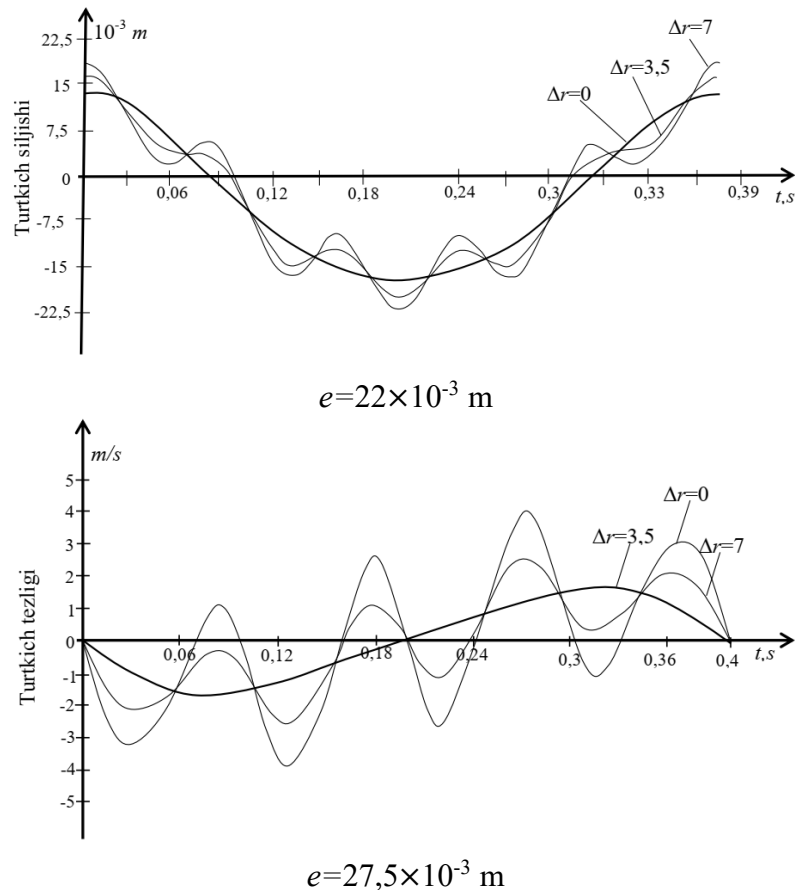
Figure 3. Graphs of the regularities of change in the angular displacement and velocity of the mesh surface (pusher-rocker) of the rice sorting machine, obtained at different values Δr depending on time.

Analysis of the presented graphs shows that the maximum deformation value from the direction of displacement of the mesh surface at the point of contact of the elastic element of the cam with the pusher increases from $\Delta r=2,1\times10^{-3}$ to $\Delta r=11,5\times10^{-3}$ m and the eccentricity values are e=22×10-3 m, $\Delta\varphi_3$ the change in the vibration range increases from $0,44\cdot10^{-3}$ rad to $2,34\cdot10^{-3}$ rad according to a nonlinear pattern (Figure 4, graph 1). With an increase in eccentricity values to $27,5\times10^{-3}$ m, the range $\Delta\varphi_3$ of inclined oscillations increases from $0,52\times10^{-3}$ rad to $3,39\times10^{-3}$ rad. Similarly, if the angular velocity range of the rocker arm increases from 2,21 s^{-1} to 13,9 m/s, and at e=$27,5\times10^{-3}$ m, the values $\Delta\dot{\varphi}_3$ increase from 3,83 s^{-1} to 15,7 m/s with a nonlinear dependence (Figure 4).

It is known that an increase in the value of Δr $\Delta\dot{\varphi}_3$ and $\Delta\ddot{\varphi}_3$ a sharp increase in can lead to damage to the rice, therefore it is recommended that the stiffness of the elastic element of the cam $\Delta r \leq (4,5\div5,5)\cdot10^{-3}$ m be in the range of c=0.35×104 N/m.
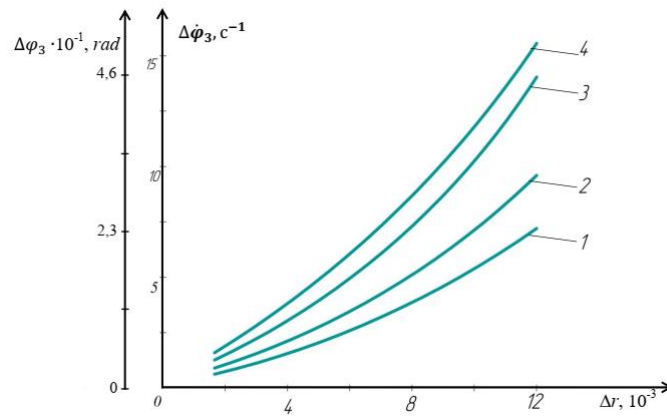
1,2- $\Delta\varphi_3 = f(\Delta r)$;   3,4- $\Delta\dot{\varphi}_3 = f(\Delta r)$;

1,3- e=22×10⁻³ m;   2,4- e=27,5×10⁻³ m;

Figure 4. Graphs of the dependence of the angle of inclination and the coverage of the inclination velocities of the mesh surface of the rice sorting machine on the maximum deformation of the elastic element and the eccentricity value.

It should be noted that the values of the oscillation ranges of the follower, i.e., the mesh surface, largely depend on its length. Figure 5 shows graphs of the dependence of the angle of inclination of the mesh surface of the rice sorting machine and the ranges of inclination speeds on the length of the mesh surface (rocker arm).

When analyzing the graphs, with an increase in the length of the mesh surface from 0,96×10⁻³ m to 1,3×10⁻³ m and with Δr=3,5×10⁻³ m, $\Delta\dot{\varphi}_3$ decrease in values from 11,09 m/s to 2,61 m/s was observed, and $\Delta\varphi_3$ the values decreased from 2,32×10⁻¹ rad to 0,625×10⁻¹ rad according to a nonlinear pattern.
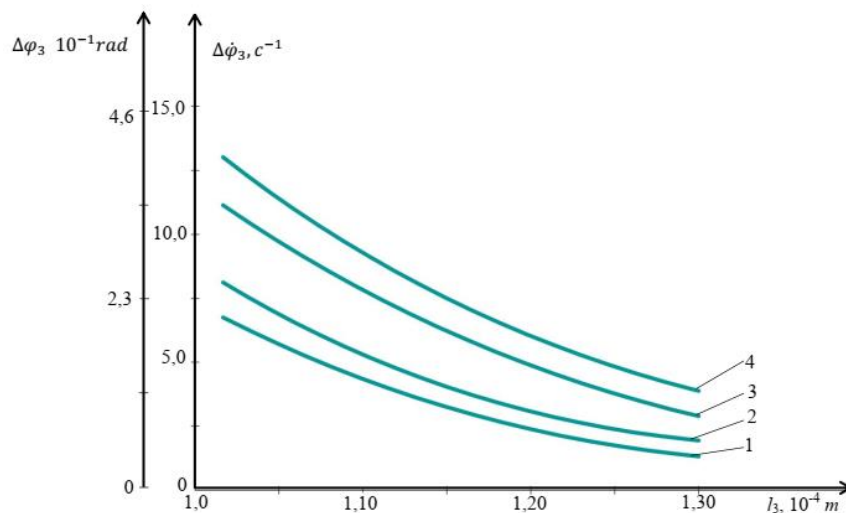
1,2- $\Delta\varphi_3 = f(l_3)$;   3,4- $\Delta\dot{\varphi}_3 = f(l_3)$;

1,3- Δr=3,5×10⁻³ m;   2,4- Δr=6,0×10⁻³ m;

Figure 5. Graphs of the dependence of the inclination angle and inclination velocity coverage of the mesh surface of the rice sorting machine on the length of the mesh surface (rocker arm).

Accordingly, when Δr=6,0×10⁻³ m, the $\Delta\dot{\varphi}_3$ values decrease from 12,5×10⁻¹ to 4,71×10⁻¹, while the values of the rocker arm deflection angle coverage decrease from 2,87×10⁻¹ rad to 1,18×10⁻¹ rad in a nonlinear relationship. To ensure the required

angular displacement and angular velocity of the mesh surface, to carry out the process of effective rice sorting, it is advisable that the length of the mesh surface be in the range of $l_3 = (1{,}15 \div 1{,}20) \times 10^{-3}$ m.

Conclusion

In summary, it can be said that graphs of the dependence of the angle of inclination of the mesh surface of the rice sorting machine and the coverage of inclination speeds on the length of the mesh surface (rocker arm) were constructed, and it was determined that the required angular displacement of the mesh surface and the values of the angular velocity of oscillation are ensured, and for the implementation of the process of effective rice sorting, it is advisable that the length of the mesh surface be in the range of $l_3 = (1.15 \div 1.20) \times 10^{-3}$ m.

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HIGH-TEMPERATURE GRAPHITIZATION OF AMORPHOUS CARBON MATERIALS PRODUCED FROM LOCAL RAW MATERIALS

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Annotatsiya. Amorf uglerodni grafitlash elektrotexnika va metallurgiya qo'llanmalarida ishlatiladigan uglerod materiallarining xususiyatlarini oshirish uchun jozibador jarayondir. Ushbu tadqiqot koks va melas aralashmasidan tayyorlangan naycha shaklidagi namunalarning grafitlash kinetikasini o'rganadi. Namunalar 1600 °C dan 2500 °C gacha bo'lgan haroratlarda bir soat davomida izotermik issiqlik bilan ishlov berildi. Strukturaviy evolyutsiya rentgen difraksiyasi (XRD) yordamida miqdoriy tahlil qilindi, tekisliklararo masofa (d_{002}), kristallit o'lchami (L_s) va grafitlanish darajasi o'lchandi. Natijalar jarayon harorati va kristallik o'rtasida kuchli ijobiy korrelyatsiyani ko'rsatadi, grafitlanish darajasi 1600 °C da 17% dan 2500 °C da 58% gacha oshdi. Shu bilan birga, d_{002} oralig'i 0,344 nm dan 0,33 nm gacha kamaydi va kristallit o'lchami Ls 5 nm dan 45 nm gacha o'sdi. Biroq, hatto eng yuqori haroratda ham to'liq grafitizatsiyaga erisha olmaslik jarayonning vaqtga bog'liq, kinetik xususiyatini tasdiqlaydi. Tadqiqot natijalari o'rnatilgan modellarga mos keladi va koks-petokaz tizimini sanoat maqsadlarida foydalanish potentsialiga ega materiallarni ishlab chiqarish uchun samarali grafitizatsiya qilish mumkinligini tasdiqlaydi, garchi to'liq kristallanish uchun vaqt va harorat parametrlarini optimallashtirish juda muhimdir.

Kalit so'zlar: grafit, amorf uglerod, melas, bog'lovchi, kristallanish.

Аннотация. Графитизация аморфного углерода является перспективным процессом для улучшения свойств углеродных материалов, используемых в электротехнике и металлургии. В данной работе изучается кинетика графитизации трубчатых образцов, изготовленных из смеси кокса и мелассы. Образцы подвергались изотермической термообработке в течение одного часа при температурах от 1600 °C до 2500 °C. Структурная эволюция количественно анализировалась с помощью рентгеновской дифракции (XRD), измеряющей межплоскостное расстояние (d_{002}), размер кристаллитов (L_s) и степень графитизации. Результаты демонстрируют сильную положительную корреляцию между температурой процесса и кристалличностью, при этом степень графитизации увеличивалась с 17% при 1600 °C до 58% при 2500 °C. При этом межплоскостное расстояние d_{002} уменьшилось с 0,344 нм до 0,33 нм, а размер кристаллитов L_s увеличился с 5 до 45 нм. Однако невозможность достижения полной графитизации даже при самой высокой температуре подтверждает кинетический характер процесса, зависящий от времени. Полученные результаты согласуются с существующими моделями и подтверждают возможность эффективной

графитизации системы кокс-меласса для получения материалов, потенциально пригодных для промышленного применения, хотя для полной кристаллизации необходима оптимизация как временных, так и температурных параметров.

Ключевые слова: *графит, аморфный углерод, патока, связующее, кристаллизация.*

Abstract. The graphitization of amorphous carbon is an attractive process for enhancing the properties of carbon materials used in electrical and metallurgical applications. This study investigates the graphitization kinetics of tube-shaped samples fabricated from a mixture of coke and molasses. Samples were subjected to isothermal heat treatments for one hour at temperatures ranging from 1600 °C to 2500 °C. The structural evolution was quantitatively analyzed using X-ray diffraction (XRD), measuring the interplanar spacing (d_{002}), crystallite size (L_s), and degree of graphitization. The results demonstrate a strong positive correlation between process temperature and crystallinity, with the graphitization degree increasing from 17% at 1600 °C to 58% at 2500 °C. Concurrently, the d_{002} spacing decreased from 0.344 nm to 0.33 nm, and the crystallite size L_s grew from 5 nm to 45 nm. However, the inability to achieve full graphitization even at the highest temperature confirms the time-dependent, kinetic nature of the process. The findings align with established models and confirm that the coke-molasses system can be effectively graphitized to produce materials with potential for industrial use, though optimization of both time and temperature parameters is essential for complete crystallization.

Keywords: *graphite, amorphous carbon, molasses, binder, crystallization.*

Introduction

The graphitization of amorphous carbon materials is a critical thermal process that transforms disordered carbon structures into a crystalline graphite lattice, significantly enhancing their electrical and thermal properties. The degree of graphitization is conventionally evaluated using X-ray diffraction (XRD) techniques, which measure parameters such as the interplanar distance (d_{002}), the crystallite size (L_s), and the intensity ratio of diffraction lines [1].

It is well-established that this transformation is predominantly thermally activated, with the graphitization degree increasing with higher processing temperatures [2, 3]. However, kinetic studies reveal that the process is also time-dependent, where a high degree of ordering can be achieved at lower temperatures given sufficiently long durations. For instance, achieving a specific level of graphitization in petroleum coke requires temperatures as high as 2420 °C, or alternatively, drastically longer periods such as 13 hours at 2150 °C, or even 1.5 years at 1500 °C [8-10].

Conventional research methods, which involve high-temperature processing followed by complete cooling for ex-situ analysis, can complicate the investigation and introduce inaccuracies [11-14]. Therefore, a systematic study of the kinetics and structural evolution during graphitization remains essential.

This research investigates the graphitization of tube-shaped samples fabricated from a mixture of coke and molasses. The study focuses on quantifying the influence of process temperature (ranging from 1600 °C to 2500 °C) on the structural evolution and the final degree of graphitization, as determined by X-ray diffraction analysis.

Literature Review

The graphitization of amorphous carbon is a fundamental process for producing high-performance materials used in electrical engineering and metallurgy. Extensive research has established that the transformation from a disordered to a crystalline graphite structure is governed primarily by two factors: temperature and time.

The primary driver of graphitization is temperature, with the degree of crystallinity increasing significantly as the heat treatment temperature (HTT) rises [2, 3]. However, a key finding in the literature is that for any given temperature, the graphitization process approaches a certain limit, indicating a kinetic nature [4-7]. This time-dependence has been quantitatively explored, with studies showing that achieving a specific structural state can require exponentially longer durations at lower temperatures. For example, as cited from earlier works, the graphitization of petroleum coke that is achieved at 2420 °C would require 13 hours at 2150 °C, and an estimated 1.5 years at 1500 °C [8-10].

The structural evolution during this process is typically monitored using X-ray diffraction (XRD). Key metrics include a decrease in the interplanar spacing (d_{002}) towards the ideal graphite value of 0.335 nm, a sharpening of the (002) diffraction peak, and an increase in the crystallite size (L_s) [1]. These changes are directly correlated with improvements in material properties, such as thermal conductivity, which increases in proportion to the logarithm of the isothermal holding time [10-15].

In industrial practice, the choice of raw materials is crucial. Petroleum coke is widely used as a filler, while binders such as coal tar pitch or petroleum tar are essential for shaping the green bodies before thermal treatment [9-15]. The kinetics of graphitization and the final physic-mechanical properties of the resulting material are significantly influenced by the combination of these components.

Research Methodology

Sample preparation and composition. A tube-shaped sample was fabricated using local raw materials, specifically a mixture of coke and molasses. The sample dimensions were an outer diameter of 96 mm, an inner diameter of 76 mm, and a height of 240 mm.

Graphitization process. The graphitization heat treatment was conducted in a special laboratory furnace designed for operation up to 2500 °C under a high vacuum or protective gas atmosphere. The furnace featured a double-walled steel shell with continuous water cooling to prevent overheating. The sample was subjected to a series of isothermal treatments at temperatures of 1600 °C, 1800 °C, 2200 °C, and 2500 °C, with a constant holding time of 1 hour at each temperature.

Structural characterization. To determine the degree of graphitization, fragments were cut from the heat-treated samples and analyzed using a "MiniFlex 600" X-ray

diffractometer (XRD). The analysis focused on the (002) crystallographic plane. The key parameters measured were:
- The interplanar distance (d_{002}).
- The integral width (β) of the (002) diffraction peak.
- The size of the coherence scattering regions (crystallite size, L_s).

Data analysis. The degree of graphitization was quantified based on the results of the X-ray structural-phase analysis. The data were processed and presented graphically to illustrate the effect of process temperature on the structural evolution of the carbon material.
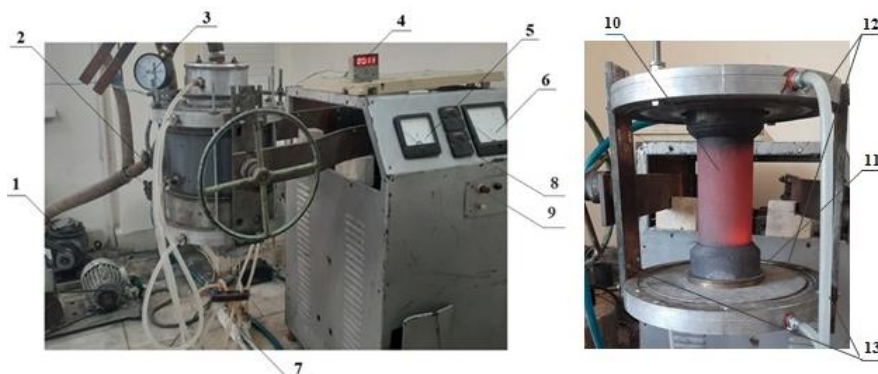
Figure 1. Schematic of the experimental procedure: baking the material in a specialized laboratory oven followed by evaluation of its physical and mechanical properties. 1 - vacuum pump; 2 - thermocouple; 3 - manometer; 4 - thermal sensor; 5 - ammeter; 6 - voltmeter; 7 - cooling system; 8 - automatic; 9 - thyristor block; 10 - test sample; 11 - bronze contact; 12 - radiator; 13 - current conductor.

Table 1 shows the chemical composition of the research samples and the corresponding technological graphitization indicators.

Table 1. Composition and graphitization metrics.

№	Chemical compoCition, %	Graphitization temperature, °C	Duration of the procedure, hour
1		1600	
2	Coke + molasses	1800	1
3		2200	
4		2500	

Figure 2 shows the electrical scheme of the oven developed for sample graphitization.
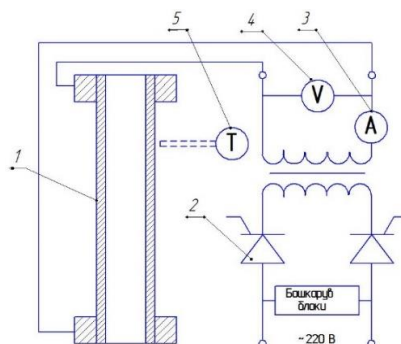
Figure 2. Schematic view of the graphitization process. 1 - sample; 2 - thyristor; 3 – ammeter; 4 – voltmeter; 5 - thermocouple.
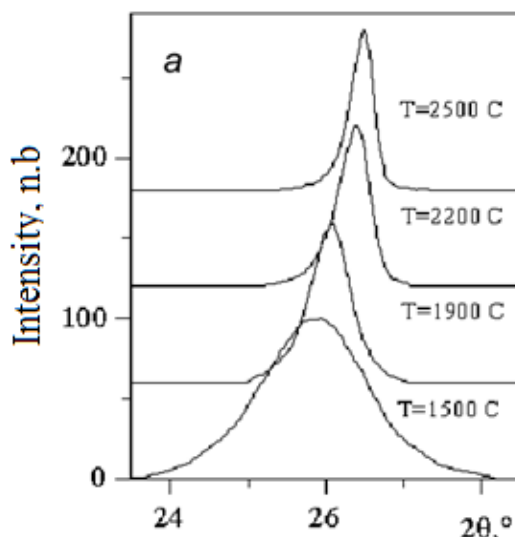
Figure 3. Diffraction profiles of the (002) crystallographic planes
for carbon samples graphitized at different temperatures.

The integral width (β) of the (002) diffraction line decreased from 1.56° to 0.2° with increasing processing temperature, indicating a significant improvement in structural order. This narrowing is attributed to an increase in the average size of the X-ray coherence length (L_s) along the c-axis, which grew from 5 nm at 1500 °C to 45 nm at 2500 °C. Concurrently, the (002) peak position shifted to higher angles (Figure 3), corresponding to a decrease in the interplanar spacing (d_{002}) from 0.344 nm to 0.336 nm. These changes collectively demonstrate enhanced graphitization at higher temperatures, evidenced by crystal growth and lattice tightening.

Analysis and Results

Figure 4 presents the degree of graphitization for samples processed at different temperatures, as determined by quantitative X-ray structural-phase analysis.
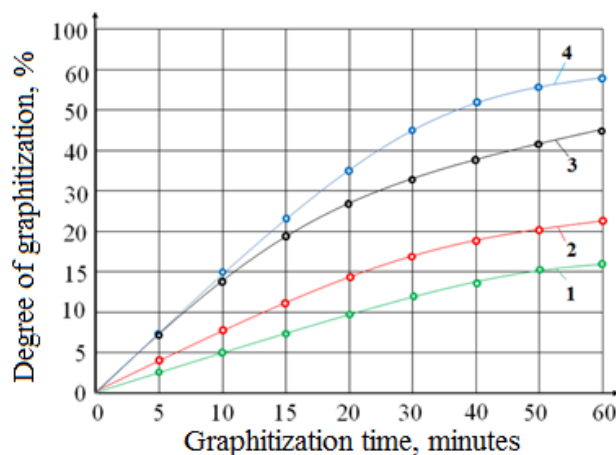
Figure 4. Effect of process temperature on the degree of graphitization of amorphous carbon, showing samples treated at 1600 °C (1), 1800 °C (2), 2200 °C (3), and 2500 °C (4).

The experimental results demonstrate a strong positive correlation between graphitization temperature and the degree of crystallinity achieved within a one-hour isothermal hold. As shown in Figure 4, the graphitization degree increased from 17% at 1600 °C to 22% at 1800 °C, 45% at 2200 °C, and 58% at 2500 °C. This trend

confirms that higher temperatures significantly accelerate the ordering of the carbon structure. However, the failure to reach full graphitization (100%) even at 2500 °C indicates that the process is kinetically limited and that a one-hour duration is insufficient for complete crystallization.

The kinetic principles of graphitization and the influence of binder systems have been extensively studied, notably in the works of Kostikov, Kasatochkin, and Kaverov [10-15]. Their research on systems using petroleum coke as a filler and coal tar as a binder established that the formation of a graphite structure is a multi-stage process, complicated by various kinetic factors, as illustrated in Figure 6. This aligns with the observed property evolution in the present study; for instance, it is well-documented that thermal conductivity increases in direct proportion to the logarithm of the processing time at a given temperature (Figure 5), a trend directly linked to the progressive structural ordering confirmed by our XRD results.
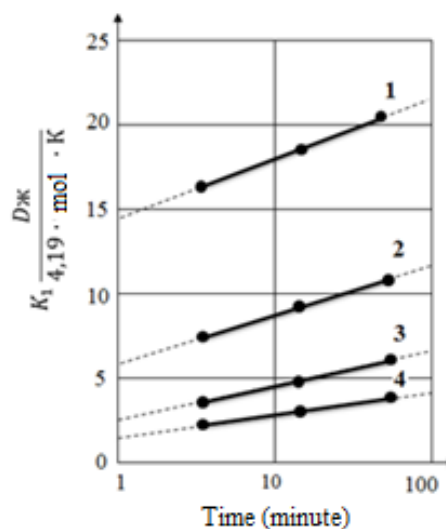
Figure 5. Thermal conductivity as a function of the logarithm of isothermal holding time for samples processed at 1600 °C (4), 1900 °C (3), 2200 °C (2), and 2500 °C (1).
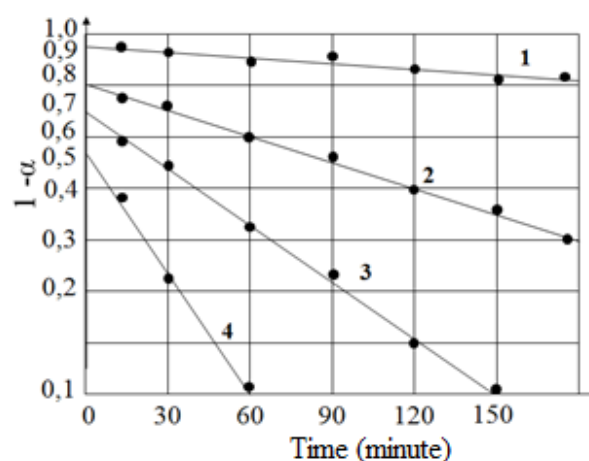
Figure 6. Dependence on (1-α) processing time of petroleum coke at different temperatures (according to V.I. Kasatochkin and A.T. Kaverov). 1 – 2000 °C; 2 – 2150 °C; 3 – 2300 °C; 4 – 2420 °C.

During graphitization of amorphous carbon, the amorphous structure changes to the crystalline structure. One of the important indicators of the graphitization process is

the process temperature. According to the analysis of the literature, graphitization of carbon with an amorphous structure by heating it at a temperature of 1600...2500 ºC ensures the transition of the amorphous structure to a fully crystalline structure (Figure 7) [8].

According to the graph presented in Figure 7 below, the crystallization of amorphous carbon materials increased depending on the temperature of the process and the time of holding at this temperature.
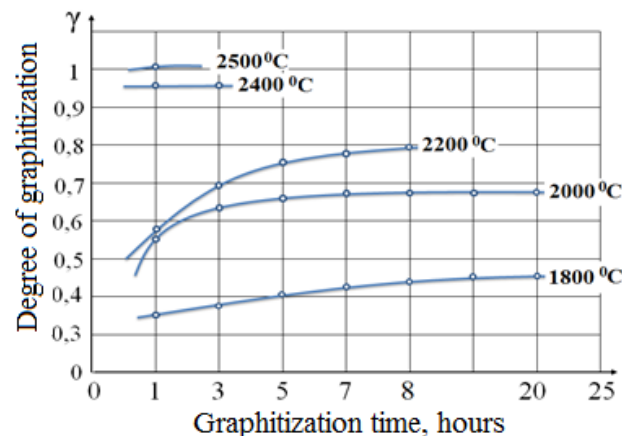
Figure 7. Relation of the graphitization degree and time at different temperatures.

The dependence of graphitization on temperature and time, summarized in Figure 7, aligns with established industrial practices. These practices commonly employ petroleum coke as a filler alongside carbon-rich binders like coal tar or petroleum pitch to facilitate the development of the graphite structure during heat treatment [9-15].

Conclusion

In summary, successfully investigated the graphitization of amorphous carbon samples composed of coke and molasses. The experimental results confirm a strong dependence of the graphitization degree on process temperature, with values increasing from 17% at 1600 °C to 58% at 2500 °C for a one-hour isothermal hold. X-ray diffraction analysis verified this structural evolution, showing a decrease in the interplanar spacing (d_{002}) and an increase in crystallite size (L_s) with rising temperature.

However, the failure to achieve full graphitization (100%) even at 2500 °C underscores the kinetic nature of the process, indicating that time is a critical factor alongside temperature. These findings align with established literature on graphitization kinetics and binder systems. The resulting graphitized material, produced from local raw materials, demonstrates potential for manufacturing products used in electrical engineering and metallurgy.

