

**ҚОРАҚАЛПОҒИСТОНДА
ФАН ВА ТАЪЛИМ**

**ҚАРАҚАЛПАҚСТАНДА
ИЛИМ ҲӘМ ТӘЛИМ**

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THE METHODS FOR SOLVING PROBLEMS OF CIRCULAR MEMBRANE OSCILLATIONS

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Summary: This work shows solutions to several specific examples of vibrations of circular membranes by the method of separation of variables using Bessel functions.

Key words: Bessel equation and function, vibration equation of a circular membrane, mixed problem, Fourier method.

INTRODUCTION. From the general theory it is known that the solution of the mixed problem for the wave equation by the method of separation of variables was reduced to the Sturm–Liouville problem. If the area in which we construct a solution to the mixed problem is a segment (vibrations of a string), a rectangle (oscillations of a rectangular membrane), then the corresponding Sturm–Liouville problem is posed for a linear differential equation with constant coefficients. If the area in which we are looking for a solution to a mixed problem is a circle, a cylinder, or a ball, then the corresponding Sturm–Liouville problem is posed for a linear equation with variable coefficients. A characteristic feature of these equations is that the coefficient of the highest derivative vanishes at at least one point of the domain boundary. One such equation is the Bessel equation (equation of cylindrical functions)

$$y''(\xi) + \frac{1}{\xi} y'(\xi) + \left(1 - \frac{n^2}{\xi^2}\right) y(\xi) = 0, \quad n = \text{const} \geq 0, \quad (1)$$

and the Bessel function $J_n(\xi)$ with index n , is a solution to the differential equation (1), limited at zero with its first derivative, i.e.

$$|J_n(0)| < \infty, \quad |J'_n(0)| < \infty.$$

We present without proof the basic properties of the functions $J_n(\xi)$:

I. For any fixed value, $n = 0, 1, 2, \dots$ the Bessel function $J_n(\xi)$ generates $[0; R]$ a complete orthogonal system on the interval $\left\{J_n\left(\mu_k^{(n)} \frac{\xi}{R}\right)\right\} \quad k = 1, 2, \dots$ with weight $\rho(\xi) = \xi$:

$$\int_0^R \xi J_n\left(\mu_k^{(n)} \frac{\xi}{R}\right) J_n\left(\mu_l^{(n)} \frac{\xi}{R}\right) d\xi = \begin{cases} 0, & k \neq l, \\ \frac{R^2}{2} J_{n+1}^2(\mu_k^{(n)}), & k = l, \end{cases} \quad (2)$$

where are $\mu_1^{(n)}, \mu_2^{(n)}, \dots$ – the zeros of the function $J_n(\xi)$.

II. Any function $f(\xi)$ that is piecewise smooth on an interval $[0; R]$ and satisfies the boundary conditions is expanded into a convergent Fourier series according to the system of Bessel functions for each fixed $n = 0, 1, 2, \dots$, i.e.

$$f(\xi) = \sum_{k=1}^{+\infty} a_k J_n\left(\mu_k^{(n)} \frac{\xi}{R}\right), \quad (3)$$

where

$$a_k = \frac{\int_0^R \xi f(\xi) J_n \left(\mu_k^{(n)} \frac{\xi}{R} \right) d\xi}{\int_0^R \xi J_n^2 \left(\mu_k^{(n)} \frac{\xi}{R} \right) d\xi} = \frac{2}{R^2 J_{n+1}^2(\mu_k^{(n)})} \cdot \int_0^R \xi f(\xi) J_n \left(\mu_k^{(n)} \frac{\xi}{R} \right) d\xi. \quad (4)$$

1-task. Find a solution to a mixed problem

$$u_{tt} = u_{xx} + \frac{1}{x} u_x + f(t) J_0(\mu_k x), \quad (1.1)$$

where is μ_k – the positive root of the equation $J_0(\mu) = 0$, $0 < x < 1$,

$$u|_{x=1} = u|_{t=0} = u_t|_{t=0} = 0, \quad |u|_{x=0} < \infty,$$

if $f(t) = t^2 + 1$.

Solution. Since we have zero boundary and initial conditions, we will look for a solution to this problem in the form of a series

$$u(x, t) = \sum_{l=1}^{+\infty} T_l(t) J_0(\mu_l x) \quad (1.2)$$

by the eigenfunctions of the corresponding homogeneous problem, where $T_l(t)$ – the unknown functions are, and $J_0(\mu_l x)$ – the eigenfunctions of the problem of oscillations of a circular membrane are:

$$y'' + \frac{1}{x} y' + \lambda^2 y = 0, \quad y|_{x=1} = 0. \quad (1.3)$$

Substituting (1.2) into equation (1.1), and assuming the validity of term by term differentiation of the series, moving all terms to the left, we obtain

$$\sum_{l=1}^{+\infty} [T_l''(t) + \mu_l^2 T_l(t)] J_0(\mu_l x) = (t^2 + 1) J_0(\mu_k x).$$

From here we find that when $l \neq k$

$$T_l''(t) + \mu_l^2 T_l(t) = 0, \quad (1.4)$$

and when $l = k$

$$T_k''(t) + \mu_k^2 T_k(t) = t^2 + 1. \quad (1.5)$$

From the initial conditions we have

$$T_l(0) = 0, \quad T_l'(0) = 0, \quad l = 1, 2, \dots \quad (1.6)$$

Then the corresponding solution to the Cauchy problem for the homogeneous equation (1.4) under zero conditions (1.6) is only a trivial function $T_l(t) \equiv 0$, $l \neq k$. When $l = k$ we obtain the following Cauchy problem:

$$T_k''(t) + \mu_k^2 T_k(t) = t^2 + 1; \quad T_k(0) = 0, \quad T_k'(0) = 0. \quad (1.7)$$

The general solution to equation (1.7) has the form:

$$T_k(t) = A_k \cos \mu_k t + B_k \sin \mu_k t + T_k^*(t),$$

where is $T_k^*(t) = at^2 + bt + c$ – the private solution. Then from

$$2a + \mu_k^2(at^2 + bt + c) = t^2 + 1$$

should

$$a = \frac{1}{\mu_k^2}, \quad b = 0, \quad 2a + c\mu_k^2 = 1 \Rightarrow c = \frac{1}{\mu_k^2} \left(1 - \frac{2}{\mu_k^2} \right) = \frac{\mu_k^2 - 2}{\mu_k^4}.$$

Thus,

$$T_k(t) = A_k \cos \mu_k t + B_k \sin \mu_k t + \frac{1}{\mu_k^2} \left(t^2 + \frac{\mu_k^2 - 2}{\mu_k^4} \right).$$

From the initial conditions (1.7) we have

$$T_k(0) = A_k + \frac{\mu_k^2 - 2}{\mu_k^4} = 0 \Rightarrow A_k = -\mu_k^{-4}(\mu_k^2 - 2),$$

$$T'_k(0) = \mu_k B_k = 0 \Rightarrow B_k = 0.$$

Finally, we can write the solution to the original problem in the form:

$$u(x, t) = \left[\mu_k^{-4}(\mu_k^2 - 2)(1 - \cos \mu_k t) + \mu_k^{-2} t^2 \right] J_0(\mu_k x).$$

2-task. Find a solution to a mixed problem

$$u_{tt} = u_{xx} + \frac{1}{x} u_x, \quad 0 < x < 1,$$

$$\left| u \right|_{x=0} < \infty, \quad u|_{x=1} = g(t), \quad u|_{t=0} = u_0(x), \quad u_t|_{t=0} = u_1(x),$$

if:

$$g(t) = \sin^2 t, \quad u_0(x) = \frac{1}{2} \left[1 - \frac{J_0(2x)}{J_0(2)} \right], \quad u_1(x) = 0.$$

Solution. In this problem, heterogeneity enters only into the boundary condition. Therefore, in order to transform the problem to homogeneous boundary conditions, we introduce a new required function

$$u(x, t) = v(x, t) + \omega(x, t), \quad (2.1)$$

where $\omega(x, t)$ we construct the function so that it satisfies the inhomogeneous boundary condition, i.e.

$$\omega|_{x=1} = \sin^2 t = \frac{1}{2}(1 - \cos 2t). \quad (2.2)$$

Then the function $v(x, t)$ will satisfy the homogeneous boundary condition. The function $\omega(x, t)$ in the form of a series

$$\omega(x, t) = \sum_{k=0}^{+\infty} (A_k \cos kt + B_k \sin kt) J_0(kx) \quad (2.3)$$

by Bessel functions. Substituting $\omega(x, t)$ into the boundary condition, we find

$$\omega|_{x=1} = \sum_{k=0}^{+\infty} (A_k \cos kt + B_k \sin kt) J_0(k) = \frac{1}{2}(1 - \cos 2t),$$

$$B_k = 0, \quad k = 0, 1, \dots, \quad A_0 = \frac{1}{2}, \quad A_2 = -\frac{1}{2J_0(2)}, \quad A_k = 0, \quad \forall k \neq 0; 2.$$

Thus,

$$\omega = \omega(x, t) = \frac{1}{2} - \frac{J_0(2x)}{2J_0(2)} \cos 2t. \quad (2.4)$$

Now, taking into account (2.4), we transform this problem to the new desired function $v(x, t)$:

$$v_{tt} + 2 \frac{J_0(2x)}{J_0(2)} \cos 2t = v_{xx} + \frac{1}{x} v_x - \frac{\cos 2t}{2J_0(2)} \left[J_0''(2x) + \frac{1}{x} J_0'(2x) \right] =$$

$$\begin{aligned}
&= v_{xx} + \frac{1}{x} v_x + 2 \frac{J_0(2x)}{J_0(2)} \cos 2t, \quad \text{those} \\
&v_{tt} = v_{xx} + \frac{1}{x} v_x, \quad 0 < x < 1, \\
&v|_{x=1} = 0, \quad v|_{t=0} = u|_{t=0} - \frac{1}{2} + \frac{J_0(2x)}{2J_0(2)} \cos 2t|_{t=0} = \\
&= \frac{1}{2} \left[1 - \frac{J_0(2x)}{2J_0(2)} \right] - \frac{1}{2} \left[1 - \frac{J_0(2x)}{2J_0(2)} \right] = 0, \\
&v_t|_{t=0} = u_t|_{t=0} - \frac{J_0(2x)}{J_0(2)} \sin 2t|_{t=0} = 0.
\end{aligned} \tag{2.5}$$

The solution to the homogeneous equation about free vibrations of a circular membrane (2.5) under zero boundary and initial conditions is only a zero function, i.e. $v(x, t) \equiv 0$.

Consequently, the solution to the mixed problem will be written in the form

$$u(x, t) = \omega(x, t) = \frac{1}{2} \left[1 - \frac{J_0(2x)}{J_0(2)} \cos 2t \right].$$

3-task. Solve a mixed problem

$$\begin{aligned}
&u_{xx} + \frac{1}{x} u_x = u_{tt} + u, \quad 0 < x < 1, \\
&|u|_{x=0} < \infty, \quad u|_{x=1} = \cos 2t + \sin 3t, \quad u|_{t=0} = \frac{J_0(x\sqrt{3})}{J_0(\sqrt{3})}, \quad u_t|_{t=0} = \frac{3J_0(2x\sqrt{2})}{J_0(2\sqrt{2})}.
\end{aligned} \tag{3.1}$$

Solution. As in the previous example, when the inhomogeneity is contained both in the equation and in the boundary condition, we look for a solution to this problem in the form of a sum

$$u(x, t) = v(x, t) + \omega(x, t), \tag{3.2}$$

where $\omega(x, t)$ we construct the function so that it satisfies the inhomogeneous boundary condition, i.e.

$$\omega|_{x=1} = \cos 2t + \sin 3t. \tag{3.3}$$

Further, as usual in the Fourier method, we formally assume

$$u(x, t) = X(x)T(t) \tag{3.4}$$

and find partial solutions that satisfy the homogeneous boundary condition.