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UDC: 62, 004.852

ANALYSIS OF MODELS AND ALGORITHMS FOR MANAGING USER DATA IN A REAL TIME SYSTEM

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Annotatsiya. Katta ma'lumotlar texnologiyalari har qanday tahlil turiga yuqori tezlikda va ehtimoliy ma'lumotlar asosida tashxis qo'yish mumkin bo'lgan tarzda erishish uchun ishlatiladi va shu bilan inson va mashina darajasida qaror qabul qilish samaradorligini oshirishga yordam beradi. Taqsimlangan hisoblash tamoyillari katta ma'lumotlar texnologiyalari va tahlil qilish uchun asosiy hisoblanadi. Bir nechta qurilmalarda taqsimlangan ishlov berishdan foydalangan holda ma'lumotlarni saqlash, o'zgartirish, kirish, uzatish, vizualizatsiya va bashoratli modellashtirish bilan bog'liq dvigatellar katta ma'lumotlarni tahlil qilishni inson va mashina iste'moli uchun belgilangan narx va vaqtda amalga oshirishga imkon beradigan asosiy masalalardan biridir. Haqiqiy vaqt tizimlarining eksponent o'sishi foydalanuvchi ma'lumotlarini boshqarish uchun samarali modellar va algoritmlarni talab qiladi. Ushbu tizimlar dinamik va oldindan aytib bo'lmaydigan xizmatlarni boshqarish uchun tezkor ishlov berish, ko'p vaqt talab qiladigan javoblar va yuqori aniqlikni talab qiladi. Ushbu maqolada real vaqtda ishlaydigan turli xil ma'lumotlarni boshqarish modellari va algoritmlarining har tomonlama tahlili keltirilgan. Biz markazlashtirilgan, tarqatilgan, gibrid ma'lumotlar modellarini ko'rib chiqamiz va ularning samaradorligini turli xil real vaqtda dasturlarda taqqoslaymiz. Bundan tashqari, biz indekslash, keshlash va mashinani o'rganishga asoslangan optimallashtirish texnikasi kabi algoritmlarni o'rganamiz. Bizning tadqiqotlarimiz shuni ko'rsatadiki, bir nechta algoritmlardan foydalangan holda gibrid yondashuv ma'lumotlar yaxlitligini saqlash va kechikishni minimallashtirishda maqbul yechimlarni taklif qiladi.

Kalit so'zlar: Raqamli, so'rov, Akka, model, PostgreSQL, Big Data, real vaqt, foydalanuvchi, NoSQL, PostgreSQL, Cassandra.

Аннотация. Технологии больших данных используются для проведения любого типа анализа таким образом, чтобы его можно было диагностировать с высокой скоростью и на основе вероятных данных, что помогает повысить эффективность принятия решений на человеческом и машинном уровнях. Принципы распределенных вычислений занимают центральное место в технологиях обработки больших данных и их анализе. Механизмы, связанные с хранением, модификацией, доступом, передачей,

визуализацией и прогнозирующим моделированием данных, использующие распределенную обработку на нескольких недорогих компьютерах, являются одной из ключевых проблем, позволяющих выполнять анализ больших объемов данных с фиксированными затратами времени для людей и машин. Экспоненциальный рост систем реального времени требует эффективных моделей и алгоритмов для управления пользовательскими данными. Эти системы требуют быстрой обработки, требующей много времени реакции и высокой точности для управления динамичными и непредсказуемыми сервисами. В этой статье представлен всесторонний анализ различных моделей и алгоритмов управления данными, работающих в режиме реального времени. Мы рассматриваем централизованные, распределенные и гибридные модели данных и сравниваем их эффективность в различных приложениях реального времени. Кроме того, мы изучаем такие алгоритмы, как индексация, кэширование и методы оптимизации на основе машинного обучения. Наши результаты показывают, что гибридный подход с использованием нескольких алгоритмов предлагает оптимальные решения для поддержания целостности данных и минимизации задержек.

Ключевые слова: Цифровой, запрос, Akka, модель, PostgreSQL, Big Data, в режиме реального времени, пользователь, NoSQL, PostgreSQL, Cassandra.

Abstract. Big Data technologies are used to achieve any type of analysis in a way that can be diagnosed at high speed and on the basis of probable data, thereby helping to improve the efficiency of decision-making at the human and machine levels. Principles of distributed computing are central to Big Data Technologies and analysis. Engines related to data storage, modification, access, transfer, visualization, and predictive modeling using distributed processing in several low-cost machines are one of the key issues that allow large data analysis to be implemented at a fixed price and time for human and machine consumption. The exponential growth of real-time systems requires efficient models and algorithms to manage user data. These systems require fast processing, time-consuming responses, and high accuracy to manage dynamic and unpredictable services. This article presents a comprehensive analysis of various data management models and algorithms that work in Real time. We look at centralized, distributed, hybrid data models and compare their effectiveness in different Real-time applications. In addition, we study algorithms such as indexing, caching, and machine learning-based optimization techniques. Our findings suggest that a hybrid approach using several algorithms offers optimal solutions in maintaining data integrity and minimizing latency.

Keywords: Digital, request, Akka, model, PostgreSQL, Big Data, real time, user, NoSQL, PostgreSQL, Cassandra.

Introduction

Chatbots are virtual personalities that can effectively chat with any human using their interactive texting skills. Nowadays, there are many Chatbots cloud services like

IBM Watson, Microsoft bot, AWS Lex, Heroku and many others available to develop and improve the chatbot industry. Virtual human is based on the concepts of machine learning and artificial intelligence (AI) and due to the dynamic nature, there are gaps in the design and development of these chatbots because they have AI, NLP, programming and conversion services. This article discusses some of the challenges and suggestions for creating chatbots. In particular, it is proposed to use PostgreSQL and NoSQL Cassandra databases for the preparation and storage of reports in chatbots, and to work with elasticsearch to effectively organize the search system in chatbots.

Literature Review

Ávila a, Papavasiliou N, Löhndorf studied the scientific paper "Computational Parallel and distributed computing for stochastic dual dynamic programming. Author T.We used urazmatov's international scientific thesis on Analysis of big data processing technologies and used our own research and applied research work on methods of Teaching Subjects Based on Mobile Technologies in Higher Education Institutions and Methods of teaching and improving web programming in higher education organizations. We studied the scientific research work of Natalia Shakhovska and other researchers on the topic "Big Data Processing Technologies in Distributed Information Systems". In addition to these, Kay R., Hosmer DW, Burges CJC A, Zhang GP, Landwehr N. the scientific work of researchers such as analyzed and applied in practice.

Research Methodology

Chatbots are one of the most widely used technologies to provide virtual assistance to users when using digital services. Nowadays, chatbot-based virtual assistants are used by many web administrators to mediate and conduct general conversations with users. Such virtual assistants are gaining a lot of attention from business organizations as they help improve customer support; reduces costs in customer service centers and provides an opportunity to work with several customers at the same time. Big data analytics is the process of collecting, organizing, and analyzing large data sets to uncover information such as usage statistics and customer requirements that can serve as business intelligence [4]. This analytics implementation enables chatbots to analyze public knowledge in a distributed environment.

The data collected by chatbots in many companies is big data. This information in today's digital age is being shaped by empowering customers. From a customer perspective, chatbots will need to provide 24-hour customer service, personal interactions, and dramatically reduced wait times. For companies, chatbots lead to time and cost savings, as many processes can be automated and employees can be assigned to more complex tasks [1].

Generally, chatbots have similar technologies and architectures. Figure 1 shows the technical process of a chatbot when a user sends a request until the appropriate response is sent by the chatbot. Users request reports or statistics to manage chatbot behavior.

The process begins with a user request using messengers or widgets on web pages or via SMS. User requests are processed by a mini-program that can handle many

requests at once. This model uses the Play framework and Akka technologies to implement the first parallel and distributed computing [3].
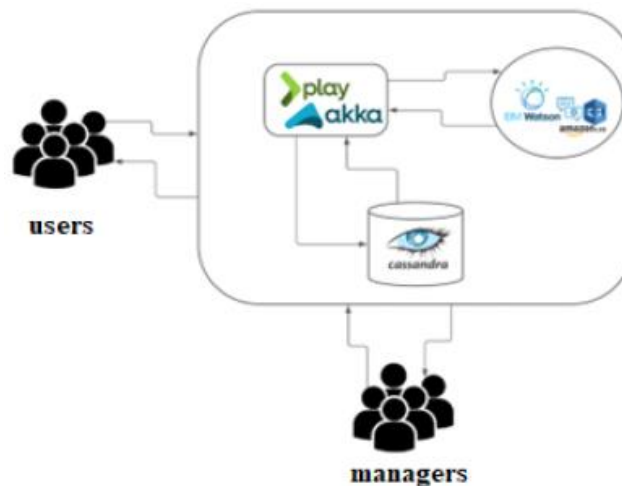
Figure 1. A general model for building a chatbot.

Next, the API of IBM Watson or Amazon Lex, written by NLP and translated into the programming language of the chat engine, is used, which then analyzes the request and redirects it to Play / Akka. To support real-time conversations over time, each process is persisted in the NoSQL database Cassandra [8], and stores data for reporting and statistics.

Advantages of this model:
- quick response to requests;
- ability to continue the conversation after any time. Disadvantages of the model;
- high consumption of RAM;
- reloading slows down by increasing chat (afterrestarting the server during startup);
- elastic reporting and statistical data requirements become ineffective [9].

To solve the reporting problem in the model below Figure 2, you need to add another database that is customized for queries.
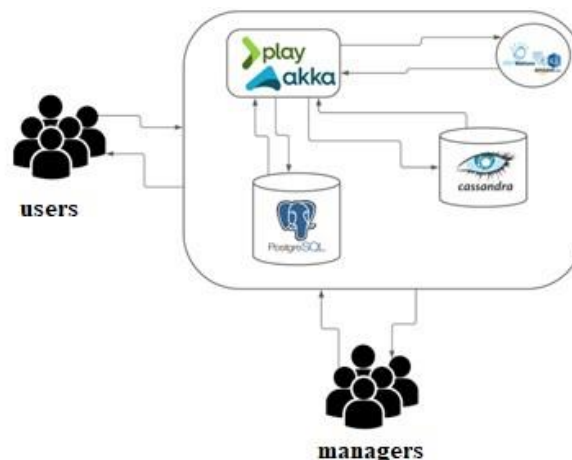
Figure 2. Chatbot model with NoSQL and SQL databases.

PostgreSQL is a database with good compatibility with queries. Now all data is not stored in Cassandra, all data is transferred to PostgreSQL [2]. Data from the last few

days is stored in Cassandra, allowing the conversation to continue in real time without delay. Starts PostgreSQL for reports and statistics.

Advantages of the model:

• quick response to requests;
• possibility to continue the conversation after a few days;
• old data is stored in ROM, new data is stored in RAM.

Model disadvantages:

• it becomes difficult to search for text or phrases within bot or user posts [10].

To improve search from input text, the model should be combined with a search tool that works efficiently with indexes in Figure 3.
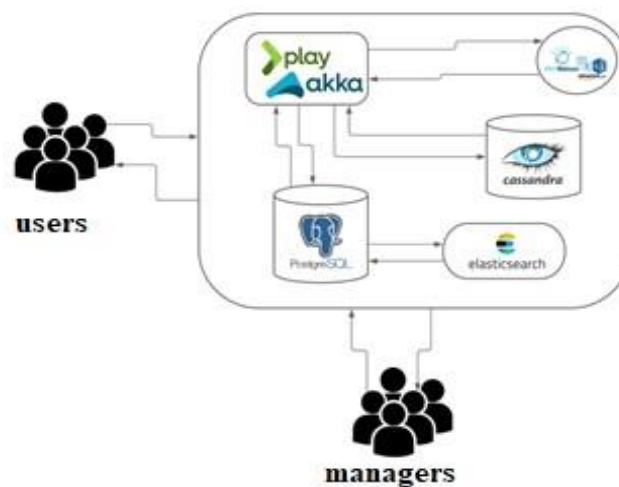
Figure 3. Building with a search engine as Elasticsearch.

Searching for text or phrases in bot or user entries is easy and fast with Elasticsearch. Works with synchronization with PostgreSQL. PostgreSQL is used for basic reporting, but Elasticsearch is used for detailed searches.

Analysis and Results
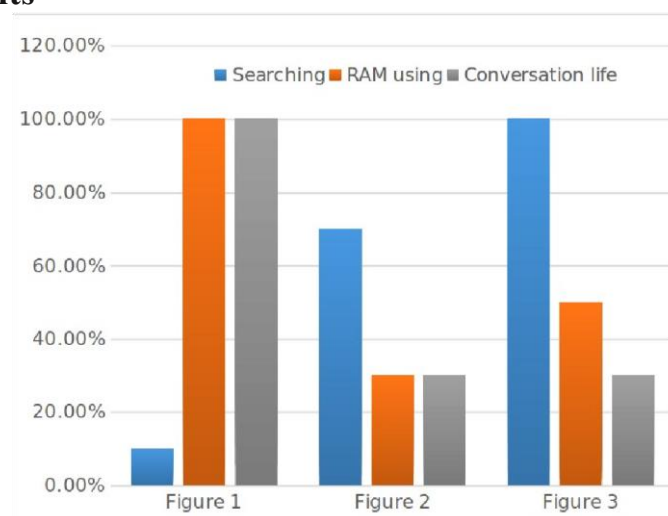
Figure 4. Model of queries in a chatbot.

In Figure 4 the first model can be seen (see Figure 1) fully functional with RAM, but not efficient for reporting and access search. The second model (Figure 2) is good

for reporting, but still not effective for searching. The third model (Figure 3) shows that any search, reporting problems are solved.

Conclusion

The use of new technologies provides many opportunities to improve and optimize the existing system. With the accumulation of data, their processing requires the use of other technologies, because these structures can be further optimized using big data technologies such as Spark, Hadoop, Storm, Kafka.
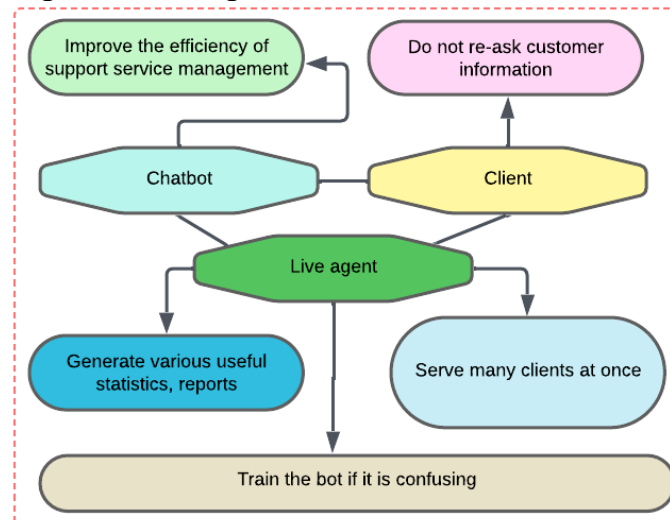
Figure 5. Model of queries in a chatbot.

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ACTUAL PROBLEMS OF NATURAL SCIENCES

OMMERCIAL PROPERTIES OF LIME–AMMONIUM NITRATE OBTAINED ON THE BASIS OF INDUSTRIAL WASTE FROM THE ALMALYK MMC LIME PLANT AND AMMONIUM NITRATE

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Annotatsiya. Kaltsiy (Ca) past elektromanfiylik va yuqori reaktivlik bilan ajralib turadigan metall elementdir. U tabiatda sof shaklda kamdan-kam uchraydi va odatda kislorod va boshqa elementlar bilan birgalikda uchraydi. Noorganik monoatomik Ca kationi Ca^{2+} deb ataladi. Kaltsiy inson tishlari va suyaklarining muhim tarkibiy qismi bo'lsa-da, uning ortiqcha miqdori odamlar va hayvonlarning sog'lig'iga salbiy ta'sir ko'rsatishi mumkin. Ca^{2+} ni o'z ichiga olgan sanoat chiqindilarining ko'pligi odamlar, hayvonlar va o'simliklarning sog'lig'iga ta'sir qiluvchi ekologik muammolarni keltirib chiqaradi va tabiiy geologik manbalar va sanoatlashtirishning kengayishi bilan chambarchas bog'liq.

Ushbu maqolada Olmaliq kon-metallurgiya kombinati (OKMK) ohak zavodining chiqindilarini (ohaktosh chiqindilari – LW) kimyoviy toza erigan ammoniy nitratga qo'shish orqali olingan ohak-ammoniy nitratning tijorat xususiyatlari ilmiy asosda o'rganildi. Tadqiqotda granulalarning mustahkamligi, granulali o'g'itlarning erish vaqti, eritmaning zichligi va yopishqoqligi (reologik xususiyatlari) turli vaqt oralig'i va harorat sharoitlarida o'rganildi.

Kalit so'zlar: *ohaktosh chiqindilari, elektromanfiylik, Olmaliq KMK ohak zavodi chiqindilari, donador o'g'it, tijorat mulki, ammiakli selitra, granulaning mustahkamligi, granulaning erish tezligi.*

Аннотация. Кальций (Ca) — металлический элемент, характеризующийся низкой электроотрицательностью и высокой реакционной способностью. В природе он редко встречается в чистом виде и обычно встречается в сочетании с кислородом и другими элементами. Неорганический одноатомный катион Ca обозначается как Ca^{2+}. Хотя кальций является важным компонентом человеческих зубов и костей, его избыток может негативно влиять на здоровье людей и животных. Обилие промышленных отходов, содержащих Ca^{2+}, создаёт экологические проблемы, влияющие на здоровье людей, животных и растений, и тесно связано с природными геологическими источниками и развитием индустриализации.

В данной статье на научной основе исследованы товарные свойства известково-аммиачной селитры (ИАС), полученной путем добавления отходов известкового завода Алмалыкского горно-металлургического комбината (АГМК) (известняковых отходов – ЛС) к химически чистому расплаву аммиачной селитры. Изучены прочность гранул, время растворения гранулированных удобрений, плотность и вязкость (реологические свойства) расплава при различных временных интервалах и температурных условиях.

Ключевые слова: известняковые отходы, электроотрицательность, отходы известкового завода Алмалыкского ГМК, гранулированное удобрение, коммерческая недвижимость, аммиачная селитра, прочность гранул, скорость растворения гранул.

Abstract. Calcium (Ca) is a metallic element characterized by low electronegativity and high reactivity. It rarely occurs in its pure form in nature and is usually found combined with oxygen and other elements. The inorganic monoatomic Ca cation is referred to as Ca^{2+}. Although calcium is an essential component of human teeth and bones, an excess amount of Ca can negatively affect the health of humans and animals. The abundance of industrial wastes containing Ca^{2+} poses environmental challenges that influence the health of humans, animals, and plants, and is closely associated with natural geological sources and the expansion of industrialization.

In this article, the commercial properties of lime–ammonium nitrate (LAN) obtained by adding waste from the Almalyk Mining and Metallurgical Complex (AMMC) Lime Plant (limestone waste – LW) to chemically pure molten ammonium nitrate were studied on a scientific basis. The research examined the granule strength, dissolution time of granular fertilizers, density and viscosity (rheological properties) of the melt under different time intervals and temperature conditions.

Introduction

At present, one of the main tasks of the chemical industry is to recycle waste materials and involve them in production processes as secondary raw materials. This not only provides economic benefits but also ensures environmental protection [1, 2].

In the activity of the Almalyk Mining and Metallurgical Combine (AMMC) Lime Plant, a large amount of lime waste is generated. The main component of this waste is $CaCO_3$ (calcium carbonate), which also contains small amounts of CaO, MgO, and mechanical impurities.

Ammonium nitrate is one of the most widely used nitrogen fertilizers in the world; however, its high hygroscopicity and explosiveness pose certain risks during storage and transportation. Therefore, the production of lime–ammonium nitrate (LAN) has been proposed as a scientifically based solution to improve its stability and physical properties [3].

The introduction of waste lime reduces the hygroscopicity of ammonium nitrate and increases its physical stability. This, in turn, allows for long-term storage and safe transportation of the product.

In this article, the possibilities of efficient utilization of waste materials generated at the Lime Plant of the Almalyk Mining and Metallurgical Combine (AMMC) were scientifically investigated. Lime–ammonium nitrate (LAN) was synthesized based on ammonium nitrate (NH_4NO_3) and lime waste ($CaCO_3$). The chemical composition, physical and commercial properties, hygroscopicity, granule strength, and storage stability of the obtained product were analyzed. The research results demonstrated that LAN has high stability, significant agronomic value, and economic efficiency.

Research Methodology

The experiments were carried out under laboratory conditions in a stainless-steel reactor made of 12X18N10T grade metal, equipped with a special metal clamp. A measured amount of pure commercial ammonium nitrate (AN) was placed into the stainless-steel reactor (beaker-type) and heated with an electric heating plate until it melted. The required proportion of lime plant waste (limestone waste – LW) was then added to the molten AN. The weight ratio of AN:LW ranged from 100:2.5 to 100:45. The resulting lime–nitrate melts were thoroughly mixed with a glass rod at a temperature range of 165–170 °C for up to 7 minutes to ensure homogeneity. At the final stage, the lime–nitrate melt was poured into a specially designed stainless-steel granulator. From the 9th floor of the building, the molten mixture was released into a special collector located on the ground level, where the granular fertilizer was collected.

Analysis and Results

The strength of the lime–ammonium nitrate (LAN) granules obtained on the basis of waste from the Almalyk MMC Lime Plant (limestone waste – LW) is of great

practical importance, as it determines not only their physico-mechanical properties but also their long-term storage capability. This property is generally associated with the composition of the fertilizer, the structure of its elementary particles, and the nature of molecular interactions between these particles.

It is well known that the strength of fertilizer granules is directly dependent on the product's moisture content and porosity. Carbonate additives (limestone) in calcium–ammonium nitrate possesses the ability to bind residual moisture and also influence the structure of its crystals. The strength of granules with a diameter of 2–3 mm was measured using the MIP-10-1 device according to the method described in [4]. The strength of granules was determined for ammonium nitrate samples containing varying proportions of lime plant waste (LW) and ammonium nitrate, in the mass ratio AN:LW = 100:(2.5–45). For comparison, the granule strength of pure ammonium nitrate was also measured. The experimental results are presented in Table 1.

Table 1. The strength of granular LAN.

Mass ratios $NH_4NO_3:CaCO_3$	Strength of the granules		
	kg/pc	kgs/sm^2	Mpa
Granular NH_4NO_3 "t" variety	0,67	13,50	1,32
Limestone with AS	0,80	16,12	1,58
100:2.5	1.605	32.35	3.17
100:5	1.688	34.03	3.33
100:10	1.771	35.71	3.49
100:15	1.855	37.39	3.66
100:18	1.966	39.625	3.88
100:20	2.077	41.90	4.10
100:22	2.188	44.155	4.32
100:25	2.30	46.41	4.55
100:30	2.35	47.42	4.64
100:35	2.40	48.43	4.74
100:40	2.45	49.44	4.83
100:45	2.50	50.45	4.94

Table 1 shows that adding lime factory waste (limestone fines — OTQ) to the ammonium nitrate slurry significantly increases granule strength. The greater the amount of limestone fines (OTQ) in the ammonium nitrate slurry, the higher the product strength. Thus, when the mass fraction of limestone fines (OTQ) per 100 parts of ammonium nitrate increases from 2.5 to 45, granule strength rises from 3.17 to 4.94 MPa. This indicates that the OAS with the highest granule strength has an AS:OTQ mass ratio of 100:45. For comparison, the strength of pure AS granules without additives is 1.32 MPa, while that of the nitrate containing a magnesium additive (0.28% MgO) is 1.58 MPa [5, 6, 7]. Thus, the observed increase in nitrate granule strength indicates a reduction in porosity and internal specific surface area, which reduces the penetration of diesel fuel into the granules and, consequently, lowers the explosibility of the nitrate. The dissolution rate of ammonium nitrate sample granules in water. A high dissolution rate of ammonium nitrate granules is one of the causes of the

fertilizer's unfavorable commercial and physicochemical properties: it promotes caking during storage and leads to substantial nutrient losses due to leaching from the soil with percolating (melt) water.

An increase in the dissolution time of granules is considered an important issue in the development of highly efficient fertilizers based on ammonium nitrate. Therefore, we conducted a study to determine the dissolution rate of ammonium nitrate granules obtained from a melt of ammonium nitrate and limestone fines (OTQ). The dissolution rates of the obtained fertilizers are presented in Table 2. As seen from the table, the presence of limestone fines (OTQ) in the composition of ammonium nitrate affects the dissolution rate of the granules.

The complete dissolution time of pure AS granules is 44.60 seconds, while that of AS with a magnesium additive (0.28% MgO) is 46.80 seconds. In fertilizer samples where the proportion of lime plant waste (limestone fines — OTQ) mixed with nitrate increases from 2.5 to 45 g per 100 g of ammonium nitrate, the complete dissolution time of granules increases from 53.80 to 100.60 seconds.

Table 2. Dissolution rate of LAN granules.

Mass ratios $NH_4NO_3:CaCO_3$	Time for complete dissolution of granules, seconds					Average value
	1	2	3	4	5	
Granular NH_4NO_3 "t" variety	45	47	42	43	46	44.60
AS with magnesium additive (0.28% MgO)	51	42	47	51	43	46.80
100:2.5	54	56	48	59	52	53.80
100:5	59	56	57	65	55	58.40
100:10	64	57	65	71	59	63.20
100:15	68	58	74	75	61	67.20
11:18	70	65	75	84	69	72.60
100:20	71	71	76	91	77	77.20
100:22	72	78	75	97	86	81.60
100:25	73	86	77	102	93	86.20
100:30	75	87	84	97	99	88.40
100:35	77	88	93	100	107	93.00
100:40	78	89	102	92	112	94.60
100:45	80	91	112	101	119	100.60

This indicates that the resulting fertilizers are washed out from the soil significantly more slowly (by about 1.5 times) compared to pure AS. Thus, according to the results of the study, the addition of lime plant waste (limestone fines — OTQ) to the ammonium nitrate melt, followed by granulation of the pulp in a granulation tower, makes it possible to produce high-quality OAS with improved physicochemical properties.

In Table 3, Limestone Gyre (Limestone Gyre-OTQ) The density of the mixture increases steadily with increasing calcium carbonate content. For example, at 170 °C, the density increases from 1.448 g/cm^3 (100:5 ratio) to 1.612 g/cm^3 (100:45 ratio). This is explained by the high molecular density of CaCOa (2.7 g/cm^3). With increasing

temperature (165 --> 180 °C), a decrease in density was observed, which is associated with thermal expansion and structural shrinkage in the material.

Table 3. Rheological properties of LAN

Mass ratios $NH_4NO_3:CaCO_3$	Density (g/cm^3) at temperature, °C				Viscosity (cP) at temperature, °C			
	165	170	175	180	165	170	175	180
AS with magnesium additive (0.28% MgO)	-	1,450	1,448	1,446	-	5,71	5,34	5,02
100:2.5	165	170	175	180	165	170	175	180
100:5	–	1,450	1,448	1,446	–	5,71	5,34	5,02
100:10	1.540	1.472	1.451	1.448	9.12	8.90	8.54	8.42
100:15	1.561	1.487	1.464	1.458	10.31	9.95	9.39	9.07
11:18	1.573	1.503	1.476	1.469	11.49	10.92	10.25	9.71
100:20	1.582	1.518	1.488	1.481	12.68	12.05	11.12	10.36
100:22	1.594	1.533	1.501	1.495	13.86	13.07	11.96	11.04
100:25	1.617	1.549	1.516	1.509	15.05	14.16	12.82	11.65
100:30	1.626	1.564	1.525	1.517	16.23	15.21	13.67	12.30
100:35	1.635	1.579	1.538	1.524	17.42	16.26	14.53	12.95
100:40	1.652	1.595	1.551	1.535	18.62	17.32	15.39	13.59
100:45	1.663	1.612	1.563	1.548	19.79	18.32	16.24	14.26

Change in viscosity. In Table 3, the viscosity increases sharply as the amount of CaCOa in the mixture increases. At 165 °C, the viscosity is 5.71 cP_z in a 100:5 mixture, while at 100:45, the viscosity reaches 19.79 cP_z. This is explained by the increase in mechanical resistance and interionic bonding within the layer.