Differentiating function (3.4), then substituting (3.1) into this equation and separating the variables, we obtain:

$$\frac{T''(t)}{T(t)} = \frac{X''(x) + \frac{1}{x} X'(x) - X(x)}{X(x)} = -\lambda^2. \tag{3.5}$$

Equalities (3.5) are reduced to two equations:

$$T''(t) + \lambda^2 T(t) = 0, \tag{3.6}$$

$$X''(x) + \frac{1}{x} X'(x) + (\lambda^2 - 1)X(x) = 0. \tag{3.7}$$

One of the particular solutions to equation (3.7) in the notation $\mu^2 = \lambda^2 - 1$ is the function

$$J_0(\mu x) = J_0(x\sqrt{\lambda^2 - 1}). \tag{3.8}$$

Thus, it becomes clear that the function $\omega(x, t)$ can be constructed as a series:

$$\omega(x, t) = \sum_{k=1}^{+\infty} (A_k \cos kt + B_k \sin kt) J_0 \left(x \sqrt{k^2 - 1} \right). \quad (3.9)$$

From the boundary condition (3.3) it follows that

$$\sum_{k=1}^{+\infty} (A_k \cos kt + B_k \sin kt) J_0 \left(\sqrt{k^2 - 1} \right) = \cos 2t + \sin 3t.$$

From here

$$A_2 J_0(\sqrt{3}) = 1, \quad B_3 \sqrt{8} = 1, \quad A_k = 0, \quad \forall k \neq 2; \quad B_k = 0, \quad \forall k \neq 3.$$

Then

$$\omega(x, t) = \frac{J_0(x\sqrt{3})}{J_0(\sqrt{3})} \cos 2t + \frac{J_0(2x\sqrt{2})}{J_0(2\sqrt{2})} \sin 3t. \quad (3.10)$$

In our case, in the transformation

$$u(x, t) = v(x, t) + \omega(x, t)$$

the function $\omega(x, t)$ was found in such a way that it satisfies not only the boundary condition, but also the equation, and also, as is easy to see, the initial conditions. Therefore, the solution to this problem is the function

$$u(x, t) = \omega(x, t) = \frac{J_0(x\sqrt{3})}{J_0(\sqrt{3})} \cos 2t + \frac{J_0(2x\sqrt{2})}{J_0(2\sqrt{2})} \sin 3t.$$

4-task. Solve a mixed problem

$$u_{tt} = u_{xx} + \frac{1}{x} u_x - \frac{u}{x^2}, \quad 0 < x < 1, \quad (4.1)$$

$$\left| u \right|_{x=0} < \infty, \quad u|_{x=1} = \sin 2t \cos t, \quad u|_{t=0} = 0, \quad u_t|_{t=0} = \frac{J_1(x)}{2J_1(1)} + \frac{3}{2} \frac{J_1(3x)}{J_1(3)}.$$

Solution. First, let's translate the inhomogeneity in the boundary condition into an equation; to do this, we'll construct a function $\omega = \omega(x, t)$ that satisfies the boundary condition, i.e.

$$\omega|_{x=1} = \sin 2t \cos t = \frac{1}{2} \sin t + \frac{1}{2} \sin 3t. \quad (4.2)$$

The function $J_1(\mu x)$ satisfies the equation

$$J_1''(\mu x) + \frac{1}{x} J_1'(\mu x) - \frac{1}{x^2} J_1(\mu x) = -\mu^2 J_1(\mu x), \quad (4.3)$$

therefore $\omega(x, t)$ can be constructed in the form of the following series

$$\omega(x, t) = \sum_{k=0}^{+\infty} (A_k \cos kt + B_k \sin kt) J_1(kx) \quad (4.4)$$

by Bessel functions. Then from the boundary condition (4.2) it follows that

$$\sum_{k=0}^{+\infty} (A_k \cos kt + B_k \sin kt) J_1(k) = \frac{1}{2} \sin t + \frac{1}{2} \sin 3t,$$

$$A_k = 0, \quad k = 0, 1, \dots, \quad B_1 J_1(1) = \frac{1}{2}, \quad B_3 J_1(3) = \frac{1}{2}, \quad B_k = 0, \quad \forall k \neq 1; 3.$$

Thus,

$$\omega(x, t) = \frac{J_1(x)}{2J_1(1)} \sin t + \frac{3}{2} \cdot \frac{J_1(3x)}{J_1(3)} \sin 3t. \quad (4.5)$$

Now, taking into account (4.5), we transform this problem to the new desired function: $v(x, t)$, i.e. we'll make a replacement

$$\begin{aligned} u(x, t) &= v(x, t) + \omega(x, t) \\ v_{tt} - \frac{J_1(x)}{2J_1(1)} \sin t - \frac{9}{2} \cdot \frac{J_1(3x)}{J_1(3)} \sin 3t &= \\ &= v_{xx} + \frac{1}{x} v_x - \frac{v}{x^2} + \left[J_1''(x) + \frac{1}{x} J_1'(x) - \frac{1}{x^2} J_1(x) \right] \cdot \frac{\sin t}{2J_1(1)} + \\ &\quad + \left[J_1''(3x) + \frac{1}{x} J_1'(3x) - \frac{1}{x^2} J_1(3x) \right] \cdot \frac{\sin 3t}{2J_1(3)} = \\ &= v_{xx} + \frac{1}{x} v_x - \frac{v}{x^2} - \frac{J_1(x)}{2J_1(1)} \sin t - \frac{9}{2} \cdot \frac{J_1(3x)}{J_1(3)} \sin 3t, \end{aligned} \quad (4.6)$$

from here

$$v_{tt} = v_{xx} + \frac{1}{x} v_x - \frac{v}{x^2}, \quad 0 < x < 1, \quad (4.7)$$

$$v|_{x=1} = 0, \quad v|_{t=0} = 0, \quad v_t|_{t=0} = 0. \quad (4.8)$$

The solution to the homogeneous equation (4.7) under zero initial and boundary conditions (4.8) is only a trivial function, i.e. $v(x, t) \equiv 0$.

Thus, the solution to this problem is

$$u(x, t) = \frac{J_1(x)}{2J_1(1)} \sin t + \frac{J_1(3x)}{2J_1(3)} \sin 3t.$$

Let us now consider a somewhat more general problem about forced oscillations of a circular membrane of radius R , fixed along the edge.

It is known that the eigenvalues and eigenfunctions of the Laplace operator $-\Delta_{r,\varphi}$ in a circle of radius R , i.e. next boundary value problem

$$-\Delta_{r,\varphi} u = \lambda u \Rightarrow -\left(u_{rr} + \frac{1}{r} u_r + \frac{1}{r^2} u_{\varphi\varphi} \right) = \lambda u; \quad u|_{r=R} = 0,$$

are defined as follows:

$$\begin{aligned} \text{at } \lambda &= \left(\frac{\mu_k^{(0)}}{R} \right)^2, \quad k=1, 2, \dots \text{ and } Y_0^k(r, \varphi) = J_0\left(\mu_k^{(0)} \frac{r}{R} \right) \cdot 1, \\ \text{at } \lambda &= \left(\frac{\mu_k^{(n)}}{R} \right)^2, \quad k=1, 2, \dots \text{ and } Y_n^k(r, \varphi) = \begin{cases} J_n\left(\mu_k^{(n)} \frac{r}{R} \right) \cdot \cos n\varphi, \\ J_n\left(\mu_k^{(n)} \frac{r}{R} \right) \cdot \sin n\varphi. \end{cases} \end{aligned}$$

5-task. Solve a mixed problem

$$u_{tt} = \Delta u + J_2(\mu_4^{(2)} r) \cos 2\varphi \cos(\mu_4^{(2)} t), \quad r < R, \quad (5.1)$$

$$u|_{r=1} = 0, \quad u|_{t=0} = f(r) \sin \varphi, \quad u_t|_{t=0} = J_2(\mu_4^{(2)} r) \cos 2\varphi, \quad (5.2)$$

where $u = u(r, \varphi, t)$, $\Delta u = u_{rr} + \frac{1}{r} u_r + \frac{1}{r^2} u_{\varphi\varphi}$.

Solution. All eigenfunctions form a complete orthogonal system, then the function $u(r, \varphi, t)$ in the domain $\Omega = \{r < R, 0 < \varphi < 2\pi, t > 0\}$ can be represented as

$$u(r, \varphi, t) = \sum_{k=1}^{+\infty} J_0\left(\mu_k^{(0)} \frac{r}{R}\right) \cdot 1 \cdot T_{0,k}(t) + \sum_{n=1}^{+\infty} \left[\sum_{k=1}^{+\infty} J_n\left(\mu_k^{(n)} \frac{r}{R}\right) \cdot \cos n\varphi \cdot T_{n,k}(t) + \sum_{k=1}^{+\infty} J_n\left(\mu_k^{(n)} \frac{r}{R}\right) \cdot \sin n\varphi \cdot \tilde{T}_{n,k}(t) \right]. \quad (5.3)$$

Now we expand the inhomogeneity in the equation and in the initial conditions into a series according to the eigenfunctions of the operator Δ in the region Ω , $R=1$.

Let us first note that $J_2(\mu_4^{(2)} r) \cos 2\varphi$ is one of the eigenfunctions $J_n(\mu_k^{(n)} r) \cos n\varphi$, then we write out the expansion

$$f(r) = \sum_{k=1}^{+\infty} a_k J_1(\mu_k^{(1)} r), \quad (5.4)$$

since $\sin \varphi$ it is a one-time simple function. From here

$$a_k = \frac{\int_0^1 f(r) J_1(\mu_k^{(1)} r) r dr}{\int_0^1 J_1^2(\mu_k^{(1)} r) r dr} = \frac{1}{\|J_1(\mu_k^{(1)} r)\|^2} \cdot \int_0^1 f(r) J_1(\mu_k^{(1)} r) r dr, \quad (5.5)$$

where $\|J_1(\mu_k^{(1)} r)\|^2 = \int_0^1 J_1^2(\mu_k^{(1)} r) r dr = \frac{1}{2} [J_1'(\mu_k^{(1)})]^2$.