The decrease in viscosity with increasing temperature (for example, 19.79 --> 14.26 cP_z at 165 --> 180 °C) is due to the increase in the freedom of movement of the molecules of the liquid phase.

Conclusion

An increase in the proportion of calcium carbonate in the NH_4NO_3 - Lime factory waste (limestone edge-OTQ) CaCOa mixture increases the density and viscosity. An increase in temperature reduces both indicators, that is, the mixture becomes closer to the liquid phase. The optimal mass ratio for the OAS product was considered to be 100:20- 25, since in this case the density is stable, and the viscosity is at a level convenient for technological processing.

Calcium elements contained in OAS neutralize the acidic environment of the soil and improve its structure. Also, the presence of calcium accelerates the assimilation of nitrogen by plants. When waste from the Almalyk KMK Lime Plant is processed together with ammonium nitrate, a new type of stable and agronomically valuable mineral fertilizer is formed - ammonium nitrate of lime (OAS).

The use of waste is environmentally and economically effective, reducing waste reserves. The OAS product has low hygroscopicity, strong granules and a long shelf life. OAS is recommended for use in agriculture as a nitrogen-calcium complex fertilizer.

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CARTOGRAPHIC ANALYSIS OF TERRITORIAL ASPECTS OF THE PROVISION OF PRESCHOOL EDUCATIONAL INSTITUTIONS OF THE POPULATION OF KHOREZM REGION

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Annotatsiya. Ushbu tadqiqot ishida O'zbekiston Respublikasi maktabgacha ta'lim muassasalariga doir ma'lumotlarini tadqiq qilgan holda, Xorazm viloyati maktabgacha ta'lim muassasalari va ularning hududiy jihatlari kartografik tahlil qilingan.

Kalit so'zlar: maktabgacha ta'lim muassasalari, tarbiyalanuvchilar, pedogog kadrlar, hududiy jihatlar, ijtimoiy geografik ko'rsatkichlar.

Аннотация. В данном исследовании на основе изучения данных о дошкольных учреждениях Республики Узбекистан проведен картографический анализ дошкольных образовательных учреждений Хорезмской области и их территориального аспекта.

Ключевые слова: дошкольные образовательные учреждения, воспитанники, педагогические кадры, территориальный аспект, социально-географические показатели.

Abstract. In this research work, kindergartens in the Khorezm region and their territorial aspects were analyzed using a cartographic approach based on the study of data on kindergartens in the Republic of Uzbekistan.

Keywords: *kindergartens, children, pedagogical personnel, territorial aspects, cartographic method, social geographic indicators.*

Introduction

Preschool educational institutions are considered a key factor in shaping the intellectual, physical, and social potential of children at the earliest stages of development, especially between the ages of 0–5. According to the World Bank, more than 250 million children under the age of five in low- and middle-income countries are not reaching their developmental potential, with only about 20% of them having access to preschool education. Globally, only 60% of children aged three to six are able to attend preschool institutions. Thus, this period is regarded as the most effective and cost-efficient investment stage, and the results of investments made during this period bring significant long-term benefits.

Empirical research clearly demonstrates the socio-economic benefits of preschool education. According to studies conducted by James Heckman and colleagues, for every dollar invested, society gains more than $7, and in some cases, $7–$10. The main outcomes observed in participants of the Abecedarian program include an increase of 1.8 levels in reading and 1.3 in mathematics, a significant rise in the likelihood of admission to higher educational institutions, and a reduction in crime and social assistance dependency. Moreover, it has been proven that quality preschool programs significantly enhance the literacy and numeracy skills of underprivileged children. This, in turn, contributes to reducing corruption in education, strengthening social stability, and supporting economic growth.

The upbringing of the younger generation, the future of our country, and the provision of quality education highlight the crucial role of preschool institutions within the education system. Establishing the preschool system as the first stage of continuous quality education that meets all requirements is of great importance in nurturing talented youth who will contribute to the development of the nation. The experience of developed countries demonstrates that ensuring the population has access to continuous, quality education and modern educational institutions is one of the most essential principles of sustainable development. Similarly, the fourth goal of the United Nations "Sustainable Development" agenda focuses on "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all."

In the "Uzbekistan-2030" strategy, reforms are outlined to elevate the preschool education system to a new stage and ensure complete coverage of children. In particular, according to Presidential Decree PD-308 of 2024, *"On measures for the development of public-private partnership in the Republic of Uzbekistan for 2024–2030"*, from 2026 onward at least 100 schools and 100 preschool institutions will be built and managed each year based on public-private partnership principles. The goal is to create preschool facilities with a capacity of more than 300,000 children.

Literature Review

Many studies have been conducted to study the territorial characteristics of preschool educational institutions, analyze their economic, social, and demographic characteristics. In particular, Hallak J. emphasized the need to pay attention to demographic, economic, social, and political aspects of regional planning when choosing a convenient geographical location, as well as to take into account distance and time, and the infrastructure of the region. Also, researcher Mendes D., in his research on the location of educational institutions, points out 9 main factors affecting the location of educational institutions.

In Uzbekistan, scientific research works by Otamirzayev O., Soliyev A., Nazarov M.I. devoted to individual sectors of public service sector are of particular importance.

The aim of this research is to analyze the geographical characteristics of preschool institutions, to identify existing problems and shortcomings, and to develop opinions and recommendations on the territorial organization of preschool institutions.

Research Methodology

Statistical, comparative, systematic analysis, comparison, cartographic analysis methods were used in the scientific work.

Results and Analysis

As a result of reforms in the education system in recent years, significant positive outcomes have been achieved. For example, in 2019 there were 7,104 preschool institutions in operation, of which 5,066 (79%) were state-owned, 63 were departmental, and 1,473 (21%) were non-state institutions. According to 2023 statistics, their number increased nearly fivefold, reaching 35,973. According to data from the State Statistics Committee of the Republic of Uzbekistan, the long-term average annual growth rate of the population is 1.7–1.8%. Considering that the mortality rate among preschool-aged children is lower than in other age groups, the growth rate of children aged 3–7 is higher than that of the overall population. Statistics indicate that more than 700,000 children are born annually in Uzbekistan, which in turn increases the demand for preschool institutions. As a result of reforms in the preschool education system, both the number and quality indicators of institutions have risen significantly. In terms of the number of preschool institutions, Fergana region (1,089), Samarkand region (969), and Tashkent city (927) lead the country. Meanwhile, in terms of preschool coverage of children aged 3–6, the highest indicators are observed in Bukhara (81.2%), Navoi (80.6%), and Andijan (79.6%) regions, while the lowest are in Kashkadarya (56.2%), Surkhandarya (59.8%), and Tashkent region (66.5%). In Khorezm region, this indicator stands at 79.5%.

In the Khorezm region, there have also been positive changes in the organization of preschool institutions and the establishment of a quality education system. For example, in 2010 there were 357 preschool institutions in the region, while in 2023 their number reached 2,065. According to statistical data of Khorezm region, the highest numbers of preschool institutions are found in Khazorasp (355), Gurlan (223), and Shovot (207) districts. The lowest indicators are observed in Tuproqqal'a (50), Yangibozor (81), (see Figure 1).
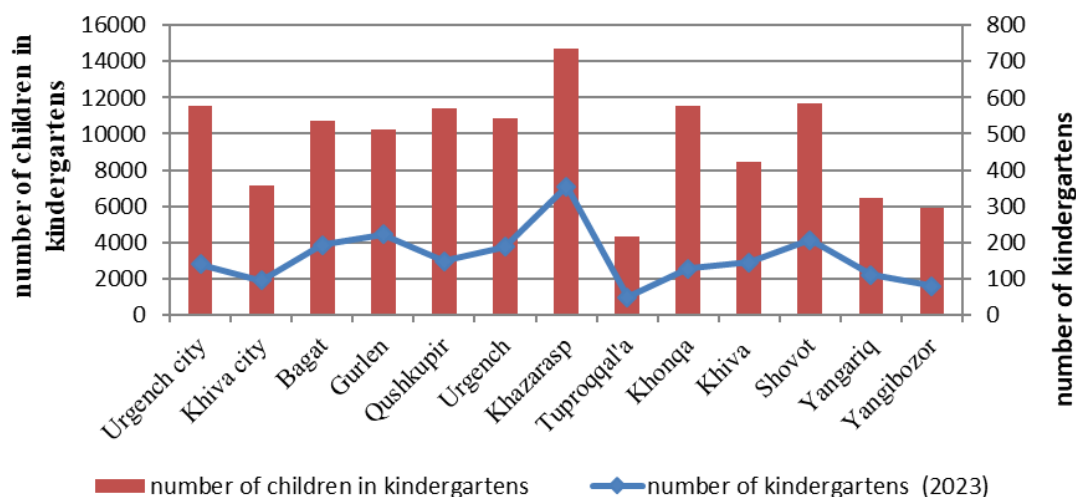
Figure 1. Prepared by the authors based on the data of the "Statistics Committee."

However, a high number of preschool institutions does not necessarily mean full coverage of demand. Therefore, it is important to analyze the ratio of the number of preschool-aged children to available places in these institutions in each district.

The indicator of provision with places in preschool institutions (per 1,000 children) is determined by dividing the number of available places in preschool organizations by the number of children aged 3–6 and multiplying by 1,000. According to this indicator, the coverage rate of children aged 3–6 in Urgench city exceeds 80%, while in other districts and cities it is below 80% (see Figure 2).
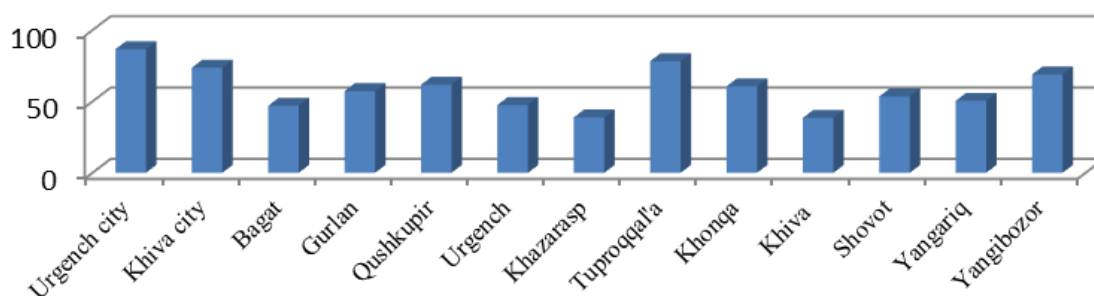
Figure 2. Prepared by the authors based on the data of the Statistics Department (2023).

The organization of quality education in preschool institutions is strongly influenced by pedagogical staff. In 2010, there were 56,476 pedagogical personnel working in preschool education across the country, while by 2023 their number had increased nearly threefold, reaching 167,570.

In Khorezm region, the territorial distribution of preschool institutions is largely aligned with the population and demand. However, about one-fifth of nearly 200,000 children of preschool age remain uncovered. The highest coverage rates are recorded in Urgench and Khiva cities, while the lowest are in Urgench district (57%), Khiva district (53%), and Khonqa district (59%) (see Figure 3).
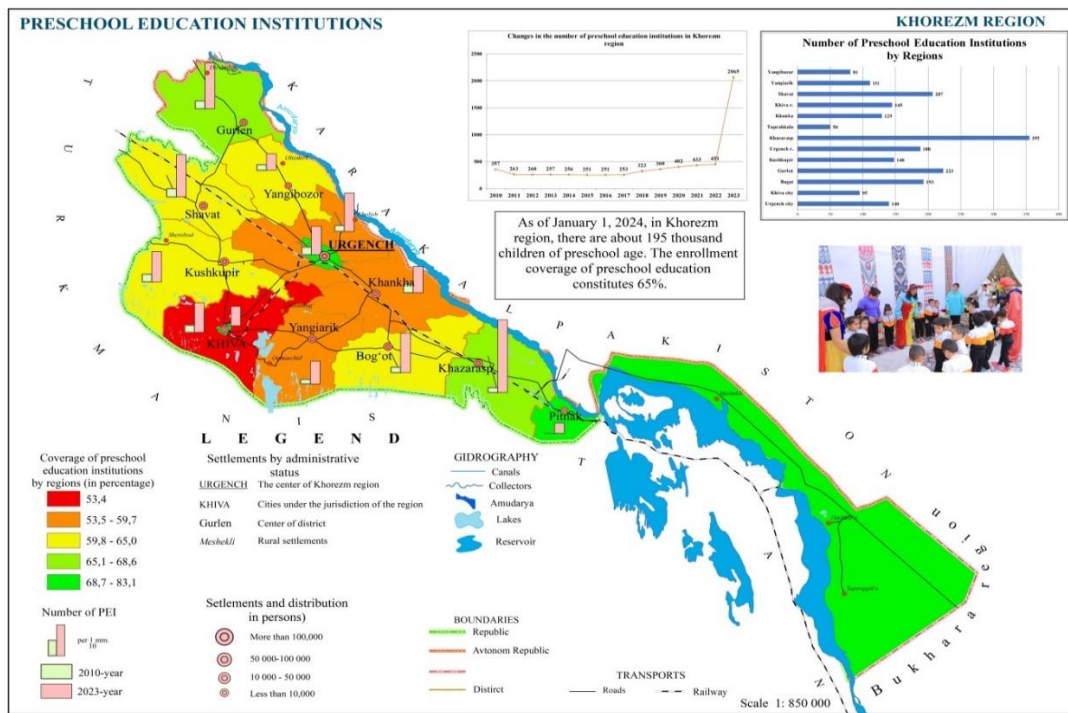
Figure 3. Map of preschool educational institutions in the Khorezm region.

When distributing preschool institutions across the region, it is necessary not only to consider coverage but also to ensure their rational placement. For example, in locating institutions, indicators such as potential demand for the next 20–30 years, accessibility, infrastructure opportunities, and possible changes must be taken into account.

According to the analysis, several factors affect the placement of preschool institutions:

- **demographic factors**-demographic indicators are of primary importance in determining the placement of preschool institutions. The territorial distribution of children, age structure of the population, birth rates, and population density determine the demand for preschool institutions. For instance, in areas with high birth rates and dense populations, it is necessary to build more preschools. Therefore, regular monitoring and analysis of demographic indicators are crucial for the optimal location of preschool institutions;

- **socio-economic conditions**-the level of income of the population, labor market activity, and government budget allocations to education directly affect the placement and capacity of preschool institutions. In high-income and economically developed areas, private preschool institutions are more common, while in economically underdeveloped areas there is a greater need for state-supported institutions. In addition, building preschools near parents' workplaces helps to effectively meet social needs;

- **territorial planning and infrastructure**-when building preschool institutions, factors such as transport accessibility, safety requirements, availability of green spaces, environmental conditions, and urbanization processes must be considered. The differences between urban and rural areas are also important: in cities, traffic density and land scarcity present challenges, while in villages population dispersion requires

specific approaches to placement. Thus, the effective organization of preschool institutions requires comprehensive planning that harmoniously integrates demographic, economic, and territorial factors.

Conclusion

Preschool educational institutions (PEIs) are among the most important factors that determine the social status of the population and the quality of education. The number of PEIs, their optimal distribution across regions, the stability of their activities, the adequacy of infrastructure and material-technical resources, as well as the qualifications of pedagogical personnel, are crucial issues in raising a mature and well-rounded young generation who will serve the future of the country.

In Khorezm region, it is advisable to take into account the annual dynamics of population growth and social stability when determining the optimal location of preschool institutions. These indicators provide opportunities to evaluate potential demand. In addition, infrastructure conditions in different districts and the accessibility of transport are also among the key factors ensuring the sustainability of preschool institutions.

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SOME ISSUES OF CARTOGRAPHIC RESEARCH IN THE EFFECTIVE USE OF TOURISM OPPORTUNITIES

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Annotatsiya. Ushbu maqolada turizm imkoniyatlarini oshirishda kartografik tadqiq qilishning ilmiy nazariy asoslari hamda oʻziga xos jihatlari tahlil qilingan. Turizm imkoniyatlarining hududiy jihatlari Respublikamiz hamda Xorazm viloyati misolida qisqacha tadqiq qilingan.

Kalit soʻzlar: turizm, tur operatorlar, turistik xaritalar, turizm atlaslari, mavsumiy turizm, madaniy turizm, sport turzimi, davolash va dam olish turizmi, ta'lim turizmi agroturizm.

Аннотация. Научно-теоретические основы картографических исследований в расширении туристических возможностей. В статье анализируются научно-теоретические основы и конкретные аспекты картографических исследований в расширении туристических возможностей. Территориальные аспекты туристических возможностей кратко изучены на примере нашей Республики и Хорезмской области.

Ключевые слова: туризм, туроператоры, туристические карты, туристические атласы, сезонный туризм, культурный туризм, спортивный туризм, лечебно-оздоровительный туризм, познавательный туризм, агротуризм.

Abstract. Scientific and theoretical foundations of cartographic research in increasing tourism opportunities. This article examines the scientific theoretical foundations and specific aspects of cartographic research aimed at enhancing tourism opportunities. The territorial aspects of tourism opportunities are briefly studied in the example of our Republic and the Khorezm region.

Keywords: tourism, tour operators, tourist maps, tourism atlases, seasonal tourism, cultural tourism, sports tourism, medical and recreational tourism, educational tourism, agrotourism.

Introduction

At present, countries around the world are paying great attention to the development of tourism and related service sectors. Developing the industry through various and colorful methods and thereby attracting more tourists has become one of the pressing issues. Of course, the practical importance of marketing, as well as advocacy and propaganda, is very great in developing the industry and achieving significant success.

In countries with developed tourism, tour operators organize free services (in particular, tours, tourist maps, visits to museums, and souvenirs), various festivals, and

carnivals to increase the flow of visitors. All of this is done based on clearly planned projects.

In this process, it is worth emphasizing the importance of tourist signposts (guides), maps, and site plans that provide information about the tourist and recreational potential of the area, regional differences, opportunities, and tourist routes.

Literature Review

Scientists such as Senin V., Bogolyubov V.S., Durovich A.P., Efremova M.V., Kvartalnov V.A., Zhulidov S.B., Skobkin S. and Ilyina E.N. have been engaged in and conducted scientific research on the characteristics of tourism development in foreign countries, identifying its problems and solving existing problems. Scientists such as Pardayev M.Q., Tukhliyev I.S., Kudratov G.H., Khomidov O., Turayev B., Usmanova D., Ibadullayev N., Amriddinova R., and Alimova M. have conducted research on the issues and regional characteristics of tourism development in Uzbekistan.

Research Methodology

Khashimov Sh.J. analyzed the issues of the development of cultural tourism in Uzbekistan and its impact on the improvement of the country's international image in the development of cultural tourism. Kurbanova M. scientifically substantiated the history of the origin of religious tourism, pilgrimage and tourism, theoretically explained the essence of their concepts, and analyzed the definitions given by foreign scientists. Roman M., Togaymurodov E. studied the possibilities of developing agrotourism on the example of farms in the Samarkand region using statistical analysis and logistic regression methods. Azamova S.A. philosophically substantiated the fact that the ecological environment of Uzbekistan is changing due to the process of ecological globalization, that ecological relations have developed normatively as a result of historical experiences, that national ecological views, imagination and knowledge have influenced the development of world ecological culture and are adequate to them. Daminov M. described the ways to develop adventure tourism, the regions where adventure tourism is developed, the differences between tourists participating in adventure tourism, the directions of adventure tourism, the problems in adventure tourism, the importance of adventure tourism, the income that countries receive through this tourism, the role of marketing in the tourism sector, the shares of participants in adventure tourism and solutions to them.

Analysis and Results

Tourist maps are geographical maps designed for tourism purposes. Tourism atlases, maps, and diagrams are mass cartographic products intended for a wide range of consumers, and their creation is one of the most interesting and promising areas in modern cartography. Tourist maps are a special application that allows you to take advantage of various benefits and discounts when travelling around a city, region, or country. They are often designed to encourage tourism, save money for tourists, and provide convenience for them. At the same time, tourist sites are also created for purposes such as designing routes and assessing tourist opportunities. Tourists visiting the region use these cartographic guides to organize independent routes, make

operational decisions, optimally use transport options, quickly and easily identify places of interest, reduce costs, and obtain more extensive additional information about the region. At the same time, signposts, maps, and site plans are closely linked to providing tourists with information about attractions and other useful materials.

The role of tourist maps in the system of socio-economic cartography is very important. They have always been closely related to population and location, service, and transportation maps, as well as physical maps depicting relief, landscape, climate, and river networks. Building on the achievements of many areas of socio-economic cartography, using knowledge from tourism statistics and a number of natural and humanities sciences, by the beginning of the 21st century, tourism maps had become an independent and highly sought-after section in cartography.

At the same time, the following requirements are imposed on tourist maps:
- Special attention to the clarity, expressiveness, and readability of the cards;
- Carefully develop artistic design in terms of color, brightness, and graphics;
- Using large devices that take up more space than the card itself;
- The presence of images, photographs, instructions, texts, and various references;
- Ease of use (format, composition, folding).

In turn, tourism maps are divided into several types, each of which has its own unique capabilities and advantages.

By territorial scope
1. City tourism maps: designed for a specific city or its surrounding attractions (e.g., Dubai, London, and Istanbul tourist maps). These maps are considered a very important resource in major tourist cities;
2. Regional tourist maps: covers a large region or several cities (e.g., maps for Central Asia, Southeast Asia, and Western Europe). For example, for tourists visiting the Benelux region, such maps make it very convenient to organize an excursion;
3. Country tourism maps: designed for use when traveling throughout a country (e.g., Greece, Turkey, or Italy tourism maps);
4. Seasonal tourism maps: maps designed for a specific season or theme (for example, spring hiking in the mountains and deserts, winter sports, summer beach, or Umrah or Hajj pilgrimage);
5. Cultural tourism maps: maps depicting historical, cultural, and architectural sites of the regions and providing an introduction to them. For example, the cities of Ancient Rome, Athens, Paris, Khiva, Samarkand, etc;
6. Sports tourism maps: mountain, hiking, water, skiing, horse riding, motorcycle, caving, and cycling tourism Today, tourism destinations associated with the organization of various sports competitions are very well developed worldwide. For example, tennis tournaments (Australian Open, US Open, English Premier League, etc.);
7. Maps of treatment and recreation tourism or medical tourism: sanatorium-resort (stationary) and expeditionary (on foot, water, horseback, or bicycle). These maps usually depict facilities and resources that are convenient for recreation and

treatment. For example, Hawaii, the Bahamas, the Alps, the Chimian Mountains, Miraki, and others;
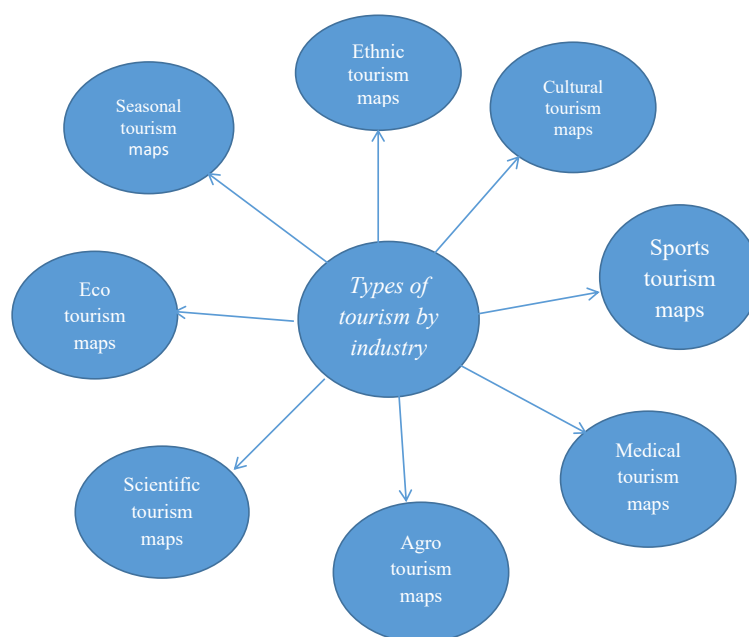
Figure 1. Types of tourism by industry.

8. Agrotourism maps: maps that provide an opportunity to get acquainted with the unique achievements and products of agriculture, indicate the specialization areas and main centers of the region, and also provide recommended routes;

9. Research or scientific tourism maps: architectural monuments, historical and cultural attractions, or other objects relevant to each scientific research area are depicted. For example, tourist maps depicting savannas and their biodiversity;

10. Educational tourism maps: provides information about educational centers, universities, colleges, language schools, seminars, business training, and more by region;
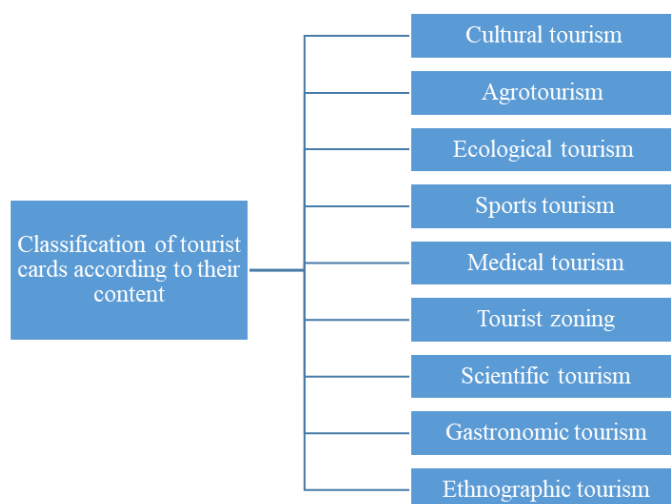
Figure 2. Classification of tourist cards.

11. Ecotourism maps: provides information on nature conservation, national parks and reserves, and their territorial features. For example, maps of the unique forest landscapes of the Lower Amu Darya can be used to create ecotourism routes;

12. Ethnic (ethnographic) and pilgrimage (religious) tourism maps: provide information about historical and architectural museums, ethnographic villages, ancient customs, and rituals. For example, Swedish cultural values, Hindu holidays, Zoroastrian religious rituals, and so on.

Of course, maps on the organizational form of tourism, assessment of tourism potential, and tourist zoning can also be included. Currently, as in other areas of cartography, animated and web maps based on modern information technologies are being created for the creation of tourism maps, and the possibilities of using them are expanding further.

Conclusion

In summary, it should be noted that the process of creating tourism maps consists of such stages as forming a database; collecting geodetic and cartographic sources, forming a geographical basis, forming statistical sources, preparing a map program and publishing it. The creation and use of tourism maps in our republic is less developed than in countries with developed tourism. However, there is a great need for tourist maps to promote and organize the huge tourist potential of the republic. In particular, using the example of the Lower Amu Darya Basin, which is rich in tourism resources, we can demonstrate the tourist potential of the region by compiling tourist maps and atlases on various topics. In the case of the Khorezm region, the development of these areas of tourism can be stimulated by mapping cultural and archaeological sites (maps of cultural heritage sites), agrotourism (specific methods of rice cultivation, melon and orchard and grape cultivation), gastronomic tourism maps (regional dishes: tukhum barak, ijjon, durvadik patir, and fish dishes), and ecological tourism (reserves with unique forest landscapes and lake landscapes). Also, it should be noted that the development of the tourism market is creating a need for many areas, including a growing demand for cartographic products (geographic maps and atlases). It will help incoming tourists get to know our country better, with its natural conditions and social and economic potential, and serve as a guide for them. To this end, the creation of systematic tourist maps of our republic and individual regions would contribute to the increase in the flow of tourists.

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ACTUAL PROBLEMS OF MATHEMATICS, PHYSICS AND MECHANICS

UDC: 53, 537, 539

MODELING THE INTERACTION PROCESSES OF FULLERENE C_{20} WITH GRAPHENE

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Annotatsiya. Maqolada molekulyar dinamika usullari (LAMMPS) yordamida C_{20} fulleren va grafen o'rtasidagi o'zaro ta'sir jarayoni o'rganildi. C_{20} fulleren molekulasi grafen bilan to'qnashgandan so'ng, fulleren darhol orqaga qaytmasdan, balki grafen yuzasiga yopishib qolishi ya'ni adsorbsiya xolatlari aniqlandi. Shunungdek C_{20} fulleren 1-35 eV energiyalarda grafen sirtiga tushirilganda grafenni teshib o'tishi va to'zg'ish jarayonlari kuzatildi.