Thus, taking into account these expansions in terms of the eigenfunctions of the operator Δ , it is enough to look for a solution to the problem of forced oscillations of a circular membrane of radius 1, fixed along the edge in the form:

$$u(r, \varphi, t) = J_2(\mu_4^{(2)} r) \cos 2\varphi \cdot T_{2,4}(t) + \sum_{k=1}^{+\infty} J_1(\mu_k^{(1)} r) \sin \varphi \cdot \tilde{T}_{1,k}(t). \quad (5.6)$$

Substituting the last expression into this equation and into the initial conditions, we get:

$$\begin{aligned} J_2(\mu_4^{(2)} r) \cos 2\varphi \cdot T_{2,4}''(t) + \sum_{k=1}^{+\infty} J_1(\mu_k^{(1)} r) \sin \varphi \cdot \tilde{T}_{1,k}''(t) = \\ = -(\mu_4^{(2)})^2 J_2(\mu_4^{(2)} r) \cos 2\varphi \cdot T_{2,4}(t) - \\ - \sum_{k=1}^{+\infty} (\mu_k^{(1)})^2 J_1(\mu_k^{(1)} r) \sin \varphi \cdot \tilde{T}_{1,k}(t) + J_2(\mu_4^{(2)} r) \cos 2\varphi \cos(\mu_4^{(2)} t), \end{aligned} \quad (5.7)$$

and the initial conditions

$$\begin{aligned} J_2(\mu_4^{(2)} r) \cos 2\varphi \cdot T_{2,4}(0) + \sum_{k=1}^{+\infty} J_1(\mu_k^{(1)} r) \sin \varphi \cdot \tilde{T}_{1,k}(0) &= \sum_{k=1}^{+\infty} a_k J_1(\mu_k^{(1)} r) \sin \varphi, \\ J_2(\mu_4^{(2)} r) \cos 2\varphi \cdot T_{2,4}'(0) + \sum_{k=1}^{+\infty} J_1(\mu_k^{(1)} r) \sin \varphi \cdot \tilde{T}_{1,k}'(0) &= J_2(\mu_4^{(2)} r) \cos 2\varphi. \end{aligned}$$

Next, we collect similar terms

$$J_2(\mu_4^{(2)} r) \cos 2\varphi: \quad \begin{cases} T_{2,4}''(t) = -(\mu_4^{(2)})^2 T_{2,4}(t) + \cos(\mu_4^{(2)} t), \\ T_{2,4}(0) = 0, \quad T_{2,4}'(0) = 1, \end{cases} \quad (5.8)$$

$$J_1(\mu_k^{(1)}r)\sin\varphi: \begin{cases} \tilde{T}_{1,k}''(t) = -(\mu_k^{(1)})^2 \tilde{T}_{1,k}, \\ \tilde{T}_{1,k}(0) = a_k, \quad \tilde{T}_{1,k}'(0) = 0. \end{cases} \quad (5.9)$$

$\tilde{T}_{1,k}(t)$ – the general solution of the homogeneous equation has the form:

$$\begin{aligned} \tilde{T}_{1,k}(t) &= C_1 \cos \mu_k^{(1)}t + C_2 \sin \mu_k^{(1)}t, \\ a_k = \tilde{T}_{1,k}(0) &= C_1, \quad 0 = \tilde{T}_{1,k}'(0) = C_2 \mu_k^{(1)}, \quad \mu_k^{(1)} > 0 \Rightarrow C_2 = 0. \end{aligned}$$

Thus, $\tilde{T}_{1,k}(t) = a_k \cos(\mu_k^{(1)}t)$.

The general solution $T_{2,4}'' = -(\mu_4^{(2)})^2 T_{2,4} + \cos(\mu_4^{(2)}t)$ of the inhomogeneous equation has the form:

$$T_{2,4}(t) = A \cos(\mu_4^{(2)}t) + B \sin(\mu_4^{(2)}t) + T^*(t), \quad (5.10)$$

where a particular solution should be sought in the form

$$T^*(t) = at \cos(\mu_4^{(2)}t) + bt \sin(\mu_4^{(2)}t). \quad (5.11)$$

$$\frac{d}{dt}: a \cos(\mu_4^{(2)}t) - at \mu_4^{(2)} \sin(\mu_4^{(2)}t) + b \sin(\mu_4^{(2)}t) + bt \mu_4^{(2)} \cos(\mu_4^{(2)}t),$$

$$\begin{aligned} \frac{d^2}{dt^2}: & -2a \mu_4^{(2)} \sin(\mu_4^{(2)}t) - at(\mu_4^{(2)})^2 \cos(\mu_4^{(2)}t) + \\ & + 2b \mu_4^{(2)} \cos(\mu_4^{(2)}t) - bt(\mu_4^{(2)})^2 \sin(\mu_4^{(2)}t) = \\ & = -at(\mu_4^{(2)})^2 \cos(\mu_4^{(2)}t) - bt(\mu_4^{(2)})^2 \sin(\mu_4^{(2)}t) + \cos(\mu_4^{(2)}t) \Rightarrow \\ & \Rightarrow -2a \mu_4^{(2)} = 0 \Rightarrow a = 0; \quad 2b \mu_4^{(2)} = 1 \Rightarrow b = \frac{1}{2\mu_4^{(2)}}. \end{aligned}$$

Let us substitute the found values a and b into the expression for $T^*(t)$, then

$$T_{2,4}(t) = A \cos(\mu_4^{(2)}t) + B \sin(\mu_4^{(2)}t) + \frac{t}{2\mu_4^{(2)}} \sin(\mu_4^{(2)}t). \quad (5.12)$$

From the initial conditions we determine the unknown coefficients A and B :

$$T_{2,4}(0) = 0 \Rightarrow A = 0; \quad T_{2,4}'(0) = 1 \Rightarrow B \mu_4^{(2)} = 1.$$

Then

$$T_{2,4}(t) = \frac{1}{\mu_4^{(2)}} \left(1 + \frac{t}{2} \right) \sin(\mu_4^{(2)}t) \quad (5.13)$$

and the final answer is:

$$\begin{aligned} u(r, \varphi, t) &= \frac{1}{\mu_4^{(2)}} \left(1 + \frac{t}{2} \right) J_2(\mu_4^{(2)}r) \cdot \cos 2\varphi \cdot \sin(\mu_4^{(2)}t) + \\ &+ \sum_{k=1}^{+\infty} a_k J(\mu_k^{(2)}r) \cdot \sin \varphi \cdot \cos(\mu_k^{(2)}t), \end{aligned}$$

where the coefficient a_k is determined by formula (5.5)

$$a_k = \frac{1}{\|J_1(\mu_k^{(1)}r)\|^2} \cdot \int_0^1 r f(r) J_1(\mu_k^{(1)}r) dr.$$

CONCLUSION. The results obtained can be used in the theory of linear differential and integral operators, in mathematical physics when integrating nonlinear equations.

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Rezyume: Uchbu maqolada doiraviy membraning tebranish tenglamalari uchun bir nechta aralash tipdagi masalalarning yechimlari Bessel funktsiyalari yordamida o'zgaruvchilarni ajratish usuli bilan topilgan.

Резюме: В этой работе показаны решения нескольких конкретных примеров на колебания круглых мембран методом разделения переменных с использованием функций Бесселя.

Kalit so'zlar: Bessel tenglamasi va funktsiyasi, doiraviy membraning tebranish tenglamasi, aralash tipdagi masala, Fur'e usuli.

Ключевые слова: уравнение и функция Бесселя, уравнение колебания круглой мембраны, смешанная задача, метод Фурье.

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FERROMAGNETIC PROPERTIES OF SILICON DOPED WITH IMPURITY MANGANESE ATOMS

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Summary: The results of the study showed that with decreasing temperature the value of the NMR in Si<B, Mn> samples increases and reaches its maximum value (about 800%) at T=240 K. When studying the magnetic properties of p-Si<B, Mn> samples in the low temperature region we discovered a ferromagnetic state at T = 30 K, i.e. using the diffusion method of manganese impurity atoms, it was possible to obtain a new magnetic semiconductor material.

Key words: silicon, manganese, diffusion, nano-cluster, impurity, hysteresis.

INTRODUCTION

Semiconductor materials doped with impurity atoms are widely used in electronics to create modern devices and sensors. Studies of the electro-physical, photoelectric, optical and magnetic properties of silicon doped with impurity atoms, which create deep energy levels, show a number of interesting physical phenomena [1-5]. The results of these studies show the possibility of creating new semiconductor devices with greater functionality [6,7]. Magnetic properties were discovered in silicon doped with impurity atoms of transition elements, which were studied in detail and devices were created that could be used in spin electronics devices. [8-10].

The process of obtaining magnetic materials based on silicon doped with impurity atoms has been studied by many authors, in particular in [11] it is written that ferromagnetic exchange interactions are mainly related to the hole concentration. The authors in [12] wrote that ferromagnetism in silicon doped with impurity manganese atoms arises due to the interaction of interstitial doubly ionized ions of impurity manganese atoms. It was reported in [13] that ferromagnetism in silicon can be explained by exchange localized carriers in accumulated clusters of manganese atoms.

Disagreements in explaining the mechanism of the authors about the ferromagnetic property of silicon doped with impurity manganese atoms are apparently due to the selection of the method of doping manganese atoms (ion implantation, diffusion from the gas phase or doping during growth in silicon) as well as the conditions of the research.

An analysis of literature data has shown that to determine the physical mechanism of the ferromagnetic properties of silicon doped with impurity atoms, more detailed studies of the elemental composition of silicon diffusion-doped with manganese impurity atoms are required. [14,15]

TECHNOLOGY FOR OBTAINING SAMPLES

To obtain samples of silicon doped with manganese impurity atoms, single-crystalline silicon of the SHB-1; 3; 5; 10; 100 Ohm·cm brand was used as a starting sample, where the concentration of boron atoms in the starting material was in the range $N_B \sim 10^{14} \div 2 \cdot 10^{16} \text{ cm}^{-3}$. The temperature and time of diffusion were chosen so that after diffusion annealing, samples with impurity manganese atoms remained with compensated and p-type conductivity.

The parameters of the manganese impurity atoms used to obtain silicon with magnetic properties are shown in Table-1.

Table 1

Electronic structure and electrical parameters of impurity manganese atoms in silicon

Element	Electronic structure	Spin	Total limiting solubility, cm ⁻³	Electro-active part of the limiting solubility, cm ⁻³	Energy levels in silicon
Mn	3d ⁵ 4s ²	$\frac{5}{2}$	2·10 ¹⁶	10 ¹⁶	$E_c - 0.43$ $E_c - 0.53$ $E_v + 0.45$

Before and after diffusion, silicon samples were subjected to mechanical and chemical treatment (cleaning in an ammonia peroxide solution and etching $t = 1$ minute in a chemical solution of HF + HNO₃ 1:3) to remove contaminants and remove mechanical damage from the surface.

The magneto-resistance of the obtained samples was measured using an installation that allows you to adjust the magnetic field strength from 0.1 to 2 T, with an electric field strength applied to the silicon sample from 0.1 to 1000 V/cm, in the temperature range $T = 77 \div 300$ K [16].

After diffusion of manganese impurity atoms in silicon in order to remove the surface layer, where the concentration of impurity atoms is several orders of magnitude greater than in the volume, the samples were mechanically ground on all sides. The surface of the samples was polished using silicon carbide powders with sizes *M-20* and *M-14*. Samples of the original silicon, doped with impurity manganese atoms, were purified in a chemical solution in order to remove technical oils and organic substances from the surface. Diffusion of manganese atoms was carried out in quartz ampoules evacuated in vacuum to $P = 10^{-6}$ mm.Hg. A quartz ampoule with initial silicon with manganese metal powders of 99.99% purity was installed in an electric furnace of the “MAGNETIC” brand at a temperature of $T = 300$ K. The oven temperature gradually rose to a temperature of $T = 723$ K, in which the quartz ampoule was kept for $t = 30$ minutes. After this technological diffusion mode, the temperature in the furnace rose to the required diffusion temperature ($T=1273 \div 1523$ K) and high-temperature diffusion of manganese impurity atoms was carried out for $t=30 \div 60$ minutes. At the end of the high-temperature diffusion, the quartz ampoules were dropped into industrial oil to rapidly cool the silicon samples. Such cooling conditions made it possible to obtain silicon samples with maximum concentrations of nano-clusters of impurity atoms.

Table 2

Electro-physical parameters of silicon doped with manganese impurity atoms.

Sample	ρ , Ohm·cm	Conductivity type	Charge carrier concentration, cm ⁻³	Charge carrier mobility, cm ² /V·c
Si<B, Mn>	$(5 \div 8) \cdot 10^3$	<i>p</i>	$5,2 \cdot 10^{12}$	160÷200

The electrical parameters of the obtained silicon samples doped with manganese impurity atoms were measured by the Van Der Pauw method using an “Ecopia HMS 3000” installation. Table 2 shows the electrical parameters of the silicon samples doped with manganese impurity atoms.

EXPERIMENTAL RESULTS

The magnetic properties of silicon doped with manganese impurity atoms were studied in installations with a constant magnetic field or an alternating electromagnetic field, which made it possible to obtain up to 2 T in a wide temperature range of $77 \div 350$ K.

Research has shown that exposure to a magnetic field contributes to the appearance of additional magnetic resistance in silicon samples doped with manganese impurity atoms. Figure 1 shows the effect of a magnetic field on the magneto-resistance of silicon samples doped with impurity manganese atoms with different resistivity. As can be seen from Fig. 1, magneto-resistance in silicon samples doped with manganese impurity atoms increases with increasing resistivity of the material.

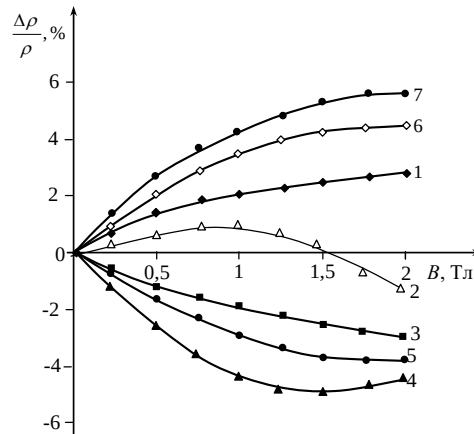


Fig.1. Dependence of magneto-resistance in *p*-type samples with nano-clusters of impurity manganese atoms on the magnetic field strength at $T=300$ K.

The studies were carried out in the dark under the same external conditions ($U=10$ V, $T=300$ K) and with the same geometric dimensions of silicon samples. With increasing magnetic field strength, the magneto-resistance in Si <Mn> samples increase in certain (Fig. 2) resistivity values and negative magneto-resistance (NMR) is observed, which was also observed in [17].

Despite the promising possibilities of forming nano-clusters of impurity atoms with certain sizes in silicon, there is still no reproducible technology for producing such materials. The developed new technology made it possible to obtain silicon with an ordered arrangement of nano-clusters of impurity manganese atoms on the surface and in the bulk of the material. It has been established that, under certain thermodynamic conditions, nano-clusters of impurity atoms with certain sizes are formed due to the process of self-organization. From the analysis of the results obtained, it was established that the most well-known method for helping the self-organization of nano-clusters of manganese atoms is additional heat treatment of silicon samples doped with impurity manganese atoms.

It has been shown that in silicon samples doped with impurity manganese atoms, a high (more than ~ 100%) negative magneto-resistance (NMR) is observed. It has been established that the magnitude of the NMR in Si<B,Mn> samples increases significantly with increasing magnitude of the applied electric (*E*) and magnetic (*B*) fields.

Interesting results were obtained when studying the temperature dependence of the magnetic resistance $\Delta\rho/\rho$ in the temperature range $T = 100 \div 380$ K. It was previously established that in silicon samples doped with impurity manganese atoms (Si<B,Mn>), with decreasing temperature, the value of the NMR increases and reaches its maximum value ($\Delta\rho/\rho = 300\%$) at temperature $T=235 \div 240$ K [18].

Research of magnetic resistance in Si <B, Mn> samples as a function of temperature, in a field $E=200$ V/cm and $B=2$ Tl (fig. 2).

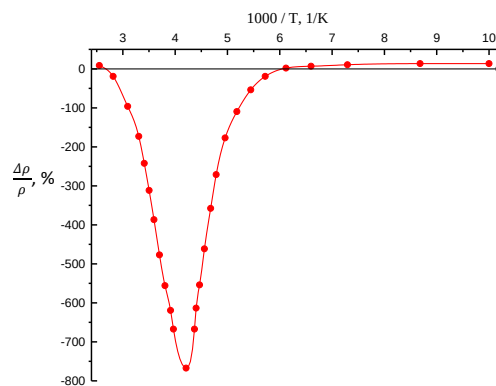


Fig. 2. Dependence of magneto-resistance on temperature for samples: Si <B, Mn>, at $E=200$ V/cm, $B=2$ Tl.

The results of the study showed that with decreasing temperature, the value of the NMR in Si<B,Mn> samples increases and reaches its maximum value (about 800%) at $T = 240$ K; a further decrease in temperature leads to a fairly rapid decrease in the NMR at temperatures $T = 160 \div 170$ K there is an inversion of the sign of the magneto-resistance, i.e. The NMR passes to the PMR, the value of the PMR in this temperature range depends weakly on temperature. At temperatures $T > 380$ K, a slight PMR is also observed.

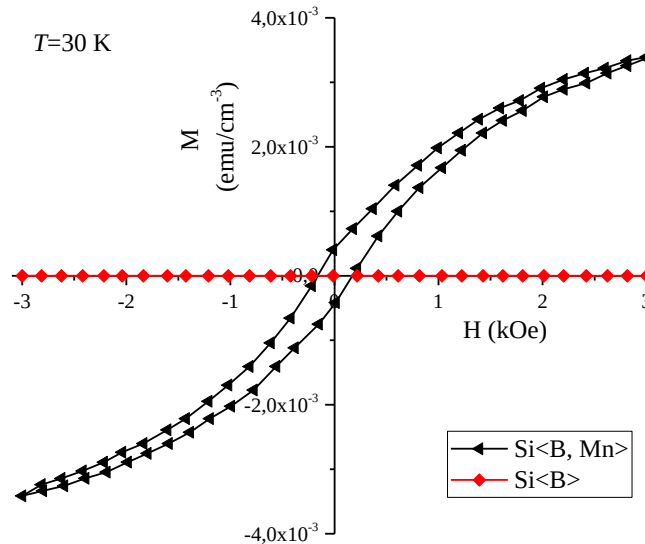


Fig. 3. Dependence of the magnetization of the $p\text{-Si} < \text{B}, \text{Mn} >$ sample on the magnetic field (hysteresis) at $T = 30$ K

DISCUSSION OF THE RESULTS OBTAINED

When studying the magnetic properties of $p\text{-Si} < \text{B}, \text{Mn} >$ samples in the low temperature region, we discovered a ferromagnetic state at $T = 30$ K (Fig. 3), i.e. using the diffusion method of manganese impurity atoms, it was possible to obtain a new magnetic semiconductor material. In overcompensated $\text{Si} < \text{B}, \text{Mn} >$ (n -type) samples, no magnetic hysteresis was detected. This shows the significant influence of the charge and spin state of manganese atoms in nano-clusters on the magnetic properties of silicon by impurity manganese atoms.

ESR studies have shown that only in $p\text{-Si} < \text{B}, \text{Mn} >$ samples are nano-clusters of the BMn_4 type with a high magnetic moment formed [19]. It was found that under optimal doping conditions, the concentration of formed clusters reaches up to $N \sim 10^{16} \text{ cm}^{-3}$.

There are a lot of works in the literature about the possibility of the appearance of a region of inhomogeneity in semiconductor materials [20] under conditions of heavy doping with impurity atoms. However, the authors of these works mainly studied semiconductor materials in which the concentration of impurity atoms is quite high ($N \sim 10^{18} - 10^{19} \text{ cm}^{-3}$) and creates small energy levels in the band gap in the semiconductor material.

From the analysis of these works, it was established that the impurities that the authors studied mainly have a small diffusion coefficient and are in singly charged states. In contrast to these impurities, impurities that create deep energy levels in semiconductors have a large diffusion coefficient, being in a multiply charged state and interacting strongly with charge carriers and defects in the crystal lattice of the source material [21]. The multiply charged charge of the formed nano-clusters of impurity atoms leads to strong heterogeneity of the material, compared to impurity atoms creating shallow energy levels. In the resulting samples of silicon doped with manganese impurity atoms, new physical phenomena, magneto-resistance (PMR) and negative magneto-resistance (NMR), were discovered.

Based on the results obtained, it can be argued that to obtain silicon with magnetic properties, one can use the method of diffusion doping of silicon with impurity manganese atoms to form BMn_4 nano-clusters.

CONCLUSION. The high concentration of highly sensitive nano-clusters of impurity manganese atoms (BMn_4) formed and the ferromagnetic state observed in them at $T = 30$ K makes it possible to use this material to create devices operating on the spin-polarization principle. A significant value of the NMR, reaching 50% at room temperature, makes it possible to create sensitive magneto resistive sensors for magnetic measurements.

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Rezyume: *Tadqiqot natijlari shuni ko'rsatdiki, kremniyga temir o'tish gurugi bo'lgan marganets atomlarini diffuziya usulida kiritish natijasida bu na'munalarga tashqi elektr va magnit maydonning ta'siri o'rganildi. O'rganish natijlari shuni ko'rsatdiki haroratning $T = 240\text{ K}$ bo'lganda teskari magnit qarshilikning qiymati o'zining eng katta qiymati (taxminan 800%)ga yetdi. p-tipli kremniyda 30 K haroratda na'munaning ferromagnit xususiyati aniqlandi. Marganets atomlarini kremniy panjarasida diffuziya usulida hosil qilish orqali yangi magnit yarimo'tkazgich material olish mumkin.*

Резюме: *Результаты исследования показали, что с понижением температуры значение ОМС в образцах Si <B, Mn> увеличивается и достигает своего максимального значения (около 800%) при $T=240\text{ K}$. При исследовании магнитных свойств образцов p-Si <B, Mn> в области низких температур нами было обнаружено ферромагнитное состояние при $T=30\text{ K}$, т.е. методом диффузии примесных атомов марганца удалось получить новый магнитный полупроводниковый материал.*

Kalit so'zar: *kremniy, marganets, diffuziya, nanoklastер, kirishma, gisterezis.*

Ключевые слова: *кремний, марганец, диффузия, нанокластер, примесь, гистерезис.*

UDK 51-74

EFFECTIVENESS OF MATHEMATICAL OBSERVATION IN CHEMICAL CALCULATIONS

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Summary: *The article provides easy ways to solve problems by using mathematical observation in solving chemical problems in the school chemistry course. Also, the situations in which it is necessary to pay attention when solving chemical problems, what sequence should be followed when solving chemical problems, and the problems used in mathematical observation examples are given.*

Key words: *chemical calculations, experimental problems, proportion, making equations.*

In the educational sphere of our country, measures are being consistently implemented aimed at improving the professional competence of teachers in secondary schools. Thus, educational institutions are gradually being equipped with the necessary material and technical base, modern software and teaching aids, introducing a wide range of pedagogical and information technologies into the educational process, implementing practical applications, and organizing students' cognitive activities based on independent and creative search. Institutes for retraining and advanced training of natural science teachers and "Schools of Professional Excellence" have been created.

In these conditions, the practical implementation of all professional competencies, skills and abilities is required, as well as the use of a competent approach to organizing the educational process, including through the use of innovative methods and techniques. If theoretical knowledge, as a rule, is acquired through the use of various slides, handouts and teaching aids, then in classes on solving chemical problems, methods for solving them are used, set out in the textbook or additional literature.

In this context, a special place is given to the mathematical approach, which, when solving problems in chemistry, allows for a deeper understanding of the practical component of chemical concepts, theories and laws. As you know, the main goal of solving chemical problems is to teach students chemical laws and rules and their application in composing chemical formulas.

Before you begin solving problems, you should familiarize yourself with the necessary theoretical and tactical material.