Kalit so'zlar: grafen, fulleren, modellashtirish, sirt, sakrash, adsorbsiya, energiya, to'qnashuv, to'zg'ish.

Аннотация. В работе исследован процесс взаимодействия фуллерена C_{20} с графеном с методами молекулярной динамики (LAMMPS). Установлено, что после столкновения молекулы фуллерена C_{20} с графеном сразу не отскакивает, а прилипает к поверхности графена, то есть образует адсорбции. Кроме того, при падении фуллерена C_{20} на поверхность графена в диапазоне энергий 1-35 эВ наблюдались процессы перфорации и распыления графена.

Ключевые слова: графен, фуллерен, моделирование, поверхность, отскок, адсорбция, энергия, столкновение, распыление.

Abstract. The study investigated the interaction of C_{20} fullerene with graphene using molecular dynamics simulations (LAMMPS). It was found that after a collision, a C_{20} fullerene molecule does not immediately bounce off the graphene surface, but instead adheres to it, forming adsorption. Furthermore, when C_{20} fullerene fell onto the graphene surface in the energy range of 1-35 eV, graphene perforation and sputtering were observed.

Keyword: graphene, fullerene, modeling, surface, jump, adsorption, energy, collision, formation.

Introduction

In the last decade, two-dimensional materials (e.g., graphene) have been rapidly developed in the nanomaterials industry due to their remarkable mechanical properties. Graphene is a perfect two-dimensional lattice of sp²-hybridized carbon atoms [1], which has mechanical properties such as high Young's modulus (1 TPa), tensile strength (130 GPa) [5], and low density (2200 kg/m^3) [2–4]. Graphene is a very important material in overcoming the limitations of some traditional materials [6, 7]. Its great potential as an energy-absorbing material has attracted the attention of researchers. Several scientists have demonstrated that graphene and its various forms, such as 0-dimensional fullerenes, 1-dimensional nanotubes, and 2-dimensional graphite [8], can be used as ballistic protection materials [9–11]. This property makes graphene a suitable candidate for a new generation of materials that protect against impact and shock [12]. Despite numerous experimental tests and finite element studies [13–15] on the impact response of conventional composite materials, the impact properties of nanomaterials, especially graphene and nanocomposites, have been poorly studied theoretically [16, 17]. Studies have shown that graphene can effectively improve the properties of nanocomposites [18–22]. Avila et al. reported that the addition of graphene to conventional composites can increase their impact resistance [23]. Lee et al. conducted microballistic tests on multilayer graphene with thicknesses ranging from 10 nm to 100 nm [24]. They observed that the penetration energy of multilayer graphene was 10 times higher than that of a steel plate.

The particular interest is the interaction between C_{20} and C_{60} fullerenes and graphene. For example, charge exchange between C_{60} and graphene affects the electronic conductivity of graphene [25]. The application of electric fields allows controlling the interface properties - energy barriers, magnetism and electron-hole coupling dynamics. Thus, the ability to modulate the charge exchange state in the C_{60}-graphene system (for example, through tunable electrostatic interactions) is of great importance for the creation of prototypes of new electrochemical and optoelectronic devices.

So far, there is a lack of research on the perforation of graphene by fullerenes. Therefore, the aim of this work is to model the interaction between fullerenes and graphene using the molecular dynamics (MD) method.

Research Methodology

The LAMMPS software package [26] was used for the described modeling experiments, and the visualization of the structures was performed using the Jmol program [27]. The geometric models for graphene (10 nm × 10 nm) and C_{20} fullerene are based on the standard parameters of these structures. The reactive empirical interaction potential — AIREBO— was used in the molecular dynamics (MD) modeling process [28].

Analysis and Results

The AIREBO potential is a widely used method in the study of carbon and hydrogen-based structures. A Nosé–Hoover thermostat was installed to stabilize the temperature of the system [29].

Then, the NVE potential was used to study the interaction process between fullerene and graphene. The process of bombardment of graphene surface by C_{20} fullerene was studied using molecular dynamics method. Since fullerene has a spherical shape, it is convenient for theoretical calculations and simplified models. The graphene sheet was bombarded at the center point of the fullerene. The fullerene was initially placed close to the graphene sheet, but the distance was chosen so that it does not interact directly with graphene at the initial times, which is shown in Figure 1. The cutoff function in the AIREBO potential field is given by equation (1) below [30]:

$$f(r) = \begin{cases} 1, & r < R^{(1)} \\ \frac{1}{2}\left[1 + \cos\left(\frac{\pi\left(r - R^{(1)}\right)}{R^{(2)} - R^{(1)}}\right)\right], & R^{(1)} < r < R^{(2)} \\ 0, & r > R^{(2)} \end{cases} \tag{1}$$

r -is the bond length, and R(1) and R(2) are the cutoff radii, which are taken to be 1.7 Å and 2.0 Å, respectively. Some researchers have used improved cutoff radii — 1.92 Å and 2.0 Å — to avoid unphysical (i.e. unrealistic) behavior of the system in the modeling process. They found that the effect of the cutoff function on the graphene deformation processes and the choice of R(1) and R(2) values to 2 Å eliminate unphysical (i.e. unrealistic) states of the system dynamics in the modeling process [31]. This allows, in particular, to more accurately and correctly describe the bond breakage during the bombardment process.
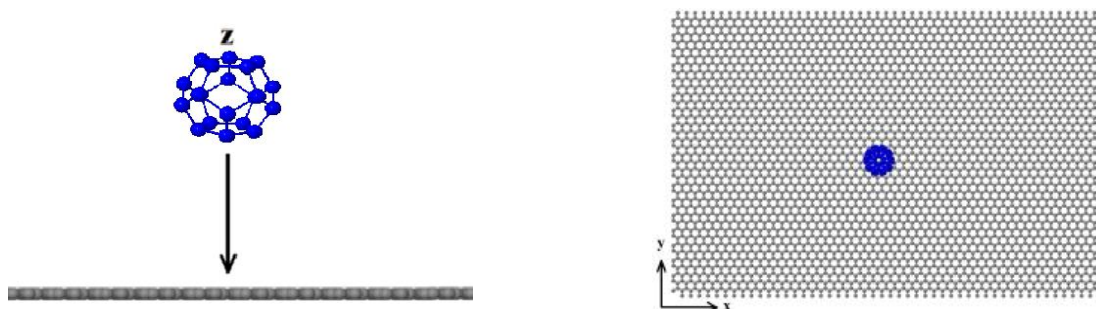
Figure 1. The initial distance between a 10 nm × 10 nm graphene sheet and a fullerene molecule on the graphene surface.

A geometric model of a fullerene with a diameter of 3.9 Å was used in the modeling. The model was created using the Nanotube Modeler program [32]. The parameters of

the fullerene geometric model are presented in Figure 2. The fullerene energy was set to 1 eV to initiate the impact process. The minimum velocity value was chosen to maintain the integrity of the graphene sheet structure during the impact process. An important quantity to evaluate the energy absorption by the fullerene is the specific energy absorption (SEA). It is determined using the following formula: SEA=(Eimpact−Erebound)/M where: Eimpact is the initial kinetic energy of the fullerene, Erebound is the (remaining) kinetic energy of the fullerene after the impact, and M is the mass of the fullerene. The SEA value is transferred by the fullerene to the graphene sheet and converted into the kinetic and potential energies of the graphene sheet.

Figure 2. Example of the C_{20} fullerene model.
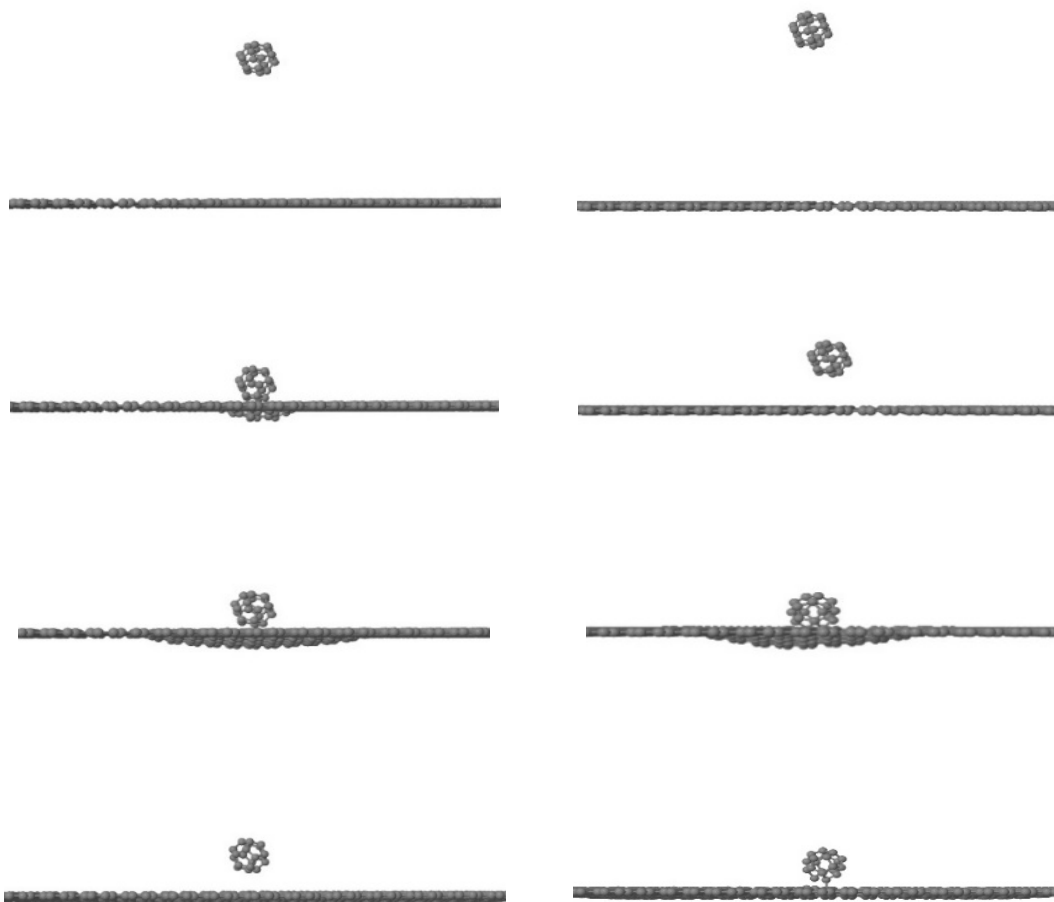
Figure 3. The process of the impact of a C_{20} fullerene molecule on a graphene surface at an energy of 3 eV.

Figure 4. The process of the impact of a C_{20} fullerene molecule on a graphene surface at an energy of 15 eV.

The fullerene energy was initially set to 1 eV. The minimum velocity value was chosen to maintain the integrity of the graphene sheet structure during the impact process. An important quantity to evaluate the energy absorption by the fullerene is the specific energy absorption (SEA). It is determined using the following formula: $SEA = (E_{impact} - E_{rebound})/M$ where: E_{impact} is the initial kinetic energy of the fullerene, $E_{rebound}$ is the (remaining) kinetic energy of the fullerene after the impact, and M is the mass of the fullerene. The SEA value is transferred by the fullerene to the graphene sheet and converted into the kinetic and potential energies of the graphene sheet.

Figure 5. The process of the impact of a C_{20} fullerene molecule on a graphene surface at an energy of 32 eV.

To study the dynamics of perforation of graphene by fullerene, the fullerene energy was varied in the range of 1-35 eV. It can be assumed that as the initial velocity of the fullerene increases, the perforation effect of graphene also increases, that is, the impact energy increases, and the degree of deformation and damage of the graphene layer becomes significant.

During the modeling process, the initial velocity values of the C_{20} fullerene molecule were considered. Based on the results obtained, the following dynamic processes were observed: When the initial energy is 3 eV, the fullerene bounces off the

graphene surface, and both structures - fullerene and graphene - remain intact. The analysis results show that at this speed, the fullerene transfers part of its energy to the graphene sheet, but the impact energy is not enough for perforation or adsorption to occur.

When the initial energy is 15 eV, the fullerene adsorbs onto the graphene surface, i.e. the fullerene sticks to the graphene surface. In this case, a stable interaction (bonding based on van der Waals forces) is formed between the fullerene and graphene.

When the initial energy is 32 eV, the fullerene pierces the graphene sheet, i.e., the fullerene breaks down and forms.

Conclusion

In this work, the interaction process of C_{20} fullerene molecule with graphene is evaluated using molecular dynamics methods. After the C_{20} fullerene molecule collides with graphene, the fullerene does not immediately bounce back, but sticks to graphene. Therefore, graphene has the ability to capture fullerene in a certain speed range, and graphene can dissipate the kinetic energy of fullerene. This property is of great importance for transforming graphene into impact-resistant materials.

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ACTUAL PROBLEMS IN MODERN AGRICULTURE

UDC: 62, 63, 631, 631.5

RESULTS OF EXPERIMENTS CONDUCTED IN A COTTON DRYER WITH COMPACTED GEOMETRIC DIMENSIONS

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Annotatsiya. Ushbu maqolada ixchamlashtirilgan quritish barabanining aylanish tezligi, barabani ichida paxta xomashyosini bo'ylama kuraklar yordamida ko'tarilish balandligi va baraban korpusini ichida paxta xomashyosini bo'lish vaqti bo'yicha S-6524 seleksiyasiga mansub ikkinchi sanoat navidagi namligi 10,9 % hamda iflosligi 7,5 % bo'lgan paxta xomashyosida olib borilgan sinov-tajriba ishlarining natijalari keltirilgan.

Kalit so'zlar: paxta, quritish barabani, tolalar, korxonalar, iflosliklar, shikastlanish.

Аннотация. В данной статье приведены результаты экспериментальных работ по определению скорости вращения уплотненного сушильного барабана, высоты подъема хлопкового сырья внутри барабана с помощью лопастей и времени нахождения хлопкового сырья внутри корпуса барабана на хлопковом сырье второго технического сорта селекции С-6524 влажностью 10,9% и содержанием сорных примесей 7,5%.

Ключевые слова: хлопок, барабанная сушилка, волокнистый, предприятия, загрязнение, повреждение.

Abstract. This article presents the results of experimental work on the rotation speed of the compacted drying drum, the height of the cotton raw material inside the drum using the paddles, and the time of cotton raw material inside the drum body on the second industrial grade cotton raw material of the S-6524 selection with a moisture content of 10.9% and an impurity content of 7.5%.

Keywords: cotton, drum dryer, fibrous, enterprises, dirtiness, damage.

Introduction

Currently, extensive research is being conducted to improve the techniques and technologies of primary cotton processing. In particular, special attention is paid to the

development of effective cotton drying technologies and the creation of modern equipment, increasing the efficiency of drying machines and analyzing the drying process. Therefore, special attention is paid to the development of technologies that allow maintaining the initial quality indicators of cotton during the technological process of drying, reducing energy consumption, and controlling product quality, as well as optimizing operating modes and indicators.

Literature Review

Chamber dryers operate at atmospheric pressure and are used for drying materials with a drying temperature of 250-300 ^{0}C and belong to periodic devices. The drying process is carried out by transferring the drying agent to the materials spread on racks installed in the chamber or on trolleys. Single or repeated use (regeneration) of the drying agent works with partial air circulation, which provides lower temperatures and gentler drying conditions. Maintenance of chamber dryers requires a lot of manual labor, which is also one of the significant disadvantages [1, 2].

In belt dryers, the drying process is carried out continuously at atmospheric pressure. In the drying chamber, the layer of material to be dried moves on an endless belt stretched between the pulling and pulling drums. The wet material is fed to one end of the belt and the dried material is discharged from the other end. The drying agent is carried out by hot air or flue gases, which are forced into a countercurrent or cross-current flow in the direction of movement of the material.

Belt dryers are bulky (like tunnel dryers) and difficult to operate, mainly due to the warping and stretching of the belts, their specific efficiency is low and their specific drying agent consumption is quite high. In addition, since they cannot dry various materials, they are used in combination with roller dryers. In some designs, superheated steam is used as a drying agent, sometimes in a mixture with hot inert gases. Drying with superheated steam is effective for drying materials that oxidize or burn at high temperatures in the presence of oxygen in the air. These dryers are complex in terms of their design, since they must be hermetically sealed to prevent air from entering them [3, 4].

Drum dryers are widely used for continuous drying of lumpy, granular, fibrous and bulk materials at atmospheric pressure. It has a cylindrical drum mounted horizontally or at an angle to the horizontal and rotating on rollers. The drum is driven by an electric motor through a gear and a reduction box. The material to be dried is fed into the drum by a feeder, entering an internal chamber located almost along the entire length of the drum. The blades inside the drying drum ensure uniform distribution and good mixing of the material along the longitudinal section of the drum, as well as its close contact with the drying agent - flue gases. In the simplest case, the blades are metal sheets welded to the inside of the drum body. The drying agent and the materials to be dried, in most cases, move in a straight line, which helps to prevent overheating of the material to be dried, since in this case the hottest gases come into contact with the material with the highest moisture content. The speed of the drying agent is selected depending on the size and density of the material [5].

Flue gases from the combustion of natural gas, fuel oil or other liquid fuels (diesel fuel, oil) are often used as a drying agent in drum dryers. Flue gases can be supplied

directly from the burner to the drum or through a separate heat generator, which allows you to adjust the degree of mixing of the flue gases with air. A separate heat generator is used when it is necessary to dry materials that decompose (break down) at high temperatures. The internal impeller devices in the drum are selected depending on the size of the particles and the properties of the materials being dried [6].

Fluidized bed dryers are one of the progressive types of drying equipment. The fluidized bed process allows to significantly increase the contact surface between the material particles and the drying agent, to increase the evaporation of moisture from the material and to reduce the drying time (up to a few minutes) [7].

Research Methodology

After the local cotton ginning enterprises were integrated into cotton weaving clusters, their productivity decreased to 6-7 tons/hour. In such conditions, the use of 2SB-10 drying drums leads to an increase in costs associated with drying cotton, which is a waste of money. Taking into account the operating modes and average productivity of primary cotton processing, a technical solution has been developed to develop a design for a cotton drying drum with reduced geometric dimensions, the implementation of which is expected to reduce the cost of drying cotton raw materials by 2 times.

A test experiment was conducted at the cotton ginning plant of the "Chaqmoq" cluster on raw cotton of the S-6524 selection with a moisture content of 10.9% and a spoilage of 7.5%, which is part of the second industrial category.

Table 1. Initial quality parameters of cotton raw materials used in laboratory experiments.

Cotton selection and industrial variety		Cotton dirtiness, %		Mechanical damage to cotton seed, %	Initial moisture content of cotton, %
		General	Small dirtiness		
S-6524	2-nav	7,5	3,7	0,6	10,9

It is known that the operation of a compact drying drum primarily depends on its geometric parameters, the dimensions and diameter of the longitudinal and transverse blades inside the drum body, the rotation speed of the drum, and the amount and speed of the drying agent fed into the drum. Theoretical studies on drum dryers have shown that the drying agent delivered to the drum is most effective when the cotton is being spun by the drum blades. For this reason, the process of raising and lowering cotton with the drum blades in our compact drum dryer in relation to its rotation speed was visually studied. The results of the experiments are presented in Table 2.

Analysis and Results

As can be seen from the data presented in Table 2, the operating mode of the drum dryer, i.e. the rotation speed of the drum body, is affected by the height of the cotton raw material being lifted inside the drying drum using the paddles. For example, when the rotation speed of the drying drum is 4 rpm and the productivity is 4000 kg/h, the average height of the cotton raw material inside the drying drum with the help of the paddles is found to be 1.46 m. However, when the rotation speed of the drying drum is

increased to 8 rpm, the average height of the cotton raw material inside the drying drum with the help of the paddles increases to 1.46 m. We can see that the average height increases to 1.73 m. Similar results were obtained for the 5000 kg/h and 6000 kg/h versions of the drying drum.

Table 2. Results of determining the height of the cotton raw material inside the drying drum using longitudinal paddles.

Drum dryer efficiency for cotton, kg/hour	Effect of the rotation speed (rpm) of the drying drum on the lifting height (m) of cotton raw material inside a drum dryer		
	4	6	8
4000	1,45	1,56	1,66
	1,47	1,49	1,72
	1,46	1,58	1,74
average	**1,46**	**1,54**	**1,70**
5000	1,43	1,51	1,73
	1,46	1,48	1,76
	1,49	1,50	1,71
average	**1,46**	**1,49**	**1,73**
6000	1,41	1,52	1,70
	1.47	1,51	1,72
	1,46	1,50	1,71
average	**1,44**	**1,51**	**1,71**

However, the results of the experiments in Table 2 show that the amount of lifting of the cotton raw material inside the drying drum using the paddles does not significantly affect the efficiency of the drying drum in terms of cotton. Thus, from the results of studying the amount of lifting of cotton raw material inside the drying drum with the help of paddles, it can be concluded that the speed of rotation of the drum body affects the amount of lifting of cotton raw material inside the drying drum with the help of paddles. It was found that the higher the rotation speed of the drum body, the greater the amount of lifting the cotton raw material inside the drying drum with the help of the paddles. These results are logical, because as the rotation speed increases, the lifting height of the cotton raw material inside the drying drum with the help of the paddles increases. Because of this, the increased speed forces the cotton on the drum blades to rise higher before it can be spun. The drum dryer can reach such a speed that it can also ensure that the cotton material inside the drying drum rotates with the blades without being spun. But in our version, such results are not necessary, our main goal is to ensure that the cotton raw material is in effective contact with the drying agent and to achieve maximum moisture extraction from the cotton.

The drying time of cotton raw material in the proposed cotton drum dryer was studied. As a result of the study of the drying time of cotton, it is possible to plan the amount of moisture removed from cotton. As a result of theoretical analysis, it was determined that the amount of drying agent introduced into the drum body should be 6000 m³/h. Therefore, from the data presented in Table 2, when studying the duration of cotton drying, the amount of drying agent introduced into the drum body through a pipe was set at 6000 m³/h. The results of the experiments are presented in Table 3. As can be seen from the results of the experiments presented in Table 3, it was found that

the efficiency of the drying drum on cotton does not have a significant effect on the drying time of cotton raw materials in a drum dryer. We can see that with an increase in the rotation speed of the drum dryer, the time it takes for the cotton raw material to dry inside the drum body, or in other words, the duration of cotton drying, decreases relatively. For example, it was found that when the cotton raw material productivity of a drum dryer was 4,000 kg/h and the rotation speed of the drum dryer was 4 rpm, the drying time of the cotton raw material was 5.3 min. However, when the rotation speed of the drum dryer was increased to 8 rpm, the drying time of the cotton raw material decreased to 1.7 min. We can see from the data in Table 3 that similar results were obtained for the developed versions of the small-sized drum dryer with a cotton capacity of 5,000 kg/h and 6,000 kg/h.

Table 3. Results of experiments conducted to determine the drying time of cotton raw materials.

Drum dryer efficiency for cotton, kg/hour	Drying time of cotton raw material (min) relative to the rotation speed of the drum dryer (rpm)		
	4	6	8
4000	5,4	3,9	3,6
	5,6	4,4	3,7
	5,1	4,3	3,6
average	**5,3**	**4,2**	**3,6**
5000	5,2	4,6	4,05
	5,0	4,1	3,95
	4,9	4,2	4,03
average	**5,03**	**4,3**	**4,01**
6000	5,0	5,1	4,1
	5,1	5,2	4,0
	4,9	5,5	4,2
average	**5,0**	**5,2**	**4,1**

Thus, from the data presented in Table 3, it can be concluded that in all three options for the productivity of cotton raw materials studied, the duration of cotton drying depends on the rotation speed of the drum dryer and does not change in relation to the amount of cotton productivity. This phenomenon can be explained by the following: the maximum drying time is obtained when the rotation speed of the drum dryer is at least 4 rpm, since in this case, the impact on the cotton raw material being dried inside the drum reduces the relative motion of the cotton in the direction of the drum axis. With an increase in the rotation speed, the impact of the speed on the cotton raw material increases, which also increases the drying time. At the same time, it should be taken into account that excessively long drying times for cotton raw materials have a negative impact on the quality of the cotton, therefore, the appropriate drying mode should be selected based on the initial moisture content of the cotton. Thus, from the results of the conducted experiment, it can be said that the duration of drying cotton raw materials in drum dryers does not depend on its productivity in terms of cotton raw materials. It was found that if the rotation speed of the drum dryer is increased in the studied variants, the duration of drying cotton raw materials decreases.

Conclusion

It was found that when the rotation speed of the drying drum is 4 rpm and the productivity is 4000 kg/h, the average height of the cotton raw material inside the drying drum with the help of the paddles is 1.46 m. When the rotation speed of the drying drum is increased to 8 rpm, the average height of the cotton raw material inside the drying drum with the help of the paddles increases to 1.46 m. It was found that the average amount of cotton increased by 1.73 m. It was observed that with an increase in the rotation speed of the drum dryer, the time for the cotton raw material to be inside the drum body, or in other words, the duration of cotton drying, decreased relatively. For example, it was found that when the cotton raw material productivity of a drum dryer was 4,000 kg/h and the rotation speed of the drum dryer was 4 rpm, the drying time of the cotton raw material was 5.3 min. However, when the rotation speed of the drum dryer was increased to 8 rpm, the drying time of the cotton raw material decreased to 1.7 min.

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THE IMPORTANCE OF USING DIALOGUE IN CREATIVE ACTIVITY IN ENSURING SOCIAL AND POLITICAL STABILITY

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Annotatsiya. Maqolada dialog fenomeni va uning ilmiy ijodiy faoliyatga ta'siri falsafiy-metodologik nuqtai nazardan tahlil qilingan. Jahon va mahalliy olimlar asarlariga tayanilgan holda dialogning bilim yaratish, ijtimoiy barqarorlik va ma'naviy rivojlanishdagi o'rni yoritilgan. Tahlil natijasida dialog ilmiy ijodning metodologik asosi, milliy taraqqiyot va ma'naviy uyg'unlikni ta'minlovchi muhim omil ekani asoslab berilgan.

Kalit so'zlar: dialog, ilmiy ijod, falsafiy metodologiya, muloqot madaniyati, ilmiy kommunikatsiya, innovatsiya, ma'naviy barqarorlik, ilmiy hamkorlik, milliy taraqqiyot, ijtimoiy ong.

Аннотация. В данной статье с философско-методологической точки зрения анализируется феномен диалога и его влияние на научно-творческую деятельность. Опираясь на труды мировых и отечественных ученых, освещается роль диалога в создании знаний, социальной стабильности и духовном развитии. В результате анализа обосновано, что диалог является методологической основой научного творчества, важным фактором, обеспечивающим национальное развитие и духовную гармонию.

Ключевые слова: диалог, научное творчество, философская методология, культура общения, научная коммуникация, инновации, духовная стабильность, научное сотрудничество, национальное развитие, общественное сознание.

Abstract. This article analyzes the phenomenon of dialogue and its influence on scientific and creative activity from a philosophical and methodological point of view. Based on the works of world and domestic scientists, the role of dialogue in the creation of knowledge, social stability, and spiritual development is highlighted. As a result of the analysis, it was substantiated that dialogue is the methodological basis of scientific creativity, an important factor ensuring national development and spiritual harmony.

Keywords: dialogue, scientific creativity, philosophical methodology, communication culture, scientific communication, innovation, spiritual stability, scientific cooperation, national development, social consciousness.

Introduction

Modern scientific research is developing not only as an individual creativity, but also as a process of collective dialogue and cooperation. In this regard, dialogue is the main methodological tool in scientific activity for Uzbek scientists. It is important not only for qualitative analysis of scientific results and creation of new ideas, but also for ensuring social stability. Dialogue itself is an effective way to promote interdisciplinary integration, cooperation in the educational and cultural spheres, as well as the practical implementation of innovative ideas in society. Therefore, it is of scientific importance to analyze the experience of using dialogue in the scientific creative process by scientists in Uzbekistan and to study its social significance [1]. The main goal of all reforms and events being implemented in Uzbekistan - the idea of building a free and prosperous homeland, a free and prosperous life - is associated with the formation of the activities of citizens with a thoughtful, analytical mindset. Such a deep and broad mindset requires a unique scientific potential. Therefore, the main idea of our country today - that the people should serve the state bodies, not the state bodies, but the people - is of great importance for understanding socio-cultural relations through mutual dialogue and expanding the worldview using its methods. This will increase the confidence of our people in themselves and in the power of the country, and will contribute to the socio-economic and spiritual-educational development of our country.