There are different methods for solving chemical problems, and the choice of a particular method depends on the conditions and formulation of the problem. To solve a problem, as a rule, a clear action plan (algorithm) is drawn up. In this case, they are guided by the following:

1. Identify a problem that needs to be solved through the same task;
2. Determine which substance, which element is involved in the condition of the question;
3. Determine the molar mass, relative molar mass, molar volume, atomic number of the element, relative atomic mass and other quantities of the substances involved in the problem;
4. Find out which branch of chemistry the problem belongs to;
5. When solving problems related to solutions, determine their percentage, mass fraction, molar, normal, equivalent concentration and, if the percentage concentration is given, its density from the table (if the density is given, determine the percentage concentration or mass fraction);
6. When solving problems related to redox reactions, the change in the oxidation states of the elements participating in the reaction is determined, and equations of the chemical reaction are drawn up. The oxidizing element (atom) or reducing element (atom or ions) is identified;
7. It is necessary to check the correctness of the formula or reaction equations and their coefficients;
8. Proportion, ratio, formulas are used in solving calculation problems;

9. The coordinate system is used to solve problems graphically;

10. When writing structural formulas of substances, the valences of the elements included in this substance are determined;

11. When studying the structure of matter, the nuclear composition of simple substances, the state of electrons in atoms and the properties of simple substances, you should learn to use the periodic system of chemical elements by D.Ya. Mendeleev;

12. When solving experimental problems, it is necessary to follow the rules of work in chemical laboratories.

The main reasons for mistakes made by students are:

1. Students in grades 5-6 pay insufficient attention to proportions, equations and related problems and examples.

2. Little attention is paid to calculations with fractions, one-sidedness in solving problems is manifested;

4. 7th grade students do not pay enough attention to solving problems in physics;

5. Chemistry teachers should pay more attention to highlighting the interdisciplinary connection between their core discipline and mathematics and physics.

To eliminate the above shortcomings and fill the gap in students' knowledge, it is necessary to pay attention to the following.

1. Ways to help students quickly memorize the relative atomic masses of chemical elements. To do this, you can resort to fun mathematics, that is, students are tasked with constructing an expression corresponding to relative atomic masses using rational exponential levels, for example:

$$2^2 = \text{Ne}$$

$$3^3 = \text{Al}$$

$$3^4 - 1 = \text{Br}$$

$$2^5 = \text{S}$$

$$2^6 = \text{Cu}$$

$$2^6 - 2^3 = \text{Fe}$$

$$2^4 = \text{O}$$

$$8^2 = \text{Cu}$$

$$10^2 + 2^3 - 1 = \text{Ag}$$

$$4^3 - 2^3 = \text{Fe}$$

This method helps to quickly memorize the relative atomic masses of chemical elements, makes the lesson interesting and meaningful, and helps to understand the relationship between chemistry and mathematics.

2. Correctly drawing up the formula of a substance and calculating its molecular weight. During the lesson, it is convenient to explain to students using the following table:

	OH-17	Cl-35.5	Br-80	S-32	SO₃-80	SO₄-96	CO₃-60	NO₃-62
H-1	H ₂ O 18	HCl 35,5	HBr 81	H ₂ S 32	H ₂ SO ₃ 84	H ₂ SO ₄ 98	H ₂ CO ₃ 62	HNO ₃ 63
K-39	KOH 56	KCl 74.5	KBr 110	K ₂ S	K ₂ SO ₃	K ₂ SO ₄	K ₂ CO ₃	KNO ₃
Na-23	NaOH 40	NaCl 58.5	NaBr	Na ₂ S	Na ₂ SO ₃	Na ₂ SO ₄	Na ₂ CO ₃	NaNO ₃
Cu-64								
Mg-24								
Ca-40								
Fe-56								
Al-27								

By completing this worksheet, students will be able to correctly write the formula and find the molecular weight.

3. Determination of quantity (mol) by mass of a substance. To solve such problems, students must be able to calculate elemental atoms, relative atomic masses, molecular weights, and in many cases, divide numbers as decimals. In this regard, you should pay attention to the mathematical solution of decimal fractions like 6.02; 22.4; 35.5; 63.5; 1.12; 0.224.

Also, students can be given the following tables as a task to find the quantity and volume of a substance:

Formula	K ₂ SO ₄	Na ₂ SO ₄	2O	NaCl	Mg(OH) ₂	uO	CaCO ₃
Molecule, g, mass	174	142	8	58,5	58	0	100
0,2 mol							
0,5 mol							
1,25 mol							
1,5 mol							
2,5 mol							
3 mol							
0,25 mol							

Determining the amount of a substance from its given mass

Formula	Al ₂ (SO ₄) ₃	NH ₄ OH	K ₂ CO ₃	BaSO ₄	Fe ₃ O ₄	NaNO ₃	Sn(OH) ₄
Molecular mass	342	35	138	233	232	85	186
mass	3,42 g	10,5 g	6,9 g	9,32 g	13,9 g	5,1 g	7,44 g
quantity							
mass	6 g						
quantity							
mass	6,4 g						
quantity							
mass	24,4 g						
quantity							

Finding the mass of a gas from its given volume

Title/ volume	Carbon dioxide	Nitrogen	ir	Phosphine	Fox's tail	Methane	Phosgene
mass	44	28	9	34	46	16	99
2,24 l		2,8					
1,12 l			,45				
3,36 l				5,1			
4,48 l					9,2		
5,6 l						4	
11,2 l							49,5

Methods for solving chemical problems are considered an important basis for teaching chemistry in secondary schools, academic lyceums and vocational schools. As a consequence, without the help of a problem-solving methodology, chemistry cannot be expressed as a whole. Lessons organized using this method increase students' interest in chemistry, mathematics and physics. Therefore, students must understand that these subjects are inextricably linked and, without mastering one of them, they should not try to master the other. The teacher, in turn, monitors the process of

mastering the subject by each student and throughout the year organizes additional classes with the weakest of them.

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Rezyume: *Maqolada maktab kimyo kursida kimyoviy masalalarni yechishda matematik mushohada yuritish orqali masalalar yechishning oson yo'llari berilgan. Shuningdek kimyoviy masalalarni yechishda e'tiborni qaratish zarur bo'lgan holatlar, kimyoviy masalalarni yechishda ganday ketma-ketlikka rioya qilish kerakligi hamda matematik mushohada yuritiladigan masalalardan namunalar keltirilgan.*

Резюме: *В статье приведены простые способы решения химических задач с использованием математического наблюдения в рамках школьного курса химии. Также указаны ситуации, в ходе которых обращается внимание на порядок решения таких задач, отмечается последовательность их решения, приводятся примеры задач, используемых в математических наблюдениях.*

Kalit so'zlar: *kimyoviy hisoblashlar, eksperimental masalalar, proportsiya, tenglamalar tuzish.*

Ключевые слова: *химические расчеты, экспериментальные задачи, пропорция, составление уравнений.*

CONTROL IN INTERVAL SYSTEMS

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Summary: *The issues of development of control of linear systems with interval-specified coefficients are considered. A review of known results on interval controllability of linear systems is carried out.*

Key words: *Control. Interval systems. Modal control. Synthesis. Regulator. Lyapunov functions.*

Differential equations are one of the most widely used mathematical tools for modeling dynamic processes. They allow us to study the dynamics of process variations over time. The dynamics of a process can be considered the functioning of ordinary differential equations, difference equations, or differential-difference equations. This mathematical apparatus is simpler and at the same time quite adequately describes the processes under study.

One of the basic methods for studying qualitative processes in dynamic systems is Lyapunov's Second Method. Its essence is to find a function (a functional) that has certain properties. In the process of its development, Lyapunov's Direct Method first was applied to the problems of motion stability in systems of ordinary differential equations. If there is a positive definite (in some sense) function that decreases in the vicinity of the equilibrium position along the solutions to the system, then the equilibrium position of the system is stable [1.37].

When building mathematical models of real objects, it is almost impossible to determine their parameters accurately. Generally, they are known to be accurate within a certain interval. In this regard, the so-called interval theory of control and stability is rapidly developing. Its feature is that the parameters that determine the dynamics of the process can take values from a certain interval. The interval model of a dynamic system reflects the real situation with the values of its parameters, when only the boundaries of the ranges of variation of certain quantities are known a priori.

The number of publications devoted to problems of control of linear interval dynamic systems is constantly growing. Quite tentatively, the following areas of research can be indicated [2.3], [3.3]:

1. Frequency methods for the synthesis of linear interval dynamic systems constructed on the basis of frequency methods of stability theory.
2. Methods and algorithms of synthesis, involving the formation of modal control in an interval setting.
3. Methods for the synthesis of optimal robust regulators for linear interval systems.
4. Methods for the synthesis of regulators based on the apparatus of Lyapunov's Second Method.

The synthesis of systems with uncertain parameters, performed using frequency characteristics, is based on the possibility of establishing a relationship between the properties of open and closed linear interval systems. The transfer matrix of the system is represented as the sum of the "nominal" and "uncertain" matrices.

Methods that involve the implementation of modal control for linear interval systems are used when considering two aspects of synthesis problems. On the one hand, when considering the uncertainty of the values of the object's parameters, and on the other hand, when determining acceptable tolerance values for the regulator coefficients (the case of the interval model of the regulator). In a number of situations, both interval models are used together [3.3].

Let the object be described by the following system of equations:

$$\dot{x} = Ax + bu, \quad u = c^T x, \quad (1)$$

here x is the n -dimensional vector of coordinates of the condition, u is the scalar control, A is the square matrix, and b is the n -dimensional vector.

It is required to find vector $c^T = (c_1, c_2, \dots, c_n)$ of control parameters $u = c^T x$ that stabilizes system (1) with given eigenvalues. This is the so-called modal control problem. In some cases, either matrix A , or vector b takes their values from some matrix or vector intervals. It is required to find vector c , or even the vector interval, at which the closed system is asymptotically stable, and the coefficients of the characteristic equation of the system will not have values beyond the corresponding intervals.

The characteristic equation of the system with the regulator under consideration has the following form:

$$P_n(\lambda) - \sum_{i=1}^n d_i P_{n-i}(\lambda) = 0,$$

where

$$P_n(\lambda) = \lambda^n + p_1 \lambda^{n-1} + \dots + p_{n-1} \lambda + p_n,$$

$$P_{n-i}(\lambda) = \lambda^{n-i} + p_1 \lambda^{n-i-1} + \dots + p_{n-i-1} \lambda + p_{n-i},$$

$$d^T = (d_1, d_2, \dots, d_n), \quad d^T = c^T S, \quad S = (b, Ab, \dots, A^{n-1}b),$$

$p_i, i = \overline{1, n}$ are the coefficients of the characteristic equation of a closed system. After equating the coefficients with the same powers of the characteristic polynomial and the one to which it is necessary to arrive, a system of algebraic equations is derived. Its solution determines the necessary control feedback coefficients. Based on similar principles, it is possible to construct control problems for systems with interval-specified matrix A and vector b .

The synthesis of interval systems can also be realized with the requirement of minimizing a certain quality criterion. In particular, for linear equations this can be a quadratic quality criterion:

$$\dot{x} = (A + \Delta A)x + (B + \Delta B)u, \quad u = c^T x,$$

$$J = \int_0^T [x^T(t) Q x(t) + u^T(t) R u(t)] dt + x^T(T) S x(T)$$

with positive semi-definite matrices Q and R .

Based on the theorem similar to N.N. Krasovskiy's theorem on the Lyapunov optimal function, functional $J(\cdot)$ satisfies the following inequality:

$$J(\cdot) \leq x^T P(t) x, \quad t \in [0, T],$$

where matrix $P(t)$ is the solution to a Riccati type matrix equation

$$\begin{aligned} -\dot{P}(t) = & (A + BC^T)^T P(t) + P(t)(A + BC^T) + Q + C^T P(t)C + \\ & + (\gamma + \delta)P + \frac{1}{\gamma} \tilde{Q}(P) + \frac{1}{\delta} C^T \tilde{R}(P)C \end{aligned}$$

with boundary condition $P(T) = S$. Here γ, δ are the arbitrary positive scalars, $\tilde{Q}, \tilde{R}(P)$ are the positively semidefinite matrices for which the following majorant conditions are satisfied:

$$\tilde{Q}(P) \geq \Delta A^T P(t) \Delta A \quad \tilde{R}(P) \geq \Delta B^T P(t) \Delta B.$$

Considering the results obtained, an algorithm was developed for finding the matrix of control parameter K , which provides the minimum upper bound for $J(\cdot)$ with account for the restrictions on asymptotic stability.