In today's world, where the number of ideological polygons is increasing, it is important to conduct dialogue-based observation to understand the ideas that ensure the prosperity, well-being, and peace of the country. This can be explained by the increasing number of political, economic, spiritual, and social unrest, terrorism, and the promotion of homosexuality in various parts of the world. It is important today to understand the history of our homeland philosophically, to show the important features of development in studying the past of our ancestors, the history of our nation, and to analyze the harmful consequences of exaggerating national identity.

Literature Review

By analyzing the works of world and local researchers, it is possible to clearly express the role of dialogue in the scientific process, its social and spiritual significance. The concept of dialogue was first expressed as a philosophical problem in the works of ancient thinkers Socrates, Plato and Aristotle. In particular, in Plato's works "Dialogue" a reflective dialogue in the form of a question and answer is described as the main means of achieving knowledge. Later, M. Bakhtin interpreted dialogue not only from the point of view of linguistics or literary studies, but also as a form of internal movement of human thought ("Problems of Dostoevsky's Poetics", 1972). According to Bakhtin, any meaning appears only through the "second word" - that is, through the answer and dialogue. From a philosophical point of view, the problem of dialogue is expressed in the views of M. Mamardashvili, P. Ricoeur, H.-G. Gadamer, Yu. Habermas. Yu. Habermas interpreted dialogue in the theory of "communicative practical reason" as a means of achieving consensus through social agreement and intelligent communication. Scientific creativity is unimaginable without dialogue. In this regard, T. Kun's "The Structure of Scientific Revolutions" (1962) emphasizes that science develops only as a result of dialogue between "paradigms." K.

Popper interprets scientific knowledge as a "dialogue of errors and correct ideas". Drucker P. and Schumpeter Y. emphasized the importance of creative communication in scientific and innovative processes and introduced the concept of "dialogue of innovation" into scientific circulation. Also, in modern social sciences, Luhmann N. considers dialogue to be the main element of the "scientific communication system". In his opinion, science develops stably only in an environment of open dialogue. In Uzbekistan, the problem of dialogue has been studied in philosophical, social and pedagogical directions. Saidov A. and Sharafutdinov O. emphasize the importance of dialogue and cooperation in the processes of innovation and social modernization ("Innovation Philosophy", 2019). According to them, dialogue is a methodological basis that ensures the stability of social systems. The works of Qosimov B., Ibrohimov M., Rahmonov N. and Yakubov Sh. analyze the dialogical traditions of national philosophical thought, in particular, the views of Forabi, Beruni and Ibn Sina. In Forabi's work "On the Residents of the Virtuous City", dialogue is interpreted as a means of harmonizing knowledge and morality. In the studies of Khakimov Yu. and Abdullaev A., the importance of dialogue in social development and spiritual stability is philosophically based. In recent years, the topic of dialogue has also risen to the level of the main idea in the works and speeches of President Sh. Mirziyoyev. In particular, the principle "The people should serve the state bodies, not the state bodies" has placed the culture of dialogue at the center of public administration.

Research Methodology

In the process of preparing the scientific article and developing its methodological basis and concept, modern historical research methods were taken as a basis. In addition, comparative and substantive analysis methods were used, as well as analysis, synthesis, complex and systemic-functional approaches, content analysis, retrospective analysis, dialectical, synergetic, comparative analysis, etc.

Analysis and Results

The experience of Uzbek scientists in using dialogue in scientific and creative activities is significant in the following main aspects:
• Development of interpersonal and interdisciplinary cooperation;
• Qualitative analysis of scientific results and their transformation into innovation;
• Ensuring cultural, spiritual and social stability;
• Increasing the prestige of Uzbekistan in the international scientific community.

Thus, dialogue appears as one of the strategic factors not only of the scientific and creative process, but also of the social, economic and spiritual development of the country [2]. The Decree of the President of the Republic of Uzbekistan № PF-6097 dated October 29, 2020 "On approval of the concession for the development of science until 2030" is the main document aimed at raising scientific and innovative development in our country to a new level. This concept sets itself the goal of developing science and technology, introducing them into various sectors of the economy, as well as strengthening international scientific cooperation. This Decree has developed a long-term program aimed at the comprehensive and coherent development of scientific activity in our country, closely linking science with the needs of the

economy and society, and forming a modern scientific and innovative environment, the content of which is as follows.

The main goal of the concept is to sustainably and rapidly develop the science sector in Uzbekistan until 2030, integrate it with various sectors of the national economy and social development, and create innovative solutions and competitive technologies based on scientific developments. The decree recognizes the science sector as a priority in state administration, and obliges each state body and regional authorities to support science from their budget and funds. The implementation of the decree is entrusted to the Prime Minister and the Presidential Advisors. The concept approved by this decree not only determines the strategic direction in the science sector, but also creates a solid foundation for ensuring an integral dialogue and cooperation between science and practice, science and economy in the country, and building a dialogue between citizens and the state on a scientific basis. This document, with its content and scope, is a step towards increasing the true social value of science and making it the central pillar of national development.

Dialogue is a factor of social communication and serves as a means of understanding the world. Therefore, it is of great importance to study the process of democratization and modernization in Uzbekistan from the perspective of dialogue, which is an important factor in understanding the process of democratization and modernization. Because it is dialogue that serves as a very favorable basis for the formation of socio-cultural relations between peoples and nations, for resolving various conflicts that are currently taking place. In this case, dialogue is manifested as a way of mutual understanding in the fields of culture, art, humanitarian affairs, and "Modern coexistence" of different schools, communities and cultures. The adoption of the "New Uzbekistan – 2030" strategy, put forward in 2023 at the initiative of the President of Uzbekistan Sh. Mirziyoyev, became an important event aimed at organizing dialogue with the people. The "Uzbekistan – 2030" strategy is a comprehensive and long-term national development program aimed at ensuring the sustainable development of the country in the social, economic, legal and environmental spheres for the next seven years. The "Uzbekistan – 2030" strategy was approved by the decree of President Shavkat Mirziyoyev on September 11, 2023 and was developed based on an analysis of the needs of the population and changes in the modern world [3, 5, 6]. At the heart of the strategy is the interests of the people, the well-being of citizens and the idea of forming the country as a democratic, fair and competitive state. In the process of developing this document, citizens' proposals, expert opinions and international experience were studied. Each of its points is provided with clear, measurable goals and performance indicators, and is implemented with clear roadmaps and long-term plans. The "Uzbekistan – 2030" strategy is not just a reform plan or an economic program. The "Uzbekistan – 2030" strategy is a set of spiritual and practical actions aimed at implementing the idea of a New Uzbekistan, put forward at the initiative of the President, and a radical renewal of relations between society and the state. The "Uzbekistan – 2030" strategy perfectly embodies the philosophy of dialogue, open communication, equality and sustainable development. In the process of analyzing the

strategy, it will be possible to consider the points, goals, distinctive aspects, and national significance of this strategy from a philosophical approach.

The "Uzbekistan-2030" strategy emphasizes human interests as the axis of policy. The most important, philosophically important turn in the strategy is the change in the perspective from the state to the person. In previous development programs, attention was focused more on economic growth, macroeconomic stability, and cross-sectoral reforms, and the human factor was lost in them. The "Uzbekistan-2030" strategy puts human dignity, its needs and rights at the center. This principle has been elevated to the level of a modern model of state governance based on the philosophy of humanity. For example, the fact that every child should receive a place in a preschool educational institution, ensuring a gradual transition to a 12-year form of education, providing medical services for every family, all this indicates that it is aimed at improving human life, dignity, and spirituality.

The "Uzbekistan – 2030" strategy also addresses the issue of a new culture of dialogue and the renewal of society-state relations. The "Uzbekistan – 2030" strategy clearly reflects the active participation of society in the formation of state policy. This is explained by the fact that it is aimed at creating a culture of dialogue, that is, a mechanism for real, effective and two-way communication between the state and citizens. Taking into account public opinion in each reform, conducting a wide discussion when making decisions, and making citizens' voices heard at the local level are not just political statements, but the formation of a complete social dialogue. Through such a dialogue between citizens and the state, social capital is formed in the country, trust is strengthened, and social solidarity is created. It is enough to recall that previously such forms of dialogue were in practice quite formal in nature. Man is the essence of life! The reliable protection of his rights, freedoms, and interests has been one of the top priorities of our state policy since the years of independence. All the noble efforts being made are aimed at ensuring that every citizen can live a free, happy, and prosperous life, work in decent conditions, and enjoy their work in old age and live in peace. The concept of dialogue and interest in Uzbekistan is "The people should serve the state bodies, not the state bodies" [4] is based on the principle that.

There is no doubt that public reception centers will be an important step in bringing the situation in each region, first of all, the implementation of laws, decrees and decisions to a wide range of the population, and in further increasing their effectiveness. These efforts are significant in that they serve to ensure human interests, join the ranks of developed countries in the world, and improve the quality and standard of living of our people. At the same time, the proposal of our President Mirziyoyev Sh.M. to introduce a system of accountability of governors of all levels, prosecutors and heads of internal affairs bodies to the population from 2017 will undoubtedly play an important role in implementing priority tasks to strengthen control over the activities of state administration bodies, supervisory and law enforcement structures, and to introduce a procedure for law enforcement bodies to report to the public in practice. After all, such a procedure is an important guarantee and a necessary condition for protecting human rights and freedoms, combating red tape and corruption in the judicial and legal sphere. The established "People's Receptions" are becoming an

effective mechanism for bringing heads of state agencies and political parties closer to the broad masses of the population.

The appeals are studied by specialists, and some of the problems that torment citizens and hinder their activities in various fields are being solved in a timely manner, and some are being considered within the framework of the law. This increases the trust of the population in our state and justice institutions. In addition, behind each appeal lies the interests of a person, his fate. Based on this, no appeal goes unnoticed. In addition, notary office specialists actively participate in conversations with applicants and in events held in collaboration with various organizations, conducting advocacy work to increase the legal knowledge of the population and explain their rights and duties. To substantiate our opinion, below we will briefly touch upon the work being carried out as a result of improving the dialogue process in the process of developing social networks in Uzbekistan.

As a result of dialogue with the people, fundamental reforms are being implemented in the healthcare system. The fact that, when admitting students to medical institutions under the Ministry of Health, separate places have been allocated to each region based on the republican level in order to fill the shortage of personnel in the regions is the result of dialogue. In addition, measures are being taken to further improve the provision of medicines and medical supplies to the population [5]. Practical work is being carried out to protect the rights and legitimate interests of business entities. As a result, entrepreneurs are being provided with preferential loans and financial and legal support to form small and medium-sized businesses [6]. Effective work is being carried out to provide people in need of housing in urban and rural areas with houses built on the basis of a model project [7].

In order to support the elderly who have contributed to the prosperity of our country with their work, as well as the youth who are the foundation of our future, and to increase the privileges and opportunities of state organizations working in this area, their activities were reviewed and new organizations were created. The activities of the "Youth Union" were radically reformed, its scope of activity was expanded, and the "Youth Affairs Agency" was established.

The role of the education system in actively organizing the dialogue process is invaluable. After all, the desire to improve the quality of education, the unification of educational programs and standards for integrating regions, and the implementation of the "lifelong learning" strategy are becoming an important factor in the further deepening and improvement of globalization processes. As we all know, when developing the basic principles of the organization and development of continuing education in our country, special attention was paid to the orientation of education in the national spirit, the formation of a fully developed, spiritually rich person. Therefore, within the framework of modern state educational standards, it is based on the principles of openness to all, the secular nature of the education system, and the harmonization of state and public administration in the education system.

In order to achieve quality education and implement targeted processes, it is necessary to enter into a dialogue with higher educational institutions with high ratings and exchange experience. For this purpose, the number of students of higher

educational institutions of Uzbekistan being sent to foreign countries for "internships" on the basis of academic mobility is increasing. This ensures participation in interstate dialogue, students not only enrich their knowledge, but also increase their life experience. Today, education has become a transnational concept, serving as a universal means of acquiring the knowledge necessary to develop professional skills in a changing world, across countries and continents. The creation of regional standards in the field of education, the implementation of the results of scientific research and experimental design work, the development of electronic information exchange, Internet technologies are becoming one of the important tasks. Thus, a policy aimed at training personnel that meets the requirements of the time is being implemented in Uzbekistan step by step. A creative approach is being taken to the issues of ensuring the needs of society in highly qualified scientific and scientific-teaching personnel, satisfying the creative interests of the individual in the field of education and professional development, as provided for in the national personnel training program. For this purpose, efforts are being made to find the most optimal way to reform the education system and educate young people on this basis [8]. It serves to form a direct dialogue between students, to improve their practical skills, experience, and quality of knowledge in language learning.

The social sphere is directly related to dialogue. The development of the social sphere in Uzbekistan has become one of the most priority areas of state policy today. If we look at the recent past of Uzbekistan, the main attention was paid to economic growth indicators, but in modern times the principle of "human interests above all else" has become the main program of action. Reforms in the social sphere are being carried out on the basis of effective dialogue and trustful cooperation between the state and citizens. Uzbekistan is pursuing a policy of dialogue, not monologue, in the development of the social sphere. The state is clearly implementing the idea that "we work with you, not for you." We can hear this in the speeches of the President. All reforms are aimed at listening to the interests of the person, listening to his pain and improving his life. This is not only the criterion of reforms of New Uzbekistan, but also the main idea of the philosophy of statehood. Peace and freedom play an important role in the development of the social sphere, in the dialogue participants finding a common language with each other.

Conclusion

Based on the above considerations, it should be noted that the importance and priority aspects of improving dialogue in the development of social spheres in Uzbekistan serve, firstly, as a program for rationally solving the urgent problems of our country, secondly, as a tool for educating the younger generation in a sense of patriotism, strengthening national independence, thirdly, as a tool for a deeper understanding of the place and role of the national idea in the development of society, and as a comprehensive strengthening of the position of intellectual activity. Without dialogue, humanity and society cannot exist. It is precisely on the basis of dialogue that cooperation between a team of individuals is formed. In order to draw up a plan of cooperative activities and implement it, dialogue between individuals is necessary. Through it, cooperative activities are organized and implemented. At the same time,

new relationships and connections are formed between people during the activity. Therefore, the process of forming dialogue and activity are closely interconnected.

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SOCIAL FACTORS CONTRIBUTING TO THE SPREAD OF HIV INFECTION

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Annotatsiya. Maqolada OIV infeksiyasi tarqalishiga kambag'allik, bilimsizlik, gender tengsizligi, migratsiya, giyohvandlik, stereotiplar va stigma kabi omillarning ta'siri tahlil qilingan hamda xalqaro tajriba va mahalliy kuzatuvlarga tayangan holda ijtimoiy tenglikni ta'minlash, tibbiy savodxonlikni oshirish va xavf guruhlari bilan ishlash zarurligi ko'rsatilgan

Kalit so'zlar: OIV infeksiyasi, ijtimoiy omillar, profilaktika, kambag'allik, gender tengsizligi, migratsiya, stigma.

Аннотация. В статье проанализированы основные социальные факторы, влияющие на распространение ВИЧ-инфекции: бедность, низкий уровень образования, гендерное неравенство, миграция, наркомания, стереотипы и стигма. На основе международного опыта и местных наблюдений подчеркивается необходимость обеспечения социального равенства, повышения медицинской грамотности и сотрудничества с группами риска и общественными организациями.

Ключевые слова: ВИЧ-инфекция, социальные факторы, профилактика, бедность, гендерное неравенство, миграция, стигма.

Abstract. The article analyzes the main social factors influencing the spread of HIV infection, such as poverty, low education, gender inequality, migration, drug use, stereotypes, and stigma. Based on international experience and local observations, it emphasizes the need to ensure social equality, improve health literacy, and strengthen cooperation with risk groups and public organizations.

Keywords: HIV infection, social factors, prevention, poverty, gender inequality, migration, stigma.

Introduction

HIV (human immunodeficiency virus) infection is currently a pressing issue not only from a medical perspective but also as a social problem. According to data from the WHO and the UNAIDS agency of the United Nations, although infection rates have decreased in some regions, the risk of transmission remains high in developing countries, including Central Asia. In Uzbekistan, HIV is also one of the priority areas of state policy. This study analyzes key social determinants such as poverty, gender inequality, low education levels, migration, drug addiction, and stigma from a sociological perspective and highlights the importance of state policy, education, and civil society institutions. The effectiveness of HIV prevention is closely linked not only to medical treatments but also to comprehensive social policies, educational programs, and raising the medical awareness of the population.

Literature Review

HIV infection has been widely studied not only as a medical but also as a social issue. French sociologist Michel Foucault (1994) interpreted the health system as part of societal power and control mechanisms, explaining diseases as social processes. Émile Durkheim (1893) emphasized in his theory that the disruption of social norms and solidarity in society creates the basis for various social problems in health. Talcott Parsons (1951), in his concept of the "sick role," revealed society's social attitudes toward the ill. International organizations also pay special attention to this issue. The World Health Organization (WHO, 2023) mentions poverty, low education levels, and migration processes as the most significant risk factors in the spread of HIV in its 2023 report. UNAIDS (2022) noted in its report that discrimination and stigma are among the most serious social obstacles worldwide in the fight against HIV. Murod Bekmurodov (2015), analyzing the link between social processes and healthcare in Uzbekistan, demonstrated that the risk of HIV is higher in groups experiencing poverty and limited access to services. Malika Nurmatova (2022) emphasized that gender-based violence and inequality pose risks to women's health, while Mahliyo Ganiyeva (2019) showed that social isolation and legal uncertainty in labor migration intensify virus transmission. Additionally, British scholars Richard Parker and Peter Aggleton (2003) developed a conceptual model of stigma and discrimination, identifying these as the greatest social barriers in HIV prevention. Overall, the literature review shows that HIV transmission is closely linked to poverty, gender inequality, migration, stigma, and cultural stereotypes. Therefore, effective prevention requires addressing these social determinants.

Research Methodology

This study was conducted based on sociological observations and surveys carried out in Jizzakh and Syrdarya regions of Uzbekistan during 2024–2025. The aim of the research is to determine the level of awareness about HIV infection, attitudes towards it, and the possibilities of participation in prevention measures among the population. The research object includes representatives of various age and social groups living in Jizzakh and Syrdarya regions. The subject of the study is the social factors influencing the spread of HIV infection, including poverty, level of education, gender inequality, labor migration, drug addiction, stigma, and lack of information. Research methods employed are sociological surveys and document analysis. Data obtained were processed using descriptive statistics with percentages and comparisons, and presented through tables and charts.

Analysis and Results

The spread of HIV infection cannot be explained solely by medical or biological processes; its roots are closely linked to the economic, cultural, ethical, and institutional relations within society. Sociological analyses show that the expansion of infection is directly related to the population's living standards, educational opportunities, gender relations, cultural stereotypes, and the effectiveness of civil society institutions. To implement effective HIV prevention and social policies, it is

first necessary to systematically analyze the social factors affecting its spread. HIV is not merely a medical problem but a complex phenomenon intersecting many social spheres. The spread of HIV is a multifaceted phenomenon closely tied not only to individual behavior but also to the social structure, values, and institutional systems of society. Therefore, effective planning and implementation of prevention policies require systematic analysis of the social factors influencing infection dynamics. Poverty and Economic Vulnerability – Among groups with low income, barriers to accessing medical services, low rates of blood testing for diagnosis and enrollment in ART programs, and reluctance to seek help in the early stages of infection are observed. Economic hardship leads to informal labor, hazardous working conditions, and exclusion from social protection, increasing the risk of transmission. Lack of Knowledge and Medical Literacy – Gaps in medical literacy strengthen misconceptions about HIV transmission mechanisms and weaken the culture of using protective measures. Continuous education on reproductive health, safe relationships, and personal hygiene among youth reduces risky behavior and expands prevention coverage.

Gender Inequality and Women's Risk – Women with limited socio-economic independence and poor access to health services are more vulnerable. Low decision-making power regarding protection methods, violence, and norms based on "male dominance" sharply increase women's risk in the HIV transmission process. Strengthening gender justice is one of the strategic directions of prevention.

Labor Migration – Environmental changes, legal uncertainty, and social isolation distance migrants from the medical system, leading to late diagnosis and strengthening hidden chains of transmission. Confidential counseling and testing services, as well as targeted prevention solutions for citizens abroad, are necessary.

Injecting Drug Use – The use of shared syringes/needles directly increases transmission through blood. Criminalization and stigmatization marginalize this group from the medical system. "Harm reduction" approaches (needle exchange, safe injection sites, psychosocial support) are recognized as effective. Lack of Information, Cultural-Religious Stereotypes, and Stigma – Stereotypes that interpret HIV as a "moral problem" increase shame, secrecy, and avoidance of medical help. Reducing stereotypes and stigma through the involvement of religious and cultural leaders, disseminating objective, accurate information, and creating an inclusive social environment is of critical importance. Analyses show that the main social factors causing the spread of HIV infection are as follows:

1. Poverty and Economic Hardship – low-income populations have limited access to medical services, with low rates of HIV testing and treatment among them.

2. Level of Education and Medical Literacy – incorrect views and stereotypes about HIV transmission persist. UNESCO and UNAIDS reports indicate that regions with higher education levels have significantly lower HIV transmission risk.

3. Gender Inequality – in societies where women's reproductive rights are restricted, their risk of infection is higher. According to UNAIDS (2022), one in five women's infection is related to lack of access to protective measures.

4. Labor Migration – unprotected sexual relations and limited access to medical services are common among citizens temporarily living abroad.

5. Drug Addiction – injecting drug use increases the risk of transmission by 20–30 times.

6. Stigma and Cultural Stereotypes – HIV is often misinterpreted as a "disease of immorality." Parker and Aggleton's (2003) research identified stigma as one of the greatest social barriers in the fight against infection.

To empirically confirm the role of socially analyzed factors in the spread of HIV, the next section analyzes the results of a survey conducted among respondents. Among the 126 respondents who participated in the survey, 54.8% were aged 18–25, indicating that young people are the most active group in HIV prevention. Women made up 79.4% of the sample, confirming the high participation of women in social research. Regarding marital status, married respondents accounted for 49.2%, and unmarried/non-married respondents made up 50%, showing nearly equal proportions.

These results align with other studies conducted in Uzbekistan (Kholmatova, 2022; UNAIDS, 2023) and clearly confirm the relevance of HIV awareness issues among youth and women.

Age distribution: 54.8% of respondents were aged 18–25, 15.1% aged 26–35, 18.3% aged 36–45, 10.3% aged 46–55, and the remaining 1.5% were over 56 years old.

Gender distribution: 79.4% women, 20.6% men.

Marital status: 49.2% unmarried/non-married, 50% married.

These findings indicate the need to focus more on youth and women in HIV prevention efforts. The study demonstrated the direct influence of social factors on HIV prevention in the context of Uzbekistan. For example, psychological barriers to testing were higher among youth, whereas women were more active in health and prevention issues. The equality in marital status allowed for comparative analysis of awareness levels. At the same time, the limited sample size of 126 respondents requires caution when generalizing; some questions were left unanswered leading to subjectivity in the data. Since the study was conducted only in certain regions, it does not provide a complete nationwide picture. However, these results provide a scientific basis for improving HIV prevention in Uzbekistan and serve to integrate theoretical analysis, empirical evidence, and practical measures towards creating a healthy social environment.

Q4. Ta'lim darajasi

Q7. OIV bo'yicha bilim darajasi

Q8. Yuqish yo'llari (bir nechta tanlov)

Q11. Jamiyatdagi munosabat

Q15. Sir tutish sabablari

Q19. Profilaktikadagi subyektlar

Q20. Keng tarqalishga ta'sir etuvchi omillar
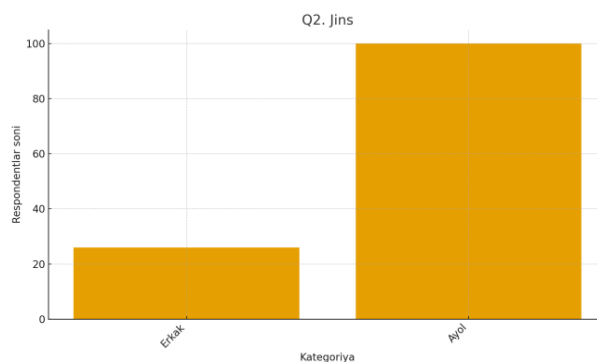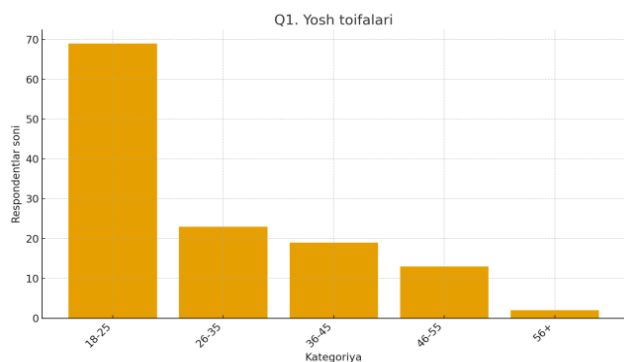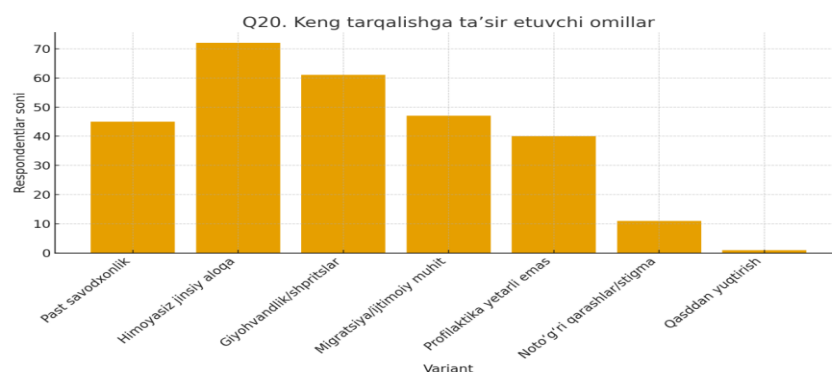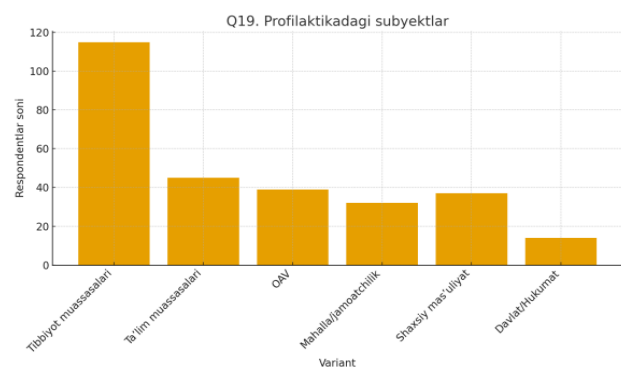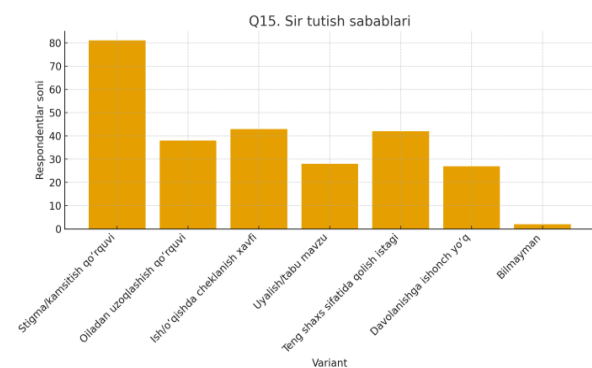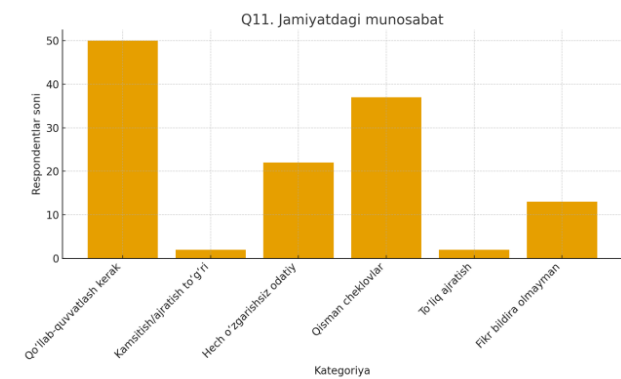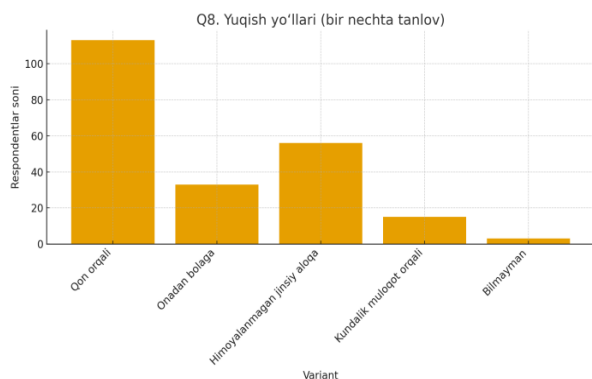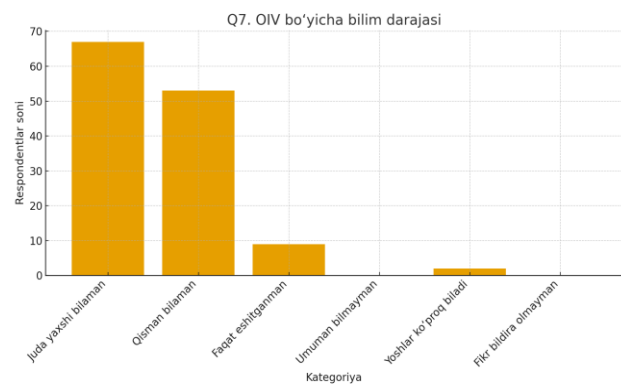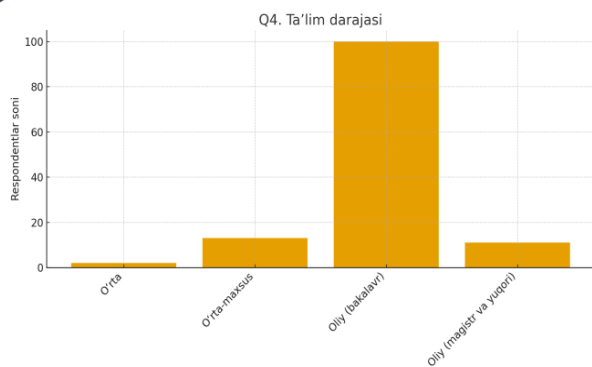
The majority of respondents are young people (18–25 years old – 54.8%) and women (79.4%). Although there is a general level of awareness about HIV among them, significant gaps in the completeness and accuracy of knowledge are a cause for concern. Medical professionals were identified as the most common and reliable source of information about HIV infection (84.9%). At the same time, the influence of the internet and social networks is also significant. Among respondents, 64.3% indicated that stigma and fear of discrimination are the main reasons why people living with HIV keep their illness secret. This indicates that the problem of discrimination persists in

society. Medical institutions were recognized as the most important actors in HIV prevention (91.3%), while the roles of educational institutions and mass media were found to be insufficient. More than half of the respondents consider government efforts to be partially sufficient but not complete. This points to the need to further expand prevention measures. According to data from the Sanitary-Epidemiological Service of the Republic of Uzbekistan and UNAIDS, the level of HIV awareness varies across regions. In our study, nearly half of the respondents reported only partial knowledge about HIV. This aligns with international research, confirming the existence of knowledge gaps in the population. To protect people from this calamity, it is necessary to focus on promoting a healthy lifestyle-a long-established tradition in our society-and addressing issues such as drug addiction, which is condemned by our people.

Conclusion

Poverty, lack of knowledge, gender inequality, migration, injecting drug use, as well as information scarcity and stigmatization are interconnected social roots of HIV spread. The survey results empirically confirmed these theoretical reflections: respondents' age, gender, education level, economic status, and trust in the healthcare system directly determined their behaviors and participation in prevention processes. The main recommendations arising from the study are as follows:

1. Expand educational and awareness programs on HIV among youth and women and improve their medical literacy.

2. Organize specialized medical and psychological support services for labor migrants and high-risk groups.

3. Conduct comprehensive social information campaigns involving religious and cultural leaders, healthcare workers, and civil society representatives to reduce stigma and discrimination.

4. Integrate healthy lifestyle and gender topics into the education system.

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SOCIOLOGICAL AND BIOETHICAL ANALYSIS OF MARRIAGE BETWEEN CLOSE RELATIVES

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Annotatsiya. Ushbu maqolada yaqin qarindoshlar o'rtasidagi nikohning sotsiologik va bioetik jihatlari ilmiy manbalar asosida tahlil qilinadi. Sotsiologik yondashuv qarindoshlar nikohining madaniy, diniy va iqtisodiy ildizlarini ko'rsatadi. Bioetik tahlil esa genetik xavflar, sog'liqni saqlash tizimining vaziflari va etik prinsplariga asoslanadi. Tadqiqot natijalari shuni ko'rsatadiki, qarindoshlar nikohi jamiyatda muayyan ijtimoiy sabablarga ko'ra davom etayotgan bo'lsada, bioetik va tibbiy xavflari jiddiy e'tibor talab qiladi. Bioetik nuqtai nazaridan bunday nikohlar genetik kasalliklar xavfini oshirishi, bola sog'lig'i va avlod salomatligiga salbiy ta'sir ko'rsatishi mumkin. Tadqiqotda bu borada turli xorijiy davlatlar tajribasi, qonunchiligi, yondashuvlar va sog'liqni saqlash siyosatlari tahliliy o'rganildi. O'zbekiston holati shu asosda solishtirilib, milliy siyosatdagi imkoniyat va muammolar ochib berildi. Yakuniy xulosalarda ushbu holatni kamaytirish, aholining genetik savodxonligini oshirish va profilaktik chora-tadbirlarni kuchaytirish bo'yicha takliflar berildi.

Kalit so'zlar: qarindoshlar nikohi, konsangvin, sotsiologiya, ekzogamiya, endogamiya, bioetika, genetik xavf, sog'liqni saqlash.

Аннотация. В данной статье анализируются социологические и биоэтические аспекты брака между близкими родственниками на основе научных источников. Социологический подход раскрывает культурные, религиозные и экономические корни кровнородственного брака. Биоэтический анализ основан на генетических рисках, задачах системы здравоохранения и этических принципах. Результаты исследования показывают, что, хотя кровнородственный брак продолжает существовать в обществе по определенным социальным причинам, его биоэтические и медицинские риски требуют серьезного внимания. С биоэтической точки зрения, такие браки могут повышать риск генетических заболеваний, негативно влиять на здоровье ребенка и здоровье поколения. В исследовании аналитически изучен опыт, законодательство, подходы и политика здравоохранения различных зарубежных стран в этом отношении. На этой основе проведено сравнение ситуации в Узбекистане, выявлены возможности и проблемы национальной политики. В итоговых выводах сделаны предложения по снижению этой ситуации, повышению генетической грамотности населения и усилению профилактических мер.

Ключевые слова: кровнородственный брак, социология, экзогамия, эндогамия, биоэтика, генетический риск, здравоохранение.

Abstract. This article analyzes the sociological and bioethical aspects of marriage between close relatives based on scientific sources. The sociological approach shows the cultural, religious and economic roots of consanguineous marriage. The bioethical analysis is based on genetic risks, the tasks of the health system and ethical principles. The results of the study show that, although consanguineous marriage continues in society for certain social reasons, its bioethical and medical risks require serious attention. From a bioethical point of view, such marriages can increase the risk of genetic diseases, negatively affect the health of the child and the health of the generation. The study analytically studied the experience, legislation, approaches and health policies of various foreign countries in this regard. The situation in Uzbekistan was compared on this basis, and opportunities and problems in national policy were revealed. The final conclusions made proposals to reduce this situation, increase the genetic literacy of the population and strengthen preventive measures.

Keywords: consanguineous marriage, sociology, exogamy, endogamy, bioethics, genetic risk, health care.

Introduction

Marriage is one of the most important mechanisms shaping the institution of the family in society. Marriages between close relatives have historically existed among various peoples, primarily arising to preserve property, strengthen tribal unity, or under the influence of religious norms. However, modern medical research shows that such marriages can increase the risk of genetic diseases. From a bioethical perspective, consanguineous marriages may also conflict with the principle of "do no harm." Therefore, studying this topic from sociological and bioethical viewpoints is highly relevant. Marriages between close relatives are regulated to some extent by law in many countries and societies. The current legislation of the Republic of Uzbekistan also imposes certain restrictions on marriage. In particular, Article 16 of the Family Code clearly outlines conditions under which marriage is prohibited [1]. Despite this, such marriages have been preserved as historical-cultural institutions in many Muslim societies. Their prevalence is high in Arab countries, where first-cousin marriages account for about 25-50% of unions in many states; Pakistan historically records one of the highest rates globally. The persistence of this practice is explained by economic security, social networks, and customs. At the same time, modern medical-genetic research indicates that these marriages increase the risk of recessive genetic disorders in offspring. Islamic scholars and jurisprudence recognize the concept of "women forbidden for marriage" or "haram women," referring to categories of women whom an individual is religiously prohibited from marrying. This is clearly and explicitly stated in the Qur'an. Specifically, Surah An-Nisa, verse 23 lists the women who are forbidden for marriage. According to this verse and jurisprudential sources, marriage between close relatives is strictly prohibited (haram) [2]. Consanguineous marriage constitutes a high proportion in certain regions (South Asia, the Middle East, North Africa). The high prevalence of consanguineous marriages is usually explained by the history of kinship systems, large multi-generational families, socio-economic security, property preservation, and motivations related to social capital within the community.

From the perspective of modern medicine and genetics, such marriages can increase the risk of autosomal recessive diseases and certain congenital defects. This topic remains relevant for Uzbekistan, where local media and official discussions increasingly address restrictions on cousin marriages according to genealogical lines and related preventive policies.

Literature Review

Marriage between close relatives is a pressing topic in both classical and modern sociology, as well as bioethics, focusing attention on its social causes, consequences, opportunities, and challenges. During the study and analysis of the topic, the works of classical sociologists such as Comte O. [3], Durkheim É. [4], and post-classical sociologists including Giddens A. [5] were examined for their discussions on marriage and consanguineous marriage. Additionally, recent foreign and local scientific articles and statistical data were analyzed. For classical sociologists, the social structure, kinship system, family, and society made consanguineous marriage, its causes, and consequences a significant and relevant issue. Comte O. considered marriages between relatives as phenomena that threaten social stability. According to him, the function of marriage is to strengthen social integration among various groups. Durkheim É., in his views, emphasized that "exogamy is a unifying mechanism of society in the evolution of family forms, while consanguineous marriage represents closure within the group" [3, 4]. A prominent contemporary sociologist, Giddens E., noted that consanguineous marriages are typical of traditional cultures, defined endogamy as the individual selecting a spouse only from within their kin, and pointed out that such marriages are decreasing today [5].

Research Methodology

This article focuses on examining the issue of marriage between close relatives from sociological and bioethical perspectives, primarily conducted through an analytical-critical approach based on secondary sources. The phenomenon of consanguineous marriage was analyzed within sociological theories such as structural functionalism, conflict theory, and normative approaches. Additionally, from the basis of bioethics and medical ethics principles, the study theoretically and analytically explored the balance between personal freedom, genetic risks, and public health. The social and moral aspects of marriages between close relatives were studied using the legislation of the Republic of Uzbekistan concerning marriage and family, Islamic jurisprudence, and other religious-legal sources [6, 7]. The experiences, legislation, and healthcare policies of certain foreign countries were examined analytically. The situation in Uzbekistan was compared accordingly, revealing opportunities and challenges in national policy. Genetic and social problems arising from consanguineous marriages were analyzed based on the fundamental bioethical principles of autonomy, non-maleficence, beneficence, and justice.

Results and Analysis

A large part of human life and activity is related to family and family relations. The comprehensive health of family relationships and the family environment is primarily

important for the welfare and stable development of the family, society, and the state. Therefore, not only family founders but also the whole society and the state should bear a certain responsibility in organizing the family and regulating family relations. If this responsibility is not fulfilled properly and attentively, it risks expanding the scale of problems for each stage mentioned above and negatively affecting subsequent processes.

One of the family processes that can be a root cause of such problems is the issue of families formed between close relatives. At first glance, this process may not seem significant enough to be widely raised as a social issue at the level of the state and society. However, the scale of problems it causes can rise beyond the family to the level of neighborhoods, society, and the state. Thus, it is not without reason that this issue is currently receiving focused attention and discussion in the political arenas of our country.

In spring 2024, the Labor and Social Issues Committee of the Legislative Chamber of the Supreme Council discussed this topic at a roundtable titled "Marriage Between Close Relatives: Causes and Consequences" within the framework of drafting a bill proposing amendments to the Family Code to prohibit marriage between close relatives by genealogical lines [8]. A proposal to ban marriage between kin relatives is being considered in the Family Code. According to data from the Civil Registry Office (CRO), from July to December 2021, a total of 1,210 marriages between close relatives were registered nationwide (529 maternal cousins, 307 paternal cousins, 178 first cousins, and 196 maternal cousins). More than half (59%) of these marriages were concentrated in two regions: Surkhandarya (343 cases) and Kashkadarya (371 cases). Among newborns, the incidence of disabilities, including congenital anomalies, deformities, and chromosome disorders within the first year of life, is increasing [9].

In the context of Uzbekistan, marriages between relatives occur more frequently in rural areas than in cities. This is due to traditional views, the desire to strengthen kinship ties, and property interests. According to global experience, in countries such as Saudi Arabia, Pakistan, and Iran, marriages between relatives account for 40-60%.

In Europe and the USA, there are legal restrictions, and this figure is below 1% [10]. Global epidemiological studies show that cultural and social determinants are the main factors in the prevalence of consanguineous marriages. Although the genetic risks are well documented in medical literature, the results regarding their impact on birth rates and overall fertility are inconsistent. For this reason, a comprehensive set of policy measures requires a complex approach that combines not only prohibition and penalties but also preconception counseling, genetic screening, targeted educational campaigns, and voluntary risk identification programs. It can be seen that developed foreign countries have achieved positive results in this area and that reforms and measures are being consistently continued. In Uzbekistan, it is necessary to further strengthen legal and educational reforms related to consanguineous marriages, as well as promotion and genetic counseling services. At the same time, it is important to collect accurate statistical data on consanguineous marriages and their consequences and regularly disseminate analyses to the broader public, as these measures will be effective in practice.

Conclusion

The issue of marriage between close relatives is a complex phenomenon from sociological and bioethical perspectives, situated at the intersection of societal values and traditions with modern medical and ethical approaches. Studies show that in some regions, such marriages persist due to socio-economic conditions, cultural traditions, and lifestyle factors. At the same time, scientific sources provide sufficient evidence of their negative hereditary consequences. In light of this situation, it is necessary to coordinate legal, educational, and medical measures. Implementing mandatory medical examinations and genetic counseling before marriage, as well as strengthening awareness-raising campaigns, is important. Throughout this process, political mechanisms should be gradually applied with respect for personal freedom and bioethical principles. Overall, reducing the potential consequences of consanguineous marriages should rely not only on prohibitions and penalties but also on state policy, scientifically based approaches, and cooperation with the public. Such a comprehensive approach will serve the upbringing of a healthy generation and the stability of society.

Based on the above scientific analyses and existing statistical data, the following proposals can be made to reduce the social and bioethical consequences of consanguineous marriages.

1.Organize regular educational campaigns through educational institutions and mass media about the consequences of consanguineous marriages. Reduce the motivations for such marriages by expanding economic opportunities and positive alternatives for young people.

2.Conduct special monitoring in high-risk areas and publish the results openly in statistical form.

3.Approach political decision-making processes with respect for personal freedom and bioethical principles, preventing stigmatization and discrimination.

The issue of marriages between close relatives is also a relevant topic for Uzbek society. Although their sociological and historical roots go back to ancient traditions, their bioethical and medical aspects today pose a challenge to national demographic security. To prevent this, it is necessary for the state, society, and scientific institutions to cooperate in developing a comprehensive approach to prevent marriages between close relatives.

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PHILOSOPHICAL, PEDAGOGICAL AND PSYCHOLOGICAL BASES OF FORMING INTEREST IN KNOWLEDGE IN STUDENTS

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Annotatsiya. Maqolada o'quvchilarda bilishga bo'lgan qiziqishni shakllantirishning falsafiy va psixologik asoslari tahlil qilinadi. Bilish jarayonining sezgi, tafakkur, xotira, tasavvur va nutq integratsiyasi orqali amalga oshishi, shuningdek, Bruner, Piaget, Vygotskiy va Dewey nazariyalarining pedagogik qo'llanilishi ko'rib chiqiladi. Zamonaviy konstruktivistik yondashuv orqali o'quvchining faol aqliy ishtirokini rag'batlantirish va bilimlarni mustaqil "qurish" mexanizmlari ta'kidlanadi.

Kalit so'zlar: *bilish jarayoni, pedagogik psixologiya, konstruktivizm, kognitiv rivojlanish, o'quvchilarda qiziqish.*

Аннотация. В статье анализируются философские и психологические основы формирования интереса учащихся к познанию. Рассматривается процесс познания как интеграция восприятия, мышления, памяти, воображения и речи, а также педагогическое применение теорий Брунера, Пиаже, Выготского и Дьюи. Подчеркиваются механизмы стимулирования активного интеллектуального участия учащихся и самостоятельного "строительства" знаний в рамках современной конструктивистской парадигмы.

Ключевые слова: *процесс познания, педагогическая психология, конструктивизм, когнитивное развитие, интерес учащихся.*

Abstract. The article analyzes the philosophical and psychological foundations of fostering students' interest in learning. The cognitive process is examined as an integration of perception, thinking, memory, imagination, and speech, along with the pedagogical application of Bruner, Piaget, Vygotsky, and Dewey's theories. The study emphasizes mechanisms for promoting active intellectual engagement of students and the independent "construction" of knowledge within the framework of contemporary constructivist approaches.

Keywords: *cognitive process, educational psychology, constructivism, cognitive development, student interest.*

Introduction

The process of cognition is one of the central aspects of human thinking, and its essence and mechanisms of formation have been studied for many years in the fields of philosophy, psychology and pedagogy. Epistemology, that is, the theory of cognition, studies the processes of human perception of the external world, the formation of knowledge and its application in practice. In this regard, one of the main tasks of pedagogical activity is to arouse students' interest in knowledge and deepen their process of acquiring knowledge. In pedagogical psychology, the process of cognition is considered as an integrated activity of perception, thinking, memory, imagination and speech. The cognitive capabilities of each student, his age characteristics and experience in the social environment determine the effectiveness of the cognitive process. Therefore, when designing educational programs and organizing the educational process, educators must take into account the psychological characteristics of cognitive stages. Theoretical approaches of philosophy and pedagogical psychology help to identify the main principles of forming interest in knowledge in students. Aristotle emphasized that knowledge is formed through the combination of intuition and reason, Kant emphasized that knowledge is realized through intuition and reason together, and Piaget showed the importance of education appropriate to the stages of cognitive development of the child. At the same time, Vygotsky reveals the role of the social environment and the zone of proximal development in the process of knowledge.

In modern pedagogical psychology, the constructivist approach accepts as the main principle the active intellectual participation of students, independent "construction"

of knowledge, and the teacher's management of the process as a facilitator. In this regard, the analysis of the philosophical and psychological foundations of the cognitive process creates a theoretical foundation for increasing interest in knowledge in students and effectively organizing the educational process.

Literature Review

The theory of knowledge (gnoseology) is one of the oldest and most important areas of human thought. Since ancient times, philosophers have sought to explain the essence, sources and boundaries of knowledge. The theory of knowledge studies the relationship of man with the outside world, the mechanisms of its reflection in consciousness. Philosophical analysis of the process of knowledge also plays an important role in the educational process, since any pedagogical activity aims to create knowledge. Therefore, increasing students' interest in knowledge begins with deepening their cognitive activity.

Aristotle interpreted the process of knowledge as a harmonious activity of sensation and reason. According to him, a person first receives information through the senses, and then the mind processes and generalizes this information. In particular, he said – "All human knowledge begins with sensation" emphasizes [1]. This view justifies the importance of observation, experience, practice, and active participation in the learning process. If a student acquires knowledge only through hearing and reading, knowledge may be superficial. However, knowledge obtained through the senses is more solid because it is based on sensory experience. Unlike Aristotle, Plato's views on knowledge are based on an idealistic approach, which considered true knowledge to belong to the "world of ideas." This idea is also important from a pedagogical point of view, since students are required to form not only facts, but also general concepts, and develop the ability to think abstractly. Today, the modern education system also uses these two factors - the combination of sensory experience and conceptual thinking. Immanuel Kant suggests that there are two main sources of knowledge: sensory experience and the categories of reason. Kant argues: "Thoughts without content are empty, sensations without concepts are blind" [2].

This view of Kant shows that in the learning process, intuition (observation, experience) and reason (analysis, understanding) should complement each other. When a student is given new information, he should not only hear, but also have the opportunity to independently analyze and associate it with concepts.

German classical philosophy after Kant (Fichte, Schelling, Hegel) considered the process of cognition as a more complex socio-historical phenomenon. Hegel's dialectics shows that knowledge is constantly developing and rising to a higher level by resolving new contradictions. This approach justifies the need to create problem situations in pedagogy, to give tasks that force the student to think.

Research Methodology

In 20th-century philosophy, phenomenology (Husserl), existentialism (Heidegger, Sartre), and pragmatism (Dewey) sought to see knowledge more subjectively, centered on experience. For example, according to Dewey, the educational process should be inextricably linked with a person's everyday life. The student acquires knowledge not

in a "ready-made" form, but in the process of activity. This view today forms the theoretical foundation of constructivist pedagogy. Thus, an analysis of the philosophical foundations of the cognitive process shows that only when intuition and thinking, individual experience and social experience, ready-made knowledge and research activity are combined with each other, real, solid knowledge is formed. One of the most important factors in arousing students' interest in knowledge is the creation of pedagogical conditions that ensure this harmony. In pedagogical psychology, the cognitive process is interpreted as a complex system aimed at a person's perception of the environment, the formation of knowledge about it and the ability to apply this knowledge. The cognitive process is considered as an integral unity of perception, memory, thinking, imagination and speech. It includes not only the individual psychological capabilities of the student, but also social factors. Therefore, when designing the educational process, it is necessary to take into account the psychological characteristics of the cognitive stages. For example, we can take Bruner's theory, Piaget's theory of cognitive development, Vygotsky's zone of proximal development and Modern cognitive approaches. In particular, Jerome Bruner divides the cognitive process into three stages: enactive (cognition through action), iconographic (cognition through images) and symbolic (cognition through symbols, concepts). "Any subject can be effectively taught to a child of any age, in an intellectually honest form for him" [3]. This approach emphasizes the need to adapt education to the age characteristics of children. Knowledge is learned effectively when the educational material corresponds to the student's existing knowledge and experience. Therefore, educators are advised to gradually complicate the curriculum. This is especially important in the formation of abstract concepts in primary school students.

Jean Piaget explains the process of cognition inextricably linked to the stages of cognitive development of a child: sensorimotor (0–2 years), preoperational (2–7 years), concrete operations (7–11 years) and formal operations (over 11 years).

In his work "The Science of Education and Child Psychology", Jean Piaget states: "The main goal of education is to educate people who can create new things, not repeat what previous generations have done" – he insists that Piaget's idea shows that education should be focused on developing creativity [4]. The process of cognition should not be just memorizing knowledge, but should develop new ways of thinking. Therefore, modern pedagogy seeks to support students' problem-solving, independent judgments, and innovative approaches. Lev Vygotsky, on the other hand, emphasizes that the cognitive process cannot be separated from the social environment and introduces the concept of the "zone of proximal development." He expressed the idea that – "A child can do what he can do in cooperation today, tomorrow he can do independently" - [5]. This view justifies the role of the teacher and peers in the cognitive process. Helping the student (scaffolding) expands his cognitive capabilities and creates conditions for faster acquisition of new skills. This approach is especially effective in differentiated education.

Analysis and Results

In modern cognitive approaches, the constructivist approach plays an important role from the point of view of current pedagogical psychology. According to this approach,

knowledge is not given in a ready-made form, but is "built" through the active mental activity of the student. The teacher should not be a giver of knowledge, but a person who organizes the learning process as a facilitator.

Analysis of the philosophical and pedogical psychological foundations of the cognitive process shows that the formation of knowledge occurs through the integral unity of perception, thinking, memory, imagination and speech. Philosophers such as Aristotle, Kant, Plato defined the harmony of perception and reason as the main principle in determining the sources of knowledge, which further increases the importance of practice and observation in pedagogical activity. The formation of interest in knowledge in students is best explained by the theories of pedagogical psychology. Bruner's three-stage model of cognition, Piaget's stages of cognitive development and Vygotsky's theories of the zone of proximal development indicate the importance of organizing education in accordance with the age characteristics of the student. At the same time, these approaches develop the student's ability to think independently, solve problems and apply knowledge in practice.

Conclusion

The modern constructivist approach, on the other hand, sees the process of knowledge as an active and subjective process and defines the role of the teacher as a facilitator who manages the process, not as a provider of knowledge. This pedagogical perspective further enhances interest in knowledge and independent cognitive activity in students, directing the educational process towards personal and creative development. Thus, the philosophical and psychological foundations of the cognitive process create the theoretical foundation of pedagogical activity. Effective strategies for arousing students' interest in learning and supporting their cognitive and social development are formed precisely on these foundations. At the same time, modern pedagogical and psychological research allows optimizing pedagogical conditions and deepening students' cognitive activity.

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JEAN PIAGET'S THEORY OF COGNITIVE DEVELOPMENT AND ITS STAGES

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Annotatsiya. Mazkur maqolada Jean Piagetning kognitiv rivojlanish nazariyasi tahlil qilinadi. Bolalarning tafakkur jarayonlari to'rt bosqichda rivojlanishi ko'rsatilib, har bir bosqichning o'ziga xos xususiyatlari bayon etiladi. Shuningdek, ushbu nazariyaning ta'lim jarayonidagi amaliy ahamiyati va bolalarning aqliy rivojlanishiga ta'siri tahlil qilinadi.

Kalit so'zlar: kognitiv rivojlanish, Jean Piaget, bolalar tafakkuri, sensor-motor bosqich, preoperatsional bosqich, konkret operatsiyalar, formal operatsiyalar, ta'lim metodikasi.

Аннотация. В данной статье анализируется теория когнитивного развития Жана Пиаже. Рассматривается, как мышление детей развивается в четырех этапах, с описанием характерных особенностей каждого этапа. Также изучается практическое значение данной теории в образовательном процессе и её влияние на интеллектуальное развитие детей.

Ключевые слова: когнитивное развитие, Жан Пиаже, мышление детей, сенсомоторный этап, предоперациональный этап, конкретные операции, формальные операции, методика обучения.

Abstract. This article analyzes Jean Piaget's theory of cognitive development. It describes how children's thinking processes develop in four stages, highlighting the unique characteristics of each stage. Additionally, the practical significance of this theory in education and its impact on children's intellectual development are examined.

Keywords: cognitive development, Jean Piaget, child thinking, sensorimotor stage, preoperational stage, concrete operations, formal operations, educational methodology.

Introduction

Cognitive development represents the process of formation of a person's ability to think, acquire knowledge and solve problems. This process develops from the moment a child is born, in connection with his ability to perceive the environment, process information and use it. The formation and change of human thinking can be different at different age stages. Therefore, psychologists have been paying great attention to studying the process of mental development of children. The theory of cognitive development, developed by the Swiss psychologist Jean Piaget (1896–1980), has created an important scientific basis for understanding children's thinking processes. Through his research, Piaget emphasized that children actively participate in acquiring knowledge and understanding the environment, and determined that their thinking

changes at different stages. His theory describes four main stages of the cognitive development process: sensorimotor, preoperational, concrete operations and formal operations. Piaget's theory of cognitive development is of great importance not only in the field of psychology, but also in pedagogy and the education system. Today, educational programs are adapted to the age characteristics of children. Piaget's research plays an important role in developing age-appropriate teaching methods for children.