Disturbances of a special type are considered in several publications.

Let the uncertainty matrix for the following system

$$\dot{x} = (A + \Delta A)x + bu, \quad y = cx$$

have the form $\Delta A = bM(q)$. Then control

$$u(t) = -\gamma \Omega^T y(t)$$

for large enough $\lambda > 0$ guarantees the asymptotic stability of the closed system:

$$\dot{x} = (A + bM(q) - \gamma b \Omega^T c)x.$$

The use of the apparatus of Lyapunov's Second Method in problems of the synthesis of interval systems is traditionally related to the search for a positive definite function, which for a linear-quadratic problem has the quadratic form that satisfies certain requirements. In particular, it must be positive definite, and its total derivative, by virtue of the system, must be equal to the integrand expression of the quality criterion. For interval-specified matrices, a condition for minimum residual is added.

However, the studies using Lyapunov's Second Method in problems of control of interval systems are limited to problems of ensuring stability and do not consider optimization of the quality criterion.

Consider the following control system:

$$\dot{x} = Ax + bu. \quad (2)$$

Here $u \in R^1$ is the scalar control. It is sought in the form $u = c^T x$, $c^T = (c_1, c_2, \dots, c_n)$, where coefficients c_i , $i = 1, n$ can vary within certain limits $\bar{c}_{\min}^i \leq c_i \leq \bar{c}_{\max}^i$. We will choose them in such a way that the closed system

$$\dot{x} = (A + bc^T)x \quad (3)$$

has characteristic equation

$$\lambda^n + a_1 \lambda^{n-1} + a_2 \lambda^{n-2} + \dots + a_{n-1} \lambda + a_n = 0,$$

the coefficients are within specified fixed limits $a_{\min}^i \leq a_i \leq a_{\max}^i$, $i = \overline{1, n}$.

Let us denote

$$\begin{aligned} a^T &= (a_1, a_2, \dots, a_n), \quad \Omega(a) = \{a : a_{\min}^i \leq a_i \leq a_{\max}^i, \quad i = \overline{1, n}\}, \\ c^T &= (c_1, c_2, \dots, c_n), \quad \Omega(\bar{c}) = \{c : \bar{c}_{\min}^i \leq c_i \leq \bar{c}_{\max}^i, \quad i = \overline{1, n}\}. \end{aligned} \quad (4)$$

Definition. System (2) is called interval controlled if, for any given intervals of variation in coefficients of the characteristic equation, there are corresponding intervals of change in control parameters at which each value $a^T = (a_1, a_2, \dots, a_n)$ from given n -dimensional rectangle $\Omega(a)$ corresponds to value $c^T = (c_1, c_2, \dots, c_n)$ from n -dimensional rectangle $\Omega(\bar{c})$ in such a way that closed system (3) has coefficients of the characteristic equation from rectangle $\Omega(\bar{c})$.

Let the characteristic equation of system (2) with zero control have the following form:

$$\det(\lambda E - A) = \lambda^n + p_1 \lambda^{n-1} + p_2 \lambda^{n-2} + \dots + p_{n-1} \lambda + p_n = 0$$

Let us denote

$$p^T = (p_1, p_2, \dots, p_n), \quad S = (b, Ab, A^2b, \dots, A^{n-1}b).$$

$$G(p) = \begin{bmatrix} -1 & 0 & \dots & 0 & 0 \\ -p_1 & -1 & \dots & 0 & 0 \\ \cdot & \cdot & \dots & \cdot & \cdot \\ -p_{n-1} & -p_{n-2} & \dots & -p_1 & -1 \end{bmatrix}.$$

Theorem. For system (2) to be interval controlled, it is necessary and sufficient for the condition $\text{rang } S = n$ to be met.

Moreover, for the arbitrary rectangle $\Omega(a)$ of changes in the characteristic equation, there is the rectangle $\Omega(\bar{c})$ of changes in control parameters

$$\begin{aligned}\bar{c}_{\min}^s &= \min_{a_i} \left\{ \left[S^{-1} \left(G^{-1}(p)(a-p) \right) \right]_s, \quad a_i = a_{\min}^i, \quad a_{\max}^i, \quad i = \overline{1, n} \right\}, \\ \bar{c}_{\max}^s &= \max_{a_i} \left\{ \left[S^{-1} \left(G^{-1}(p)(a-p) \right) \right]_s, \quad a_i = a_{\min}^i, \quad a_{\max}^i, \quad i = \overline{1, n} \right\},\end{aligned}\quad (5)$$

$[\cdot]_s$ - is the s -th component of the corresponding vector.

Example. Let matrix A and vector b have the following form:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 2 \end{bmatrix}.$$

It is required to find the domain $\Omega(c_1, c_2)$ of change in coefficients c_1, c_2 of control $u = c_1 x_1 + c_2 x_2$, which corresponds to the characteristic polynomial of a closed-loop system with coefficients a_1, a_2 varying in intervals $1 \leq a_1 \leq 2, 2 \leq a_2 \leq 3$.

Let us check the controllability condition

$$S = (b, Ab) = \begin{bmatrix} 1 & 5 \\ 2 & 11 \end{bmatrix}, \quad \det S = 1 \neq 0.$$

The characteristic equation of the original system has the following form:

$$\lambda^2 - 5\lambda - 2 = 0, \quad p_1 = -5, \quad p_2 = -2.$$

Equating the coefficients with the same powers, we obtain the following system:

$$\begin{cases} a_1 = -d_1 - 5, \\ a_2 = 5d_1 - d_2 - 2. \end{cases}$$

Its solution can be represented in the following form:

$$\begin{cases} d_1 = -a_1 - 5, \\ d_2 = -5a_1 - a_2 - 27. \end{cases}$$

Finally $\Omega(\bar{c})$ has the form $\Omega(\bar{c}) = \{c : 1 \leq c_1 \leq 4, -5 \leq c_2 \leq -4\}$

Thus, using the Kalman criterion, estimates of changes in the intervals of control parameters were obtained, at which a change in coefficients of the characteristic equation of a closed-loop system is ensured in given intervals. The solution is of a quantitative nature. It is essential to reduce the calculation of coefficients of the resulting equation to a finite number of operations.

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Rezyume: Intervalli koeffitsientli chiziqli sistemalarni boshqarishni rivojlantirish masalalari ko'rib chiqiladi. Chiziqli sistemalarning intervalli boshqarilishi bo'yicha ma'lum natijalarni ko'rib chiqish amalga oshiriladi.

Резюме: Рассмотрены вопросы развития управления линейными системами с интервально заданными коэффициентами. Проведено обзор известных результатов по интервальной управляемости линейными системами.

Kalit so'zlari: Boshqarish. Intervalli tizimlar. Modal boshqarish. Sintez. Regulyator. Lyapunov funktsiyalari.

Ключевые слова: Управление. Интервальные системы. Модальное управление. Синтез. Регулятор. Функции Ляпунова.

SEWING SCRAPS AND PRINTS, FIBER LAYER FORMING PERFORATED DRUM

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Summary: Sawdust and scraps considered as sewing waste in order to increase the effect of regeneration, the former of the fibrous layer, the pressure of the air flow acting on the surface of the punch drum was studied and its magnitude variable along the axis of the drum, close to the fan when the unevenness is studied on them because the part is thicker, and smaller in the middle, and the pressure is greater at one end the thinning of the layer was determined experimentally. Formable fibrous layer hyperboloid of the punch drum in order to achieve a uniform thickness. It was recommended to form a fibrous layer on the surface of the slit in the form of air. The invariance of the pressure was determined in the experiments, and relevant recommendations were developed.

Key words. Patterns, flap, perforated drum, fiber layer, unevenness, air pressure.

Introduction. Rational use of textile waste as primary raw material to save resources, the range of manufactured products to expand, to reduce the cost of products and the amount of waste, production provides an opportunity to create resource-efficient and waste-free technology.

Properties of regenerated fibers from sewing scraps and The degree of sophistication is mainly due to the work of Chinese machines, in particular, the separation of fibers depends on the process [1]. Therefore, fiber recovery from sewing scraps, clots and waste and the production of ready-made products from them is given great attention. In this research, by recovering fiber from slag and slag and textile waste, issues of product production were considered. Fiber recovery from waste (regeneration) technology is analyzed, resource-saving techniques and technology [2] Wash fibers recovered from textile waste, if appropriated at work Mixing with fiber and obtaining knitted fabric is considered in detail in the work [3]. These works have been performed at a high level by the candidate and they are doctoral theses, new constructions based on technology analysis created [4-8]. They are mainly new machine designs and technology aimed at improving the composition and properties of renewable fiber almost bypasses improvement. "SHANDONG SHUNXING MACHINERY" of China. The company's fiber recovery equipment from shavings and clots has ten sections, air intake from the punch drum in each of them was studied from one side, but changes in the thickness of the emerging fiber layer have not been studied. Recycled fiber no studies have been conducted to improve the composition. Note that It should be noted that these devices are mainly among the supply cylinders with saw-toothed or needle-toothed attachments that pull out the pinched shavings coated drums and forming the supply layer conveyed to them composed of mesh or perforated drums [10]. The some problems were learned to get aim deeply.

The principle of operation is the use of air fans from both sides of the inner part of the drum when absorbed, the fibers settle in the form of a layer on the perforated surface of the drum based on getting Some issues were studied to achieve the goal.

Theoretical part. In this study, the formation of the fibrous layer air movement in the holes on the surface of the punch drum was studied. Reed drums beat fiber recovery from clarifiers, condensers, regenerators and scraps is one of the main working bodies included in the machines. The fiber layer formed on the surface of the punch drum is absorbent in many ways depending on the distribution of air across the drum. When air is sucked out of the drum the air pressure is high at both ends, and the air pressure is decreasing towards the middle progress is observed. That the air pressure does not change along the axis of the punch drum theoretical research was conducted in order to provide. Air pressure to solve the problem the regression equation of the change was constructed. For this, the following information it was taken into account: a) an empirical regression equation was created; b) of the regression equation level of importance $\alpha = 0.05$ evaluated when available; c)

connection between variables determination correlation of density empirical correlation ratio R through was assessed. Adopting the following nonlinear equation for correlation coupling it was accepted as appropriate.

$$y_x = b_0 + b_1x + b_2x^2 \quad (1)$$

b_0 , b_1 and b_2 the coefficients have the smallest value of the squared deviation is determined by the method of being. For this, a system of appropriate equations is created, the significance of the obtained association was evaluated and its value was determined and compared with the Fisher-Snedecor criterion, the significance of the association and the regression. The validity of the equation was confirmed. To evaluate the parameters of the punching drum 1- The number of holes along the axis of the punch drum and their occupation are given in the table given above for mathematical processing of the distribution of surfaces regression analysis method was used.

Table 1

The number of holes along the axis of the drum and the distribution of their surfaces

Coordinate	X_1	X_7	X_{14}	X_{21}
The number of holes	188	147	131	120
Hole surface	2361,28	1846,32	1645,36	1507,2

Using the values given in the table, it is shown in figure 1 and 2 graphs are obtained. It should be noted that in the graphs of the solution of the regression equation the number of perforations and the distribution of the surface of the perforations along the axis of the drum in the experiment corresponds to the obtained distribution.