Literature Review

Jean Piaget argued that children's thinking develops in a sequential and sequential manner. He believed that each child develops their thinking and problem-solving skills through four main stages. Each of these stages has its own characteristics, and the level of thinking and knowledge acquired by the child varies depending on which stage they are in. These stages are:

1. Sensorimotor stage (0–2 years)
2. Preoperational stage (2–7 years)
3. Concrete operational stage (7–11 years)
4. Formal operational stage (11 years and older)

During the Sensorimotor stage, up to two years of age, infants and young children perceive the environment mainly through their senses (sensory) and movements (motor). The process of learning the world is shaped by reflexes, repetitive actions, and experience. The main characteristics of this stage are, first, reflexive actions (adaptation to the environment through innate reflexes (e.g., the sucking reflex), second, repetitive actions (when a child accidentally performs an action and sees its result, he repeats this action (e.g., hitting a doll and seeing it move, hitting it again), and third, the concept of object permanence (even if the child cannot see an object, it begins to understand its existence. For example, if you cover a toy, the child thinks it is gone. However, at 8–12 months of age, he begins to look for the object) and children's initial views of the environment begin to form

The practical significance of this stage is that Piaget described the importance of various stimuli (vision, hearing, touch) for the early development of children. Today, special toys and educational methods for children aged 0–2 are based on these discoveries [1].

During the Preoperational stage, from two to seven years old, children begin to develop symbolic thinking, meaning they first try to express their thoughts through words, then images, and finally symbols. They also develop the ability to imagine. However, children are still not fully capable of logical thinking.

If we dwell on the main characteristics of this stage, it is a period of development of children's thinking, in which the concepts of egocentrism and animism are formed, as well as the first manifestations of trust-based thinking. At the same time, the concept of conservation is not yet developed.

Egocentrism - the child perceives the world only from his own point of view and has difficulty understanding the thoughts of others. For example, when he watches the sun rise, he may think that the sun is rising only for him.

Animism - the child does not fully understand the difference between animate and inanimate objects. For example, he may consider toys to be alive or attribute human characteristics to them.

Belief-based thinking – the child tries to understand the world based on personal experiences and imagination, rather than making logical conclusions.

Lack of the concept of conservation – the child does not understand that when the shape of objects changes, their quantity or volume does not change. For example, if you pour liquid from a wide container into a narrow one, he may think that the amount of water has decreased.

The practical significance of this stage is that children's egocentric thinking, animistic views and belief-based thinking methods require special approaches in the educational process. In particular, the use of games, visual arts and fairy tales in the process of imparting knowledge is an effective method for developing children's understanding. Also, speaking in understandable language and patiently explaining to them is important in communicating with children, since they do not yet fully understand the concept of conservation and perceive the world through their own experiences. In the next stage, Concrete Operations, between the ages of seven and ten, children begin to think logically, but still have difficulty working with abstract concepts. They reason based on concrete and practical experiences.

If we focus on the main characteristics of this stage, children's thinking continues to develop and the following cognitive changes are observed [2].

Research Methodology

Understanding the concept of conservation – a child can understand that the amount or volume of objects does not change even when their shape or location changes. For example, they understand that when a liquid is poured from one container to another, its volume does not change.

Classification skills – children learn to group objects according to different characteristics. For example, they can distinguish fruits from vegetables or animals according to their habitat.

Understanding cause and effect relationships – children begin to understand the logical connection between events and try to explain the reasons for events. Decreased egocentrism - children try to understand the feelings of others and compare their point of view with theirs.

The practical importance of this stage is that, as children's thinking skills develop, it is important to teach them logical thinking and independent decision-making in the educational process. The educational process at this stage should be based on concrete and practical exercises. Teaching through experience and game elements helps children to understand new concepts more easily [3].

During the Formal Operational Stage, from the age of eleven and up, children develop abstract and abstract thinking. They develop the ability to solve complex problems, think theoretically, and test hypotheses. They also develop intellectual skills such as understanding their own thoughts, critical analysis, and planning for the future [4].

Analysis and Results

If we focus on the main characteristics of this stage, adolescents learn to think logically and systematically, and the following aspects are manifested: First, abstract thinking is formed - adolescents acquire the ability to think based on abstract concepts that are not dependent on concrete experience. For example, they can understand mathematical formulas, scientific theories, or philosophical ideas and form opinions based on them [5].

Secondly, the ability to develop and test hypotheses develops - students have the opportunity to predict the possible outcomes of events, make theoretical assumptions and test them through experiments.

Thirdly, the process of understanding and analyzing their own thoughts occurs - adolescents begin to think more deeply about their feelings, beliefs and plans for the future. They form their own views and try to analyze the points of view of others.

Fourthly, systematic and logical thinking develops - children are able to clearly and reasonably state their thoughts, understand the connections between phenomena and are able to compare different points of view.

The practical significance of this stage is that, among other things, the development of students' abilities to think critically, independently analyze and creatively approach is one of the main tasks of the educational process [6].

It is also important to create opportunities for students to conduct independent projects and scientific research, organize debates, and analyze various issues. At the same time, connecting theoretical knowledge with practical activities serves to further strengthen students' abstract thinking and has a positive impact on their scientific and creative development.

Conclusion

Jean Piaget's theory of cognitive development has provided an important scientific basis for explaining the processes of thinking and learning in children. His research has shown that human thinking develops in a consistent and sequential manner. The four stages identified by Piaget - sensorimotor, preoperational, concrete operational and formal operational - define the basic principles for understanding children's mental development. This theory is also widely used in the educational process and serves as the basis for developing age-appropriate educational strategies for children.

Piaget's theory is widely used in pedagogy and psychology, and it is of great importance in understanding how children think at different ages. While knowledge is acquired through sensations and movements in the sensorimotor stage, symbolic thinking is formed in the preoperational stage. In the concrete operations stage, children learn to think logically, and in the formal operations stage, abstract thinking develops. Understanding the specific features of these stages allows educators to organize the educational process more effectively.

The practical significance of the theory is that it is necessary to adapt teaching methods depending on the stages of development of children's thinking. In particular, interactive and visual games are important for younger children, while experiments and discussions are effective for older children. At the same time, the role of the theory in the modern education system is also important, as it helps to develop educational

methodologies that take into account the individual characteristics of children's thinking.

In general, Piaget's theory of cognitive development serves to fully explain the process of intellectual growth of children. This approach is one of the main criteria for the formation of curricula not only in psychology, but also in the education system. Today, Piaget's concept is effectively used in the development of age-appropriate teaching methods for children, which has a positive effect on increasing the effectiveness of education and the intellectual development of children.

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EXPRESSION OF THE SOVIET TOTALITARY SYSTEM IN THE KHOREZM DISTRICT: POLITICAL REPRESSIONS OF THE 1930S

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Annotatsiya. Ushbu maqolada 1930-yillarda Xorazm okrugida sovet totalitar tizimining ifodasi va "Katta terror" davrida yuz bergan siyosiy qatag'onlarning oqibatlari yoritilgan. Normat Isroilov, Nazirqul Hasanov va Davlat Rizayevlarning taqdiri misolida totalitar siyosatning rahbar kadrlar va jamiyat hayotiga ko'rsatgan salbiy ta'siri tahlil qilingan.

Kalit so'zlar: Okrug, siyosiy qatag'on, "Katta terror," siyosiy repressiya, mafkura, sovet totalitar tizimi, xalq dushmani.

Аннотация. В статье рассматриваются проявления советской тоталитарной системы в Хорезмском округе в 1930-е годы и последствия политических репрессий периода "Большого террора." На примере судеб Нормата Исроилова и Назыркула Хасанова проанализировано влияние тоталитарной политики на руководящие кадры и общественную жизнь.

Ключевые слова: Округ, политические репрессии, "Большой террор," политические репрессии, идеология, советская тоталитарная система, враг народа.

Abstract. This article examines the manifestations of the Soviet totalitarian system in the Khorezm district during the 1930s and the consequences of political repressions of the "Great Terror." Using the cases of Normat Isroilov and Nazirqul Hasanov, the study analyzes the negative impact of totalitarian policies on local leadership and social life.

Keywords: District, political repression, "Great Terror," political repression, ideology, Soviet totalitarian system, enemy of the people.

Introduction

The 1920s and 1930s were a period of profound socio-political transformation in the life of the Khorezm Okrug. The consolidation of Soviet power, the formation of administrative-territorial structures, and the implementation of economic and cultural policies pursued by the central government had a direct impact on the development of the oasis. Beginning in 1925, a district (okrug) administrative system was established in Khorezm, which, from 1938 onward, was reorganized as an oblast (region). During this period, a number of political leaders held key administrative positions, each contributing to the socio-political and economic development of the region in their own way.

However, the latter half of the 1930s witnessed the intensification of political repressions that swept across the Soviet Union. Many prominent leaders were accused of being "enemies of the people" and were unjustly persecuted. Among those who suffered during this tragic period were Normat Isroilov, who served as the First Secretary of the Khorezm District Party Committee between 1934 and 1937, and Nazirqul Hasanov, Chairman of the District Executive Committee. Their fates stand as tragic examples of the brutality and arbitrariness of the totalitarian system of the time.

Literature Review

The issue of political repressions in the Khorezm Okrug during the 1930s began to receive renewed scholarly attention in the post-independence period, when historians started to analyze these events based on new methodological approaches. Recent research in regional studies, archival science, and historical source studies has made it possible to reassess these complex historical processes with greater objectivity.

Among the leading scholars in this field are Shamsutdinov R. and Bekmuhammad U., whose works — "Qatag'on Qurbonlari" ("Victims of Repression") — occupy a special place. Their studies analyze the scope of political persecution in the Khorezm region, the number and social background of those repressed, and provide documentary evidence of their activities and fates. These works serve as primary sources in examining the implementation of the "Great Terror" in Khorezm. Similarly, M. Mahmudov's book "Barhayot Siymolar" ("Living Figures") also contains valuable biographical information about the victims of repression.

In his monograph "The Soviet Policy of Repression in Uzbekistan and Its Consequences", Shamsutdinov R. provides a comprehensive analysis of the ideological foundations of the Soviet totalitarian system, the political mechanisms of repression, and their social-political consequences across the republic.

Archival documents preserved in the national archives of Uzbekistan, particularly the records of the Central Committee of the Communist Party of Uzbekistan, the Khorezm District Executive Committee, and the judicial-investigative bodies, constitute crucial primary sources for studying this topic. These materials shed light not only on the mechanisms of the repression policy but also on the lives of regional leaders such as Normat Isroilov and Nazirqul Hasanov, who were unjustly accused and executed.

In addition, scholarly articles and memoirs published in the independence era have contributed significantly to understanding the human, moral, and social dimensions of the repressions. Their analysis reveals that the central objective of the Soviet totalitarian regime was to create a climate of fear, eliminate independent-minded leaders, and establish an administrative system fully subordinated to the central authority.

This research is based on the principles of historicism, scientific objectivity, and impartiality, employing the following methodological approaches:

1. Historical-analytical approach – enabled a comprehensive examination of the political repressions in Khorezm within the broader socio-political context of the 1930s.

2. Comparative method – allowed for the comparison of repressions in Khorezm with the nationwide "Great Terror," thereby identifying both local specificities and general patterns of implementation.

3. Source-critical method – archival documents, minutes of party meetings, and government decrees were used as primary sources, complemented by modern research studies.

4. Principle of scientific impartiality – ensured that the analysis remained free from subjective bias, relying solely on verified historical evidence.

Methodologically, this article aims to demonstrate the scope of political repressions in Khorezm and their impact on governance, society, and individual destinies through a rigorous academic framework.

Research Methodology

From 1925 onward, the Khorezm Okrug (later oblast) was governed by a succession of leaders officially titled the First Secretary of the District (Regional) Party Committee. These included:

I. Khonsuvarov (1925–1926), Karim Boltaev (1926–1928), Ibrohimov M. (1928–1929), Davlat Rizaev (1929–1930), Yoʻldosh Irismetov (1930–1932), Qodiraliev I. (1932–1934), Normat Isroilov (1934–1937), Ahmadjon Ibrohimov (1937–1938), Yoqubjonov M. (1938–1944), Fathulla Nosirov (1944–1947), Majid Saidov (1947–1949), Imomali Iskandarov (1949–1950), Madrim Rahmonov (1950–1960), Fakhriddin Shamsutdinov (1960–1962), Bektosh Rahimov (1962–1968), Madiyor Khudoyberganov (1968–1986), Mirahmad Mirqosimov (1986–1988), and Rimajon Khudoyberganov (1988–1991). Each contributed uniquely to the socio-economic development of the region [1-4].

Likewise, several figures served as Chairmen of the District (Regional) Executive Committee, including Nazirqul Hasanov, Yoqutjon Murodova, Bolta Davletov,

Ro'zmat Jumaniyozov, Madiyor Khudoyberganov, Rahim Eshchanov, Rimajon Khudoyberganova, Qozoq Xolimbetov, and Abdulla Iskandarov — all of whom played significant roles in the region's progress [2-4].

Among these leaders, Davlat Rizaev, who served as First Secretary between 1929 and 1930, deserves particular attention. Recognized for his integrity, he often resisted blind obedience to directives from the central authorities, at times refusing to implement unreasonable orders. Consequently, in 1930, the Bureau of the Central Committee of the Communist Party of Uzbekistan accused him of "violating party policy" and dismissed him from office for "errors committed in the collectivization campaign."

Yet, Rizaev's political ordeal did not end there. On August 3, 1937, he was arrested as an "enemy of the people." During the investigation, he was subjected to severe torture and, on September 30 of the same year, took his own life in prison at the age of 35. His fate illustrates the ruthlessness of the totalitarian Soviet regime and its disregard for human dignity.

Two other prominent leaders, Normat Isroilov and Nazirqul Hasanov, also fell victim to Stalin's "Great Terror."

Normat Isroilov, born in 1904 in Tashkent, was an educated and dedicated leader who graduated from the Communist University of the Toilers of the East in Moscow. Known for his commitment and diligence, he prioritized state affairs above all else, even foregoing family events such as his sister Zulfiya's wedding and the birth of her first child.

During the 1937–1938 "Great Terror," 1,375 individuals in Khorezm — representing various professions — were subjected to repression. Of these, 394 were sentenced to 10 years of imprisonment in labor camps, 107 to 8 years, while the remainder were executed. Among those executed were Normat Isroilov and Nazirqul Hasanov [3].

After attending a party plenary session in 1937, Isroilov went on leave to Crimea, where he was arrested. He was later transferred to Tashkent, tried, and sentenced to death by the Military Collegium of the Supreme Court on October 8, 1938. On February 28, 1957, the same body officially annulled the verdict and posthumously rehabilitated him.

Nazirqul Hasanov, born in 1903 in the Yom village of Zomin District, came from a poor peasant family. After receiving primary religious education, he attended a Russo-native school between 1914 and 1916 and joined the Communist Party in 1920. Since 1934, he had served as Chairman of the Khorezm District Executive Committee.

Analysis and Results

According to archival documents, on August 5, 1937, the Bureau of the Central Committee of the Communist Party of Uzbekistan convened to review Hasanov's case and resolved:

1. To dismiss Hasanov N. from his position as Chairman of the Khorezm District Executive Committee;

2. To remove him from candidacy for membership in the Central Committee;

3. To submit this resolution to the agenda of the upcoming plenary session [4].

The following day, on August 6, 1937, a criminal case was opened against Hasanov. His trial, held in Urganch and Tashkent, lasted over a year. On November 2, 1938, the Military Collegium of the Supreme Court of the USSR sentenced him to death and ordered the confiscation of his property. After Stalin's death, during the rehabilitation campaigns of the 1950s, his wife, Sora Alieva, petitioned for a review of his case. On November 26, 1957, the Office of the Prosecutor General of the USSR officially exonerated Nazirqul Hasanov posthumously.

This decision not only restored justice but also symbolized the rehabilitation of his honor and the broader restoration of historical truth. The exoneration of both Isroilov and Hasanov serves as an important step in understanding the extent of the "Great Terror" in Khorezm and its devastating effects on local governance and society.

Conclusion

The political repressions that took place in the Khorezm Okrug during the 1930s vividly reflect the workings of the Soviet totalitarian system in the region. The centralization of power, the intensification of party control, and the systematic elimination of alleged "enemies of the people" led to the unjust persecution of many devoted leaders, intellectuals, and ordinary citizens.

The tragic fates of Davlat Rizaev, Normat Isroilov, and Nazirqul Hasanov illustrate the destructive nature of totalitarian politics. Despite their genuine contributions to the economic and social development of Khorezm, they were falsely accused and executed. Their subsequent rehabilitation demonstrates how justice and truth were distorted under the Soviet regime.

Therefore, the repressions in Khorezm during the 1930s must be regarded as a historical tragedy that deeply affected both the leadership and the broader social fabric of the region. Studying this period serves as a reminder of the importance of preserving historical memory, ensuring justice, and safeguarding democratic values to prevent the recurrence of totalitarian oppression in the future.

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THE RATIONAL AND IRRATIONAL CLASSIFICATION WITHIN CONTEXTUAL ARGUMENTATION

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Annotatsiya. Ushbu maqolada kontekstual argumentlashning ratsional va irratsional tasnifi falsafiy-nazariy jihatdan tahlil qilinadi. Tadqiqotda ratsional argumentlash mantiqiy dalil, isbot va tajribaga asoslangan bo'lsa, irratsional argumentlash insonning ichki ruhiy holati, sezgi va e'tiqod bilan bog'liq ekani ko'rsatiladi. Maqolada G'arb va Sharq mutafakkirlarining qarashlari tahlil qilinib, kontekstual yondashuvda bu ikki turdagi fikrlashning o'zaro uyg'unligi ishonch va e'tiqod shakllanishining poydevori sifatida talqin qilinadi.

Kalit so'zlar: kontekstual argumentlash, ratsional fikrlash, irratsional fikrlash, ishonch, e'tiqod, mantiq, kontekst, tafakkur, falsafa.

Аннотация. В данной статье рассматривается философско-теоретическая классификация рационального и иррационального контекстуального аргументирования. Показано, что рациональное аргументирование основано на логических доказательствах и опыте, тогда как иррациональное — на интуиции, вере и эмоциональном восприятии человека. Анализируются взгляды западных и восточных мыслителей, делается вывод о том, что гармония рациональных и иррациональных элементов в контексте является основой формирования доверия и убеждения.

Ключевые слова: контекстуальное аргументирование, рациональность, иррациональность, доверие, убеждение, логика, контекст, мышление, философия.

Abstract. This article provides a philosophical and theoretical analysis of the rational and irrational classification of contextual argumentation. The study demonstrates that rational argumentation is based on logic, evidence, and experience, while irrational argumentation relies on intuition, belief, and emotional perception. The views of Western and Eastern thinkers are analyzed, and it is concluded that the harmony between rational and irrational elements within context serves as the foundation for the formation of trust and belief.

Keywords: contextual argumentation, rational thinking, irrational thinking, trust, belief, logic, context, reasoning, philosophy.

Introduction

In modern philosophical thought, the contextual approach is gaining increasing attention as a new stage in the theory of argumentation. This approach primarily recognizes that human thinking is formed within social, cultural, moral, and historical conditions. From this point of view, "the value of any argument is determined not only

by its logical consistency or formal foundations, but also by the context in which it exists" [1]. This article provides a philosophical analysis of the two main types of contextual argumentation — its rational and irrational aspects. The purpose of the study is to classify contextual argumentation according to its rational and irrational dimensions and to identify the mechanism of their interrelation and harmony.

Literature Review

The theory of contextual argumentation emerged in the second half of the twentieth century as a critique of logical positivism and formalism. Toulmin, in his work "The Uses of Argument," shifted the model of argumentation from strict formal logic to contextual situations [1]. Perelman and Olbrechts-Tyteca, in "The New Rhetoric," emphasized the importance of audience, culture, and social values in the process of argumentation [2]. Wittgenstein, through his theory of language games, demonstrated that thought and meaning are always dependent on social context [3]. Eastern thinkers, particularly Al-Farabi, Ibn Sina (Avicenna), and Al-Ghazali, also highlighted the harmony between rational reasoning and faith-based conviction in their works [4]. Modern scholars such as Habermas and Polanyi show that, in human communication, irrational factors play a decisive role alongside rational foundations [5].

Research Methodology

This study is based on theoretical and analytical methods. The main methodological approaches applied include contextualism, hermeneutics, pragmatism, and constructivism. Contextualism is grounded on the principle that the meaning of every thought is determined by the situation in which it is formed [6]. Hermeneutics emphasizes the importance of subjective interpretation in understanding a text or an argument. Pragmatism, in turn, evaluates the value of any argument through its practical consequences. Throughout the research, logical-analytical, comparative, and conceptual approaches were applied in a complementary manner.

Analysis and Results

Rational contextual argumentation is primarily based on logical reasoning, evidence, and empirical results. It seeks to establish truth through proof and justification within scientific, legal, or moral contexts. In this type of argumentation, the main focus is on epistemological reliability — that is, the value of any thought is determined by its logical coherence and correspondence to truth. For instance, in Aristotle's syllogistic logic or Descartes' method of doubt, rationality manifests itself as an epistemic foundation [7]. From this perspective, rational contextual argumentation embodies the analytical, critical, and objective aspects of human thinking. It serves to distinguish thought from subjective impressions, to arrange arguments in a logical sequence, and to form conviction through the process of substantiating truth.

The strength of rational argumentation lies in its tendency toward universality: arguments and proofs can be recognized as valid even beyond a specific context. However, from the standpoint of the contextual approach, this universality is always relative — every logical argument is formed within particular social, cultural, or

historical conditions and derives its strength precisely from that context. Therefore, by contextual rationality we mean not only logical rigor but also meaningfulness within a given situation. For example, a scientific proof may establish truth within one context, yet in another social or cultural setting it may lose its relevance. Thus, rational argumentation, when viewed through the lens of contextual analysis, acquires a new and dynamic form.

Irrational contextual argumentation, on the other hand, relies on a person's inner spiritual state, intuition, faith, and aesthetic perception. This type of argumentation is most often found in religious, artistic, political, or moral discourses. In such contexts, the source of conviction is not evidence or logical proof, but rather inner spiritual experience, intuitive perception, or moral sensitivity [8]. For example, in religious belief, internal faith, heartfelt experience, and spiritual emotions hold a more significant place than empirical evidence or logical justification. In art, the individual's aesthetic intuition expresses a deeper form of truth than rational explanation can provide. Therefore, irrational argumentation reveals the emotional, intuitive, and axiomatic layers of human thought. The contextual analysis of the irrational approach shows that such types of arguments are often based not on logical reasoning but on personal experience, social values, and cultural traditions. For instance, a moral norm or a religious belief accepted in one society may be interpreted entirely differently in another context. Therefore, irrational argumentation cannot be fully understood outside of its context — it is deeply intertwined with culture, tradition, and history.

In genuine communication and argumentation processes, rational and irrational aspects coexist in harmony. This harmony ensures a balance between logic and emotion, proof and intuition, evidence and belief. The rational foundation forms trust, while the irrational dimension gives faith its depth and stability. Their dialectical unity represents the wholeness of human thought — one expressing reason, the other embodying the spirit.

Thus, in the process of contextual argumentation, rational and irrational elements function as complementary and mutually balancing forces. Their correlation determines the effectiveness of communication, the depth of trust, and the stability of belief. In modern philosophical approaches, this integrative position — that is, the harmony of reason and intuition, evidence and conviction, logic and spirituality — is regarded as the highest form of human thought.

Conclusion

The research findings show that contextual argumentation is a complex yet balanced process that unites the rational and irrational layers of human thought. While the rational approach serves to justify truth through reasoning, evidence, and logic, the irrational approach reinforces it spiritually, emotionally, and psychologically. Thus, contextual argumentation reflects the harmony of the two poles of human cognition — reason and emotion, evidence and belief, knowledge and faith.

Modern philosophy demonstrates that evaluating human thought solely by rational criteria does not allow for its complete understanding. Every idea, view, or belief is formed within a particular social and cultural context and is nourished by the value system of that context. Therefore, the contextual approach analyzes the human being

not only as a knowing subject but also as a feeling, believing, and spiritually experiencing being.

The rational and irrational elements of contextual argumentation appear as two complementary forces. Their integration contributes not only to the formation of trust and belief but also to the deepening of communicative culture. Mutual understanding, tolerance, and the exchange of ideas among people develop precisely through this harmony.

Therefore, contextual argumentation can be regarded as an important methodological approach in modern philosophy and social thought aimed at restoring the integrity of human cognition and enriching the meaning of trust and belief. In the present era, it increasingly asserts its relevance as a philosophical model that seeks to explain the intellectual, emotional, and spiritual dimensions of human activity within a unified system.

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THE TEACHER'S PERSONAL POSITION AND THE PEDAGOGICAL ENVIRONMENT: THEIR IMPACT ON THE INTELLECTUAL DEVELOPMENT OF STUDENTS

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Annotatsiya. Ushbu maqolada pedagogik muhit va o'qituvchining shaxsiy pozitsiyasining ta'lim jarayonidagi roli tahlil qilinadi. Pedagogik muhit o'quvchilarning intellektual va ijtimoiy rivojlanishiga ta'sir ko'rsatishi, o'qituvchining shaxsiyati esa o'quvchilar bilan samarali muloqot va ishonch muhitini yaratishda muhim omil ekani yoritilgan. Zamonaviy pedagogik yondashuvlar va olimlarning fikrlari asosida o'qituvchining motivator va yo'naltiruvchi sifatidagi roli hamda ta'lim samaradorligini oshirishdagi ahamiyati muhokama qilinadi.

Kalit so'zlar: pedagogik muhit, o'qituvchining shaxsiy pozitsiyasi, ta'lim, motivatsiya, pedagogik yondashuv, o'quvchi rivojlanishi.

Аннотация. В статье анализируется роль педагогической среды и личной позиции учителя в образовательном процессе. Освещается влияние педагогической среды на интеллектуальное и социальное развитие учащихся, а личность учителя рассматривается как ключевой фактор в создании эффективной коммуникации и доверительной атмосферы с учениками. На основе современных педагогических подходов и взглядов ученых обсуждается роль учителя как мотиватора и наставника, а также его влияние на повышение эффективности обучения.

Ключевые слова: педагогическая среда, личная позиция учителя, образование, мотивация, педагогический подход, развитие учащихся.

Abstract. This article analyzes the role of the pedagogical environment and the teacher's personal position in the educational process. It highlights how the pedagogical environment influences students' intellectual and social development, and the teacher's personality as a crucial factor in creating an effective communication and trust environment with students. Based on modern pedagogical approaches and scholars' views, the teacher's role as a motivator and guide, as well as their impact on enhancing educational effectiveness, are discussed.

Keywords: pedagogical environment, teacher's personal position, education, motivation, pedagogical approach, student development.

Introduction

In the modern education system, the comprehensive development of the student's personality, supporting him not only with knowledge, but also with socio-psychological aspects, is becoming an important task. In this process, the quality of the pedagogical environment and the personal position of the teacher come to the fore as a decisive factor. Because the educational process is effective only when it is carried out in an environment that is comfortable, stimulating and based on mutual trust not only in terms of content, but also emotionally and socially.

The pedagogical environment is a complex system consisting of interactions between teachers and students, the socio-psychological atmosphere in the classroom, attitudes towards education and the internal motivation of participants. Such an environment does not form by itself - it is built on the basis of the teacher's professional skills, personal qualities and methodological approaches. The teacher is the organizer of the pedagogical environment and plays a key role in creating an atmosphere of respect, freedom, justice and mutual support in the classroom.

Today, a teacher is seen not just as a transmitter of knowledge, but as a guide, a reliable companion, a mentor who contributes to the intellectual and spiritual development of the student. Therefore, the interaction and harmony of the pedagogical environment and the personal position of the teacher play an important role in ensuring socio-emotional growth in modern education, forming students' internal motivation, and educating them as active individuals.

Literature Review

The concept of pedagogical environment has become one of the central concepts of the educational process today. This environment is not limited only to the physical space where students sit, but also includes such aspects as psychological relations between teachers and students, the social climate in the classroom, student interactions, motivational factors, and emotional security. The effectiveness of education largely depends on the harmony of these factors, and in a positive pedagogical environment, students feel valued, free, and active subjects. In such conditions, the student not only receives knowledge, but also acquires important skills such as thinking, asking questions, striving for problem solving, and a tendency to creativity. From this point of view, the pedagogical environment is not an organizational tool for educational activities, but an important pedagogical factor that directly affects the personal development of the student. Vygotsky L.S. writes in this regard: "The teacher is the organizer of the social environment in which the child can fully develop as a person" [1]. This view interprets the role of the teacher not only as a person who imparts knowledge, but also as a social leader who establishes healthy social relationships in the classroom, forms an atmosphere of cooperation, and encourages mutual respect and support among students. The teacher not only manages the lesson process, but also actively influences the socio-psychological development of students. A positive pedagogical environment in the classroom is considered a space where students can freely express their opinions, where mutual respect reigns, and where the dignity of each individual is recognized. In such an environment, students not only receive

knowledge, but also acquire social skills: they learn to work in a team, share responsibility, listen to others, and resolve disagreements peacefully.

Research Methodology

Students' interest in learning is often closely related to their level of emotional safety in the classroom. If there is an atmosphere of intense competition, fear, or excessive criticism in the classroom, the student becomes internally withdrawn and their activity decreases. On the contrary, if the teacher encourages students, appreciates their every success, their interest increases, and a desire for creative exploration arises. Psychological safety is a necessary condition for a student to freely express his or her opinion, ask questions without fear of making mistakes, and dare to test new knowledge. This increases not only individual development, but also the effectiveness of group communication and cooperation. A favorable pedagogical environment encourages the student not only to think freely, but also to be creative, to create new ideas. In such an environment, the student enjoys his intellectual activity, perceives each new knowledge as a personal achievement. In this process, the teacher acts as a motivator, guide and advisor. He values the students' questions, allows them to find independent solutions and teaches them to defend their opinions. As a result, students do not limit themselves to simply mastering ready-made information, but also become active subjects who discover knowledge for themselves, conduct research.

The personal position of the teacher is the main determinant of this environment. The behavior of the teacher, the style of interaction in the lesson, his communicative skills and moral principles directly affect the positive or negative atmosphere in the classroom. Komensky Y.A. said: "The teacher is the heart of the school; as the teacher is, so is the school" [2]. These words of Comenius emphasize the decisive role of the teacher's personality not only in imparting knowledge, but also in shaping the general socio-psychological climate in school life. The teacher, with his moral position, speech, culture of managing emotions and pedagogical skills, has a direct impact on the life of the entire classroom. If he is knowledgeable, fair, demanding and at the same time sincere, mutual respect and cooperation will increase among students, they will not be afraid to freely express their opinions and will actively participate in the educational process. In such an environment, students will learn not only to acquire knowledge, but also to think independently, analyze, communicate and make responsible decisions. On the contrary, the negative behavior of the teacher, for example, injustice, indifference, belittling students or indifferent attitude to their questions, reduces the general mood of the class. This discourages students from learning, reduces their initiative, and in some cases even instills a sense of self-doubt and fear of classes. Therefore, the pedagogical environment is determined not only by didactic materials, but also by the personality of the teacher, his humanity and psychological sensitivity.

Analysis and Results

Modern pedagogical research also reinforces this idea. The following idea of Jerome Bruner deepens this issue: "Motivation develops by creating an environment in which interest can be continuously maintained." This idea of Bruner further reveals the relationship between the personal position of the teacher and the pedagogical

environment. According to him, the teacher, as a source of knowledge, is not a person who gives knowledge, but a guide who encourages students to think, research, make independent decisions and make their own discoveries. The learning environment in the classroom should be such that students are not afraid to express their opinions freely, accepting even incorrect answers as an opportunity for growth and learning. This awakens intrinsic motivation in students, turns the process of acquiring knowledge into a personal experience and reveals the true meaning of education.

In such conditions, the teacher's personal position is in harmony with the national knowledge environment, and he appears as an intellectual support, a reliable force, and a true partner. Bruner's idea of "teaching through discovery" shows that students should not be limited to mechanical memorization of ready-made knowledge, but should acquire it through their own search, testing through experience, analysis, and independent production of new knowledge. In this process, the teacher is not a source of material knowledge, but a guide, he does not limit the freedom of students to think independently and creatively. The physical and practical environment in the classroom increases the cognitive activity of students, develops in them the skills of asking questions, developing and solving problems, creative thinking, and applying them to real-life situations.

This shows that the learning process is not a means of information assistance, but a complex collaborative process that develops the intellectual personality of the student. When students feel themselves to be active participants in this process, they are formed by an emotional attitude towards the lesson, strive for personal goals in acquiring knowledge and development. This strengthens long-term motivation and further strengthens the bonds of trust and cooperation between the teacher and the student. Thus, as Bruner noted, effective education is the result of constant respect between the student and the teacher, mutual communication and a common desire to search for new ideas. Another important aspect of the pedagogical environment is the opportunity for the student to express himself, engage in creative activities. Carl Rogers writes: "A truly educated person is a person who has learned to learn and change." Rogers's vision radically reinterprets the role of the teacher: the teacher is not a transmitter of knowledge in a ready-made form, but a companion who guides the student to independent learning, self-development and adaptation to life factors. In this case, the student is put at the center of the educational process, and lessons are organized in accordance with his personal pace, production and physical exercises. According to Rogers' concept of "Human Education", true education is the student's self-awareness, discovery of inner wealth, determination of personal goals and abilities, and finding his own identity on the path to success in life.

In this way, education becomes a process aimed not only at acquiring external knowledge, but also at ensuring the internal development of the student. The teacher acts as a guide, a facilitator in this process, and helps the student to fully understand his or her identity. In this pedagogical approach, the thinking, emotional and personal aspects of the student are taken into account, and the educational process must be adapted to their specific needs.

Conclusion

The pedagogical environment and the personal position of the teacher play a decisive role in the effectiveness of the educational process and the personal development of students. An effective educational environment not only provides students with the opportunity to gain knowledge, but also encourages them to think freely, be creative, and express their opinions. In this process, the teacher is not only a person who transmits information, but also an organizer, motivator, and social leader of the pedagogical environment.

A positive personal position strengthens mutual respect and trust in the classroom, increases motivation and activity in students. On the contrary, a negative attitude and incorrect approach of the teacher discourages students from acquiring knowledge, reduces their self-confidence, and leads to passivity in the educational process. Therefore, the psychological support and kindness of the teacher are among the most important factors determining the quality of the educational environment.

Modern pedagogical approaches, including the educational concepts of Bruner and Rogers, attach great importance to the personal development of the student. They consider education not only as a transfer of knowledge, but also as a complex process that encourages the student to independent thinking, self-awareness and creative activity. In this approach, the teacher, as a guide, awakens the internal motivation of students and comprehensively develops the pedagogical environment. At the same time, the personal qualities of the teacher, his moral position and communicative abilities play a key role in the pedagogical process. By creating a socio-cultural environment in the classroom through his sincerity, patience and pedagogical skills, he forms students' interest in learning and their attitude towards education. As a result, real education becomes a process of effective cooperation between the student and the teacher, based on trust and respect.

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REFLECTION OF THE DEVELOPMENT OF COMMUNICATIVE SKILLS IN STUDENTS OF PEDAGOGICAL DIRECTION IN PSYCHOLOGICAL LITERATURE

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Annotatsiya. Ushbu maqola pedagogika yoʻnalishidagi talabalarda kommunikativ koʻnikmalarni rivojlantirish masalasining psixologik adabiyotlarda qanday yoritilganligini tahlil qiladi. Adabiyotlar tahlili shuni koʻrsatadiki, boʻlgʻusi pedagog mutaxassislarning kommunikativ koʻnikmalari ularning professional faoliyatining samaradorligini belgilovchi asosiy omillardan biridir. Tahlil natijalari pedagogik taʼlim tizimida kommunikativ koʻnikmalarni rivojlantirishga qaratilgan psixologik yondashuvlarning xilma-xilligini va ularning amaliy ahamiyatini namoyon etadi.

Kalit soʻzlar: kommunikativ koʻnikmalar, pedagogik kommunikatsiya, boʻlgʻusi oʻqituvchilar, kommunikativ kompetentlik, psixologik adabiyotlar, professional tayyorgarlik, pedagog shaxsi.

Аннотация. В статье анализируется освещение проблемы развития коммуникативных навыков у студентов педагогических специальностей в психологической литературе. Анализ литературы показывает, что коммуникативные навыки будущих педагогов являются одним из основных факторов, определяющих эффективность их профессиональной деятельности. Результаты анализа демонстрируют многообразие психологических подходов, направленных на развитие коммуникативных навыков в системе педагогического образования, и их практическую значимость.

Ключевые слова: коммуникативные навыки, педагогическое общение, будущие учителя, коммуникативная компетентность, психологическая литература, профессиональная подготовка, педагогическая личность.

Abstract. This article analyzes how the issue of developing communicative skills in students of pedagogical specialties is covered in psychological literature. The analysis of the literature shows that the communicative skills of future pedagogical specialists are one of the main factors determining the effectiveness of their professional activities. The results of the analysis demonstrate the diversity of psychological approaches aimed at developing communicative skills in the pedagogical education system and their practical significance.

Keywords: communicative skills, pedagogical communication, future teachers, communicative competence, psychological literature, professional training, pedagogical personality.

Introduction

The question of educating pedagogical personnel continues to be an essential issue in the modern educational practices. Teacher's professional activity relies heavily on the communication process; therefore, communication skill development of the future teachers has been considered one of the significant tasks. Communicative competence is a core factor of the teacher's individual and professional characteristics, which not only determines the effectiveness of teaching but also influences the quality of the relationship with students and the overall success of the teaching activity. Even though this topic has been approached from different angles in literature on psychology, still, the lack of systematic analysis of the theoretical grounds and practical methods for developing the communicative skills in students of pedagogical specialties is evident. There have been observable processes of modernization in pedagogy education over the last few years in the higher education institutions of Uzbekistan, and consequently, the problem of providing future teachers with good communication skills has gained urgency in this very context.

This study aims to examine the issue of developing communicative skills in students of pedagogical specialties as it is presented in psychological literature, and to point out the primary approaches. The objectives of the research are: to investigate the theoretical basis of communicative skills concept, to depict the traits of pedagogical communication, to scrutinize the psychological mechanisms for enhancing future teachers' communicative competence and to assess the practical relevance of the approaches highlighted in the literature.

Literature Review

The research was performed systematically while looking through psychological and pedagogical literature. Different methods like comparative study of texts, conceptual analysis of concepts, and theoretical approach synthesis were applied during the analysis.

The theoretical folds of the communicator skills concept have been disclosed through several channels. Leontev A.A. views communication as an act and examines its psychological structure and identifies the motivation, goal, and action as the human personality traits in the interaction process [1]. Ananev B.G. looks at the development of communicative abilities as a stage of the general system of abilities and studies it from a genetic point of view [2].

In psycho-therapy, Davletshin's M.G. works have revealed the problem of developing the teacher's communicative culture while underlining the influence of the national mentality and cultural traits, and also focusing on the communication methods that have been practicing in Uzbek teaching and their effectiveness [3].

Under the international studies, the issue of communicative competence is treated as part of a larger global picture. The communicative competence model of Hymes D. brings out the linguistic use to the level of being not only grammatically correct but also socially and culturally acceptable [4]. The application of this view is particularly significant in the teaching context where being able to talk and interact in an appropriate manner in different social situations is a must for teachers.

The particular traits of pedagogical communication have been particularly focused on in several studies. Kan-Kalik V.A. presents pedagogical communication as a professional communication that aims at achieving mutual understanding, cooperation, and building up interpersonal relationships between the teachers and the students [5]. The author isolates the didactic, educational, and psychological functions of pedagogical communication and illuminates their interconnectedness. Bodalev A.A. points out the significance of a teacher's ability to accurately interpret students' minds in the context of the psychology of interpersonal perception and comprehension and investigates the ways through which this ability can be developed [6].

The Uzbek researcher Azizkhojayeva N. investigates the issue of teacher's communicative competence formation through the prism of pedagogical technologies and advocates for the necessity of interactive communication methods in the modern education system [7]. Among the international researchers, Rogers C. with his person-centered approach illustrates the significance of the principles of empathy, congruence, and unconditional acceptance in the process of pedagogical communication [8]. These principles are extensively utilized in the teacher training programs for the future educators.

The psychological mechanisms for developing the communicative competence of future educators have been delved into from different angles. Petrovskaya L.A., who stands on the grounds of the active teaching methods for the development of communicative competence, shows the efficacy of role-playing, psychological training, and large-group working techniques [9]. In Russian psychology, Rudensky E.V. developed the structure of communicative competence in pedagogical activity, identified its cognitive, emotional, and behavioral components, and described the stages of their development.

In the Uzbekistan education system, Mamatov S.S. emphasizes the importance of communicative preparedness in training pedagogical personnel and develops specific methods for developing the speech culture and professional communication skills of future teachers [10]. These methods are created taking into account the linguistic characteristics of the Uzbek language and national pedagogical traditions, and have practical significance.

Analysis and Results

The literature review carried out reveals that the issue of forming the communicative abilities of students in pedagogy has been considered in psychology as a multifaceted and intricate problem. The analysis of the literature produces a few important points for us to reflect upon. One such point is that it has been clearly stated that the term 'communicative competence' is a holistic concept which comprises not only the verbal and nonverbal communication skills but also the ability to understand others, to feel for, to be emotionally intelligent, and to adapt socially and psychologically. The multi-faceted nature of this concept demands a still more complicated approach in the realm of pedagogical training. Another significant point in this context is that the peculiar features of teaching communication set it apart from communication in other professional activities as it not only enables but also directly staffs the progressive development of students. Moreover, the literature on Uzbek,

Russian, and foreign texts shows that while there are some commonalities and differences at the same time one can see that the mix of factors is such that the former is due to the universal psychological mechanisms of communicative competence while the latter is because of the cultural-national peculiarities. The study of the theoretical approaches offered in the literature demonstrates that there are various ways of working on communicative skills development. The activity approach believes in the creation of communication skills through the practical activity and claims that the students acquire those skills by engaging in many different activities such as practice, simulation, and role play in different pedagogical situations. The person-centered approach, on the other hand, is about taking into account each student's specific traits, their initial level of communication readiness, and psychological characteristics. The competence-based approach involves developing clear criteria and assessment indicators in forming the communicative competence of future teachers. The cultural-contextual approach requires taking into account national educational traditions, cultural values, and the characteristics of the social environment, which is particularly important in multinational and multicultural societies like Uzbekistan. These approaches complement each other and should be applied comprehensively in pedagogical education.

Based on the analyzed sources, several important conditions for developing communicative skills in students of pedagogical specialties are identified. The first condition is connecting theoretical knowledge with practical skills, meaning that students must acquire fundamental knowledge in psychology, pedagogy, and communication theory while also possessing the skills to apply them in practical pedagogical situations. The second condition is developing reflective activity, as the ability to analyze and evaluate one's own communicative behavior is an important factor of professional growth. The third condition is creating a psychologically safe environment, which gives students the opportunity to test their communicative skills, learn from mistakes, and develop new communication styles. The fourth condition is taking into account the national-cultural context, as each culture has its own specific communication norms, etiquette rules, and acceptable behaviors. The fifth condition is ensuring opportunities for continuous practice and experience accumulation, which is implemented through pedagogical practice, internships, and work in real educational institutions.

Conclusion

In psychological literature, the issue of developing communicative skills in students of pedagogical specialties has been extensively and deeply covered, and research in this field presents rich material both theoretically and practically. The literature analysis shows that communicative competence is considered the main component of a teacher's professional activity, and its effectiveness largely depends on the teacher's ability to communicate. Developing the communicative skills of future teachers requires a comprehensive approach, which includes not only acquiring knowledge of communication theory but also forming practical skills, developing personal qualities, and continuous professional growth. The analyzed Uzbek, Russian, and foreign sources provide valuable information about various pedagogical technologies, methods, and

approaches that can be applied in the process of preparing future teachers and help understand the similarities and differences between them.

The research results show that special attention to communicative preparedness is necessary in the pedagogical education system. For this purpose, it is recommended to improve educational programs, introduce a system of special courses and training aimed at developing communicative competence, create more opportunities for students to accumulate practical pedagogical activity experience, and establish a system for continuous monitoring of their communicative development. In the context of the Uzbekistan education system, taking into account national-cultural characteristics, the creative application of modern foreign experience and preserving the best aspects of Uzbek pedagogical traditions are of great importance.

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LINGUOCULTURAL CLASSIFICATION OF VISUAL AND VERBAL SIGNS IN ENGLISH AND UZBEK LANGUAGE

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Annotatsiya. Ushbu maqola ingliz va o'zbek tillaridagi vizual va verbal belgilarni o'rganish uchun kognitiv lingvistika, vizual semiotika va tanqidiy diskurs tahlili nazariyalarini qo'llaydi. Shuningdek, reklama diskursida ingliz reklamasi odatda individualizm va ijodkorlikka urg'u berishi, o'zbek reklamasi esa kollektivizm va an'anaviy qadriyatlarga urg'u berishi ta'kidlangan. Bundan tashqari, kinoda vizual va verbal kodlarni taqqoslashda ingliz kino madaniyati asosan global va individuallikni ta'kidlaydigan tasvirlardan foydalanadi, o'zbek filmlari esa oilaviy, an'anaviy qadriyatlar va milliy o'ziga xoslikni ta'kidlaydi.

Kalit so'zlar: kognitiv tilshunoslik, vizual va og'zaki belgilar, individualizm, ijodkorlik, reklama diskursi.

Аннотация. В данной статье применяются теории когнитивной лингвистики, визуальной семиотики и критического дискурс-анализа для изучения визуальных и вербальных знаков в английском и узбекском языках. Также отмечается, что в рекламном дискурсе английская реклама, как правило, акцентирует индивидуализм и креативность, в то время как узбекская – на коллективизме и традиционных ценностях. Более того, при сравнении визуальных и вербальных кодов в кинематографе, английская кинокультура преимущественно использует образы, подчёркивающие глобальное и индивидуальное, тогда как узбекские фильмы отдают центральное место семье, традиционным ценностям и национальной идентичности.

Ключевые слова: когнитивная лингвистика, визуальные и вербальные знаки, индивидуализм, креативность, рекламный дискурс.

Abstract. This article applies the theories of cognitive linguistics, visual semiotics, and critical discourse analysis in the study of visual and verbal signs in English and Uzbek. It also highlights that in advertising discourse, English advertisements tend to emphasize individualism and creativity, while Uzbek advertisements focus on collectivism and traditional values. Furthermore, when comparing visual and verbal codes in cinema, English film culture predominantly features images emphasizing the global and the individual, whereas Uzbek films place central importance on family, traditional values, and national identity.

Keywords: Cognitive linguistics, visual and verbal signs, individualism, creativity, advertising discourse.

Introduction

In modern communication, multimodal expression is becoming increasingly widespread - meaning that meaning-making is not limited to written or spoken language alone, but involves the combined use of several semiotic modes such as images, colors, sounds, and graphics. Such poly-code texts are complex structures made up of combinations of different codes, in which language (verbal), images (visual), color, and other sign systems merge to form a coherent meaning [9]. Examples of multimodal texts include advertisements, film frames, school textbook pages, and social media posts. In such texts, the interaction between verbal and visual signs - their cooperation and mutual complementarity - plays a particularly important role.

Literature Review

A scientific and theoretical basis is needed for understanding how visual (illustrative) and verbal (textual) signs in English and Uzbek can convey individualism and creativity. In this regard, approaches such as cognitive linguistics, visual semiotics, and critical discourse analysis play an important role. According to cognitive linguistics, human thought and language are closely interconnected, with cultural concepts formed through words and images [1]. For example, in English, conceptual metaphors related to colors are significant: the color "blue" is associated with sadness ("Monday morning blues" – Monday melancholy), which is an example of cognitive culture. In Uzbek, colors also carry semantic weight: for instance, "white" (*oq*) is linked with purity and goodness ("*oq koʻngil*" – kind-hearted) while "black" (*qora*) symbolizes evil or sorrow.

Research Methodology

Visual semiotics applies sign theory to images: visual representations and symbols can have iconic, indexical, or symbolic meanings. Critical Discourse Analysis (CDA) aims to uncover hidden ideas and ideologies embedded in visual and verbal codes. Through a critical approach, it becomes possible to identify the social values or power relations underlying images and texts in advertisements, films, or textbooks. For example, in advertising, visual images and slogans may transmit consumerist ideology or gender stereotypes; in textbooks, images and texts may be used to instill certain historical or national ideas.

These three theoretical approaches, taken together, provide a foundation for multimodal analysis. Multimodal analysis examines text and image simultaneously, explaining the complex process of meaning formation. Thus, cognitive linguistics studies the concepts formed in the mind through visual and verbal signs, semiotics investigates their sign systems, and critical analysis explores their socio-cultural impact.

"Advertising is one of the key areas in which cultural codes are concentrated, where the combination of words (verbal slogans) and images (brand visuals, colors) serves to influence the consumer. The analysis of English and Uzbek advertisements clearly reveals their linguacultural features. Studies show that English advertisements rely more on individualism and creativity, while Uzbek advertisements tend toward collectivism and traditional values. In particular, English slogans are often quick and

humorous in style, sometimes containing irony or intertextual references" [8]. Similarly, English advertisements often emphasize personal benefit - for example, slogans like "Just Do It" encourage individual decision-making. In contrast, Uzbek advertisements, taking into account the national mentality and traditions, are based on collective values.

Distinctive Features of English and Uzbek Advertisements

English Ads
- Individualism
- Creativity

Uzbek Ads
- Collectivism
- Traditionalism
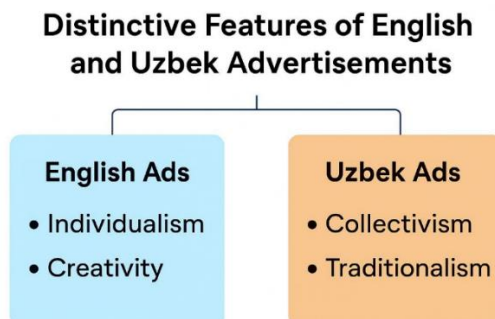
Figure 1. Distinctive features of English and Uzbek advertisements.

A comparative analysis of advertising slogans also reveals sharp differences. According to research findings, English advertising slogans widely use linguistic devices such as punning, rhyme, and alliteration to make them impactful and memorable. For example, in English, short, concise slogans rich in humor and wordplay work effectively for branding ("Hungry? Grab a Snickers" – "Are you hungry? Grab a Snickers").

Uzbek advertising slogans, on the other hand, tend to rely on expressions that reflect traditional values and national pride. They often make use of local proverbs, idioms, and personal addresses to evoke warm feelings and nostalgia in the audience. In Western advertising, visual elements often emphasize attractiveness (for example, featuring famous celebrities or modern design), whereas advertisements in Uzbekistan usually include images that suggest family happiness and references to national traditions. As noted above, this is largely due to the country's demographics, where a significant proportion of the population consists of young families with strong traditional values [6]. Moreover, cultural and religious factors also influence advertising imagery - for example, in Uzbekistan, depictions that violate ethical or moral norms are restricted; instead, imagery that aligns with family values and concepts of honor and modesty is chosen. In Western advertising, individual scenes focusing on personal achievement and self-satisfaction (a businessman on a yacht, an athlete training, etc.) are more common. These differences, of course, can be explained by the position of each culture on the individualism–collectivism spectrum. Researchers, referring to Hofstede's theory, also emphasize that cultural values (especially the degree of individualism or collectivism) play an important role in how advertising messages are received [6].

From a critical analysis perspective, the visual-verbal signs in advertisements also serve to spread stereotypes and ideologies within society. Thus, in advertising discourse, there is a story constructed through both text and image, and through it, along with cultural values, a certain ideology is also transmitted.

Cinema – a mirror reflecting the nation's mindset and aesthetics. The comparison of visual-verbal signs in English (and Western in general) cinema and Uzbek cinema clearly demonstrates cultural differences. Hollywood films often develop a visual language in line with global modernity: they prioritize international symbols, fast-paced editing, and imagery familiar to audiences worldwide. For example, the Hollywood hero often embodies the idea of individual freedom - through allegorical figures such as the super-warrior, the independent detective, or the lone savior of the world, the ideology of individualism is staged. In national films, family, traditions, and the local environment are depicted realistically; themes such as respect for parents, neighborly relations, and compassion take center stage. For example, in the famous Uzbek film *Suyunchi* (1971), the joy of a family at the birth of their daughter is shown alongside traditional values (the expectation of a male child, but also respect when a girl is born) conveyed through humor. This storyline visually and verbally highlights national views on respect for parents and attitudes toward women. Verbal signs - the way characters speak - reflect culture: in an English film, a boy may not address his father as "dad" in the same way, but in an Uzbek film, calling one's father *ota* or *dada* is natural and observed, thus visually and verbally reinforcing family hierarchy. From a visual perspective, Western films frequently feature militaristic symbols (for example, the US flag, a soldier with a weapon saving the world) or metropolitan landscapes (New York skyscrapers, London's Big Ben) as background elements, giving a globalist aesthetic. In contrast, Uzbek films often show images rich in national color, such as Tashkent neighborhoods (mahalla), desert landscapes on the outskirts of the city, and ancient monuments.

In school textbooks intended for children and pupils, culture and education are closely interconnected, with both scientific ideology and cultural values conveyed through visual and verbal signs. If we compare English-language and Uzbek-language textbooks, we can see what kinds of messages are communicated through the images, illustrations, and texts they contain. In English textbooks-especially those published in the United Kingdom or the United States-multiculturalism and international settings are often depicted. For example, English language textbooks frequently feature pictures of people from different nations, children of various races and ethnicities playing together. This reflects the multinational nature of English-speaking societies and aims to instill the idea of tolerance. Verbally, English textbooks are characterized by simplicity, clarity, and direct expression. For example, an English language textbook will more likely include topics such as "Birthday party" or "Christmas," rather than local celebrations like *Mavlud* or *Diwali*, choosing instead universal themes familiar to children around the world. In Uzbek textbooks, particularly since the period of independence, special emphasis is placed on instilling national pride and traditions in children. When textbooks are compared, it becomes evident that illustrations in Uzbek textbooks usually have a strong national flavor: for example, in the Grade 1 "Alphabet" (Alifbe) book, children are shown wearing traditional *do'ppi* caps, a girl playing with a traditional doll, or a boy reading a book while sitting on *xonatlas* (carpet) - vivid local images. The aim is to foster respect for and interest in one's own culture from an early

age. From a verbal perspective, Uzbek textbooks are written in literary language and frequently include proverbs, sayings, and slogans with educational value.

Analysis and Results

Summary, a detailed comparison of English and Uzbek textbooks shows clear differences: English textbooks are more oriented toward international and modern contexts, whereas Uzbek textbooks are rich in national and moral-educational aspects. In both, however, visual aids and simple language play an important role in making content understandable for children. The cultural benchmarks embedded in the content differ: the English textbook aims to educate a "global citizen," while the Uzbek textbook strives to raise a citizen loyal to national pride and traditions. In both approaches, visual (images) and verbal (text) signs work together to deliver the intended message to the child.

Conclusion

The analysis of the linguacultural classification of visual and verbal signs in English and Uzbek shows that each culture has its own distinct sign language. As seen in examples from advertising, cinema, social networks, and educational textbooks, visual elements (images, colors, symbols) and verbal elements (text, slogans, dialogues) work in harmony to convey specific cultural values. Comparative analysis revealed several general patterns and differences. In particular:

- in English communication, an approach based on individualism, innovation, and humor is more prominent, while in Uzbek communication, collectivism, traditionalism, and practicality dominate. This is evident in advertising slogans, film characters, internet memes, and even textbook content;
- visual colors and imagery carry important semiotic weight in both cultures, but their interpretation varies. For example, white and black universally symbolize the archetype of good and evil, but the use and connotations of other colors (blue-green, red) show culturally specific variation.

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