Regression equation $y=190.48-3.78x+0.05x^2$

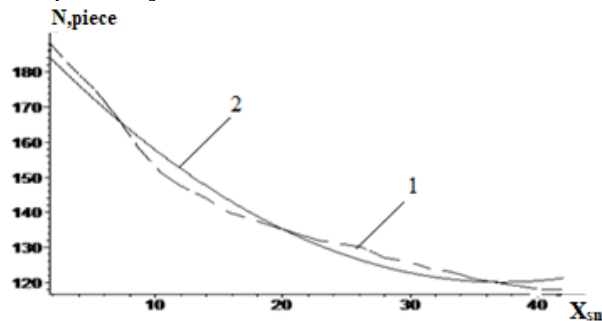


Figure 1. Distribution of perforations along the drum
1st experimental; 2nd theory

Regression equation $y=2401,77 - 48,08 x + 0,65x^2$

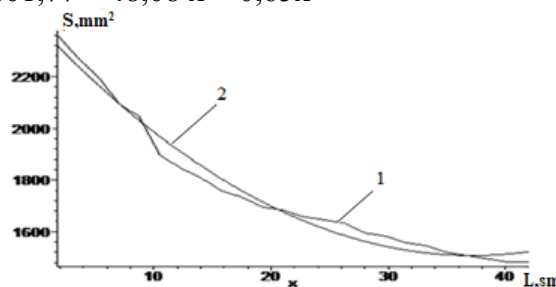


Figure 2. The distribution of the surface of the perforations along the drum
1st experimental; 2nd theory

So that the air pressure does not change along the axis of the drum confirmed to be provided. That's why a new punch drum was created in order to ensure that the air pressure does not change in

the perforation holes of the structure the structural unevenness of the formed fiber layer decreases sharply.

Experimental part. One of the local enterprises "EURASIAALLIANCETEX" In the joint venture of LLC, China's ten-section "SHANDONG SHUNXING MACHINERY" company's fiber recovery equipment air is sucked from the punch drum in each of them from one side. Other companies and in equipment, air is sucked from two sides of a perforated drum or mesh drum. Such drums are installed in most cars. Fiber is recovered from slag and slag and formed in a punch drum corresponding experiments were conducted by taking samples from the layer. Examples are in Figure 3.



Figure 3. View of the fiber layer formed and separated in the punch drum.

The resulting layer is cut lengthwise, and the masses of the 5 layers are obtained and they are. When the unevenness is studied, the part of the layer close to the fan is thicker than it and it was found that the layer becomes thinner as it moves away. Cut along the length of the layer. The obtained layers are shown in Fig. 4.



Figure 4. Layers cut lengthwise.

Each layer contains untorn remnants of fabric and yarn in the thick part of the layer, they are more abundant, they are isolated and the mass decreases from the thick side of the layer to the thin side in Fig. 5 shown.



• **Figure 5.** The two edges of the layer and the middle part of the layer are not included in the content scrap fabric and thread scraps.

The mass of residual yarns per mass unit of the obtained sample the layer is thick, i.e. close to the fan, and the thin layer is thin found to be in place. Therefore, the influence of air is not on the stronger side scraps of fabric and scraps of thread are studied and left in the thick part of the layer The mass of pieces of fabric and residual threads is more, they are isolated and their mass decreases from the thick side of the layer to the thin side in Table 2 given.

Table 2

The mass of untied shavings and threads, mg

Samples №	Mass mg	Samples N	Mass mg	Samples	Mass mg
1	0.52	№ 3	0.41	№ 5	0.30
№ 6	0.47	№ 8	0.35	№ 10	0.27
№ 11	0.51	№ 13	0.35	№ 15	0.21
Average	0,5		0.37		0.26
CV	5,3		9,4		17,6

Taking this into account, the fiber layer is one of the thickness of the cross-section in order to ensure diversity, a new design of the punching drum was created (6-,7- picture).

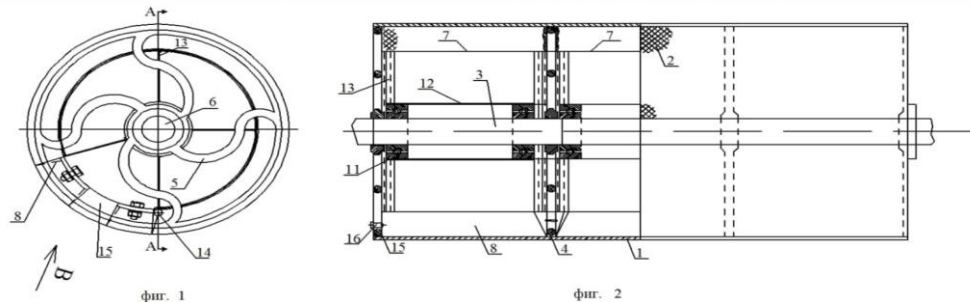


Figure 6. New punch drum design.

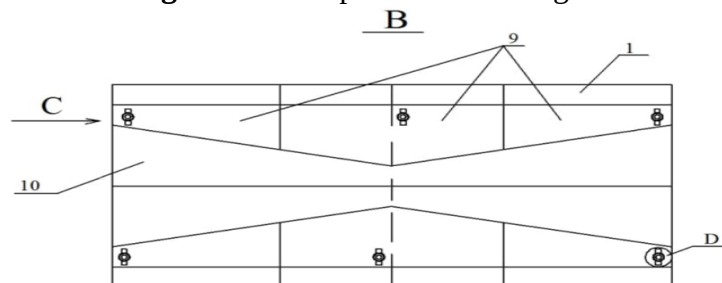


Figure 7 Air intake hole.

The essence of the new construction is to clean and restore the fiber For machines, the drum 1 is covered with a mesh cylinder 2, and the shaft 3 is covered with a cross 4 is an intermediate flange, and they are connected by a spigot 5 and a bushing 6. of the drum inside, in the space between the crossbars 4, three cylinders 7 are installed, which adjustable devices have 8, mesh 2 with sealing pads on the edges and equipped with six symmetrically arranged plates 9. Among them two symmetrical ones with small bases in the middle of the drum along the cylinder the dimensions of the trapezoidal hole 10 are adjusted.

Analysis of results. One of the local enterprises "EURASIAALLIANCETEX" "SHANDONG SHUNXING MACHINERY" of China in the joint venture of LLC a layer of fibers obtained in the company's fiber recovery equipment from shavings and clots the part of the layer close to the fan

based on the study of the change in thickness thicker, and the further away from it, the layer becomes thinner. Keep that in mind and ensure the uniformity of the thickness of the cross-section of the fiber layer in order to, the new k of the punching drum.

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Rezyume: Ushbu maqolada yigirish usullari va xoashyodanqatliy nazar tolali qatlam hosil qilishi uchun ko'pincha qo'llaniladigan maxsus qurilma to'rlari yoki perfobaraban ishi tahlil qilingan. Perfobarabanning sirtida tola so'ruvchi havo tasirida shakllanadi. To'rlari barabanlar savash, tozalash mashinalari, kondensatorlar, reginatorlar va qiyqim hamda laxtaklardan tola tiklash mashinalari tarkibiga kiruvchi asosiy ishchi organlardan biri hisobga olinib, ularning ishi o'rganilgan.

Резюме: В данной статье анализируются методы прядения и специальные приспособления-сетчатые или перфобарабанные работы, которые часто применяются для формирования волокнистого слоя независимо от сырья. На поверхности перфобарабана под воздействием всасываемого воздуха образуется волокнистый слой. Изучена работа перфобарабанов, являющихся одним из основных рабочих органов, входящих в состав трепальных, очистительных машин, конденсаторов, регенераторов и машин для восстановления волокна из выкровок и лоскута.

Kalit so'zlar: Qiyqim, laxtak, perfobaraban, tola qatlami, notekislik, havo bosimi.

Ключевые слова: Выкройки, лоскут, перфобарабан, слой волокна, неровнота, давление воздуха.

UDK 517.95

BOUNDARY VALUE PROBLEM FOR THE EQUATION OF TRANSVERSE VIBRATION OF A BEAM

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Summary: *The paper considers a boundary value problem for a fourth-order equation. The solution is constructed using the method of separation of variables.*

Key words: *beam vibration equation, boundary value problem, method of separation of variables, eigen functions.*

Currently, in connection with problems of geophysics, oceanology, atmospheric physics, and a number of other problems, interest in studying the dynamics of various inhomogeneous fluids, which lead to initial-boundary value problems for fourth-order partial differential equations, has increased significantly. Transverse vibrations of a beam are reduced to the study of a fourth-order equation of the form [1-2].

$$\frac{\partial^2 u}{\partial t^2} + a^2 \frac{\partial^4 u}{\partial x^4} = 0. \quad (1)$$

Here $u = u(x, t)$ – beam displacement.

Beams are widely used in the construction of buildings, bridges, overpasses, overpasses and other structures. The largest number of bridges under construction are girder bridges. These are the main structures for the construction of short crossings (small road and railway bridges, aqueducts, overpasses, overpasses). Beam-type crossings over obstacles (rivers and ravines) were the first bridges and aqueducts in history. Floating bridges supported by pontoons are also beam-type bridges by design. Therefore, the supports of beam bridges can be either rigid (for stationary bridges) or elastic (for floating bridges). In the construction of industrial buildings, beams are also used that bend under the influence of not only static, but also periodically changing loads. The beams of beam bridges work in bending, and therefore it is completely justified to study the transverse vibrations of beams, which comes down to the study of both free and forced vibrations of beam bridges when a moving load passes through them. Beams used in industrial buildings mainly operate under static bending, but when any equipment (machine tools, compressors, piston engines, etc.) is installed on them, they experience dynamic loads that are periodic in nature. Under such loads, the beams also undergo transverse vibrations.

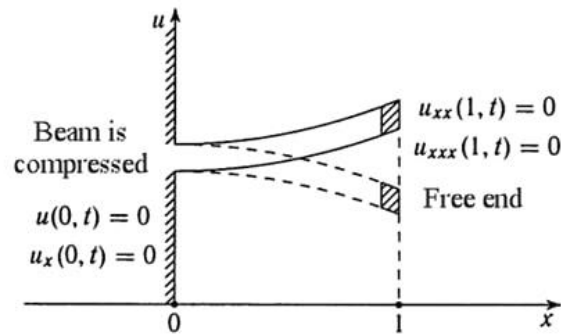
If, during static loading of a beam, it is necessary to determine the elastic line of the beam, construct static diagrams of the bending moment and shear force, then the dynamic effect requires studying the oscillatory process of the beam (determining the frequencies and modes of vibration of the beam, as well as time-dependent diagrams of bending moments and shear forces) [1].

Oscillations - various movements and processes that have a determinable repeatability over time. To determine oscillations, it is necessary to know the dependence of the oscillation parameter on time.

Depending on the appearance and causes of occurrence, the following types of vibrations are distinguished [3]:

1. Deterministic, random, chaotic;
2. Decaying, stationary, increasing (according to the type of graph);
3. Own, forced, parametric (according to the nature of external influence);

Let us consider the transverse vibrations of a thin beam. The main difference between the vibrations of a beam and the transverse vibrations of a string is that the beam resists bending. The vibrations of a beam clamped at one end are described by the equation (draw. 1)



Drawing 1. Beam vibrations.

The differential equation for transverse vibrations of a single-span beam of constant cross-section has the form

$$\rho \cdot S \cdot \frac{\partial^2 u}{\partial t^2} + E \cdot J \cdot \frac{\partial^4 u}{\partial x^4} = 0, \quad (2)$$

here ρ - density of the beam material $\left(\frac{\text{kg}}{\text{m}^3}\right)$, S - cross-sectional area (m^2) , E - elastic modulus $\left(\frac{\text{H}}{\text{m}^2}\right)$, J - moment of inertia of the section (m^4) , $u = u(x, t)$ - transverse movement of the section at the moment of time t .

Differential equation (2) does not take into account the rotation of the cross section when the beam vibrates.

Boundary conditions for a given end ($x = 0$) is the immobility of the beam and the horizontality of the tangent $\left(\frac{\partial u}{\partial t}(0, t) = 0\right)$, at the free end ($x = l$) must be equal to zero bending

moment $M = -E \frac{\partial^2 u}{\partial x^2} J$ and tangential force $F = -EJ \frac{\partial^3 u}{\partial x^3}$ (Fig. 1). Note that in equation

(1) $a^2 = -EJ/\rho S$ (ρ - beam material density, S - cross-sectional area of the beam).

In order to completely determine the motion of a beam clamped at one end, it is necessary to set the initial conditions: the initial deflection and the initial speed in each section of the beam, i.e., determine

$$u|_{t=0} = \varphi(x), \quad u_t|_{t=0} = \psi(x), \quad 0 \leq x \leq l.$$

Here $t = 0$ two diagrams are given:

- 1) diagram $\varphi(x)$ transverse movements for all sections of the beam,
- 2) diagram $\psi(x)$ speeds of movement of these sections.

Boundary value problems for fourth-order equations with various conditions have been studied by many authors [4-8].

Consider the following mixed problem: define a function $u(x, t)$ for given initial and boundary conditions.

$$\begin{cases} u_{tt} + a^2 u_{xxxx} = 0, & 0 < x < l, \quad t > 0, \end{cases} \quad (3)$$

$$\begin{cases} u(0, t) = 0, \quad u_x(0, t) = 0, \end{cases} \quad (4)$$

$$\begin{cases} u_{xx}(l, t) = 0, \quad u_{xxx}(l, t) = 0, & t \geq 0, \\ u(x, 0) = \varphi(x), \quad u_t(x, 0) = \psi(x), & 0 \leq x \leq l. \end{cases} \quad (5)$$

We will solve this problem by the method of separation of variables under the assumption that we are looking for time-periodic beam vibrations. Believing $u(x, t) = X(x) \cdot T(t)$ and substituting the expected form of the solution into equation (1), we obtain

$$X(x) \cdot T''(t) + a^2 X^{IV}(x) \cdot T(t) = 0.$$

whence follows

$$\frac{T''(t)}{a^2 T(t)} = -\frac{X^{IV}(x)}{X(x)} = -\lambda.$$

It's clear that $\lambda > 0$ (for the existence of periodic t decisions). For function $X(x)$ we obtain the problem of natural oscillations

$$X^{IV}(x) - \lambda X(x) = 0, \quad (6)$$

under boundary conditions

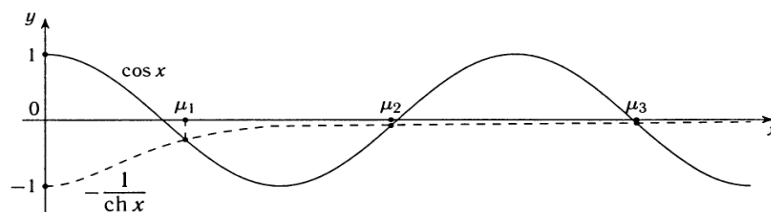
$$X(0) = 0, \quad X'(0) = 0, \quad X''(l) = 0, \quad X'''(l) = 0. \quad (7)$$

The general solution to equation (6) is represented as

$$X(x) = A \operatorname{ch}(\sqrt[4]{\lambda} x) + B \operatorname{sh}(\sqrt[4]{\lambda} x) + C \cos(\sqrt[4]{\lambda} x) + D \sin(\sqrt[4]{\lambda} x).$$

From the conditions $X(0) = 0, \quad X'(0) = 0$ we find that $A + C = 0, \quad B + D = 0$. this implies

$$X(x) = A \left[\operatorname{ch}(\sqrt[4]{\lambda} x) - \cos(\sqrt[4]{\lambda} x) \right] + B \left[\operatorname{sh}(\sqrt[4]{\lambda} x) - \sin(\sqrt[4]{\lambda} x) \right].$$



Drawing 2. Determining the roots of an equation $\cos x \operatorname{ch} x = -1$.

Boundary conditions (7) at the right end of the beam give

$$\begin{cases} A \left[\operatorname{ch}(\sqrt[4]{\lambda} x) + \cos(\sqrt[4]{\lambda} x) \right] + B \left[\operatorname{sh}(\sqrt[4]{\lambda} x) + \sin(\sqrt[4]{\lambda} x) \right] = 0, \\ A \left[\operatorname{sh}(\sqrt[4]{\lambda} x) - \sin(\sqrt[4]{\lambda} x) \right] + B \left[\operatorname{ch}(\sqrt[4]{\lambda} x) + \cos(\sqrt[4]{\lambda} x) \right] = 0. \end{cases} \quad (8)$$

Homogeneous system (relative to unknown A And B) (8) has nontrivial solutions if and only if its determinant is equal to zero:

$$\begin{vmatrix} ch(\sqrt[4]{\lambda}x) + \cos(\sqrt[4]{\lambda}x) & sh(\sqrt[4]{\lambda}x) + \sin(\sqrt[4]{\lambda}x) \\ sh(\sqrt[4]{\lambda}x) - \sin(\sqrt[4]{\lambda}x) & ch(\sqrt[4]{\lambda}x) + \cos(\sqrt[4]{\lambda}x) \end{vmatrix} = 0. \quad (9)$$

From equation (9) we obtain an algebraic equation for calculating the eigen values tasks

$$sh^2(\sqrt[4]{\lambda}l) - \sin^2(\sqrt[4]{\lambda}l) = ch^2(\sqrt[4]{\lambda}l) + 2ch^2(\sqrt[4]{\lambda}l)\cos^2(\sqrt[4]{\lambda}l) + \cos^2(\sqrt[4]{\lambda}l). \quad (10)$$

Having designated $\mu = \sqrt[4]{\lambda}l$ and using the equality $sh^2x + 1 = ch^2x$, from equation (10) we find

$$ch\mu \cdot \cos \mu = -1, \quad (11)$$

This equation can be solved graphically (draw. 2). The roots of equation (11) are

$$\mu_1 = 1,875; \quad \mu_2 = 4,694; \quad \mu_3 = 7,854; \quad \mu_n \approx \frac{\pi}{2}(2n-1) \text{ at } n > 3.$$

Next, for the function $T(t)$ we have the equation

$$T''(t) + \lambda_n a^2 T(t) = 0.$$

Its general solution is written as

$$T_n(t) = A_n \cos(a\sqrt{\lambda_n}t) + B_n \sin(a\sqrt{\lambda_n}t) = A_n \cos\left(a\frac{\mu_n^2}{l^2}t\right) + B_n \sin\left(a\frac{\mu_n^2}{l^2}t\right),$$

where A_n and B_n – arbitrary constants.

Consequently, the “atoms” of the solution to problem (3), (4) are formed by the functions

$$u_n(x, t) = \left[A_n \cos\left(a\frac{\mu_n^2}{l^2}t\right) + B_n \sin\left(a\frac{\mu_n^2}{l^2}t\right) \right] \cdot X_n(x),$$

Where

$$X_n(x) = \frac{(sh\mu_n + \sin \mu_n) \left[ch\left(\frac{\mu_n}{l}x\right) - \cos\left(\frac{\mu_n}{l}x\right) \right]}{sh\mu_n + \sin \mu_n} - \frac{(ch\mu_n + \cos \mu_n) \left[sh\left(\frac{\mu_n}{l}x\right) - \sin\left(\frac{\mu_n}{l}x\right) \right]}{sh\mu_n + \sin \mu_n}.$$

According to the general theory of the Sturm-Liouville problem native functions $\{X_n(x)\}_{n=1}^{\infty}$ form a complete orthogonal system of functions on the segment $[0, l]$. Then the solution to problem (3) - (5) is given next

$$u(x, t) = \sum_{n=1}^{\infty} \left[A_n \cos\left(a\frac{\mu_n^2}{l^2}t\right) + B_n \sin\left(a\frac{\mu_n^2}{l^2}t\right) \right] \cdot X_n(x),$$

where are the coefficients A_n and B_n – are determined from the initial conditions using the formulas

$$A_n = \frac{\int_0^l f(x) X_n(x) dx}{\|X_n(x)\|^2}, \quad B_n = \frac{\int_0^l g(x) X_n(x) dx}{a \frac{\mu_n^2}{l} \|X_n(x)\|^2},$$

Where

$$\|X_n(x)\|^2 = \int_0^l X_n^2(x) dx.$$

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Rezyume: Maqolada to'rtinchi tartibli tenglama uchun chegaraviy masala urganiladi. Masala yechimi o'zgaruvchilarni ajratish, usuli bilan quriladi.

Резюме: В работе рассматривается краевая задача для уравнения четвертого порядка. Решение строится методом разделения переменных.

Kalit so'zlar: balkaning tebranish tenglamasi, chegaraviy masala, o'zgaruvchilarni ajratish usuli, hos funksiyalar.

Ключевые слова: уравнение колебания балки, краевая задача, метод разделения переменных, собственные функции.

GENERAL CHARACTERISTICS OF PR OF THE MINISTRY OF FOREIGN AFFAIRS OF UZBEKISTAN IN THE SYSTEM OF FOREIGN POLICY CONTACTS

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Summary: *In the article, the author examines the activities of the PR service of the Ministry of Foreign Affairs of Uzbekistan, its priority tasks, goals and legal framework established by the Decree of the President of the Republic of Uzbekistan.*

Key words: *Ministry of Foreign Affairs, PR, media, press conference, briefing, press secretary*

The PR service of the Ministry of Foreign Affairs of Uzbekistan builds its work in accordance with the Decree of the President of the Republic of Uzbekistan dated February 25, 1994 “On improving the activities of the Ministry of Foreign Affairs of the Republic of Uzbekistan”, the Law of July 3, 1992 “On the establishment of diplomatic classes and ranks for diplomatic workers”, the resolution Cabinet of Ministers “On issues of organizing and improving the activities of the Ministry of Foreign Affairs of the Republic of Uzbekistan” dated March 16, 1994 No. 140 and the Consular Charter of the Republic. The Ministry carries out its activities under the direct leadership of the President of the country. The main tasks and functions of the Ministry of Foreign Affairs of Uzbekistan are set out in Appendix No. 1 to the Resolution of the Cabinet of Ministers of March 16, 1994 No. 140 “Regulations on the Ministry of Foreign Affairs of the Republic of Uzbekistan”. Amendments to this Regulation were made in 2000, 2002, 2003, 2005, 2010 and 2011.

The priority areas of PR activities are the implementation of the principle of state sovereignty of the republic, the implementation of the foreign policy course of the President of the country, the protection of the state interests of Uzbekistan and the rights of its citizens in relations with foreign countries, as well as in international and regional organizations. Together with the National Information Agency of Uzbekistan (UZA), the Uzbek Press and Information Agency, the Ministry of Foreign Affairs coordinates the dissemination of information about the socio-political and economic life of Uzbekistan on the Internet. The PR services of the ministry also draw up plans and organize the publication of literature on issues of foreign policy and international relations, cooperate with the University of World Economy and Diplomacy. The structure of the Ministry of Foreign Affairs of the Republic of Uzbekistan also includes the provision of communications, computer systems and the Internet, “the Jahon news agency”, diplomatic service service “Diphorizhizmat”.

The Ministry of Foreign Affairs of Uzbekistan is a government agency at the level of the Cabinet of Ministers in Uzbekistan, responsible for conducting and developing the foreign policy of Uzbekistan. The ministry is divided into several departments. Recently, a new department for cultural and humanitarian cooperation, tourism and sports were formed in the Foreign Ministry of Uzbekistan. It is noted that the new unit plays a coordinating role in the implementation of foreign policy objectives of the Republic of Uzbekistan in the assigned areas, ensuring the country’s active position in the global dialogue of civilizations, and promoting its positive image on the world stage.¹ Takes part in the search and return, including by obtaining copies or duplicates of originals, of the national cultural and scientific heritage of Uzbekistan stored in foreign museum funds, archives and collections. PR provides assistance in expanding cooperation and implementing joint projects to study and present the Uzbek language, culture, history, and literature abroad. It also takes measures to organize student internships, conclude inter-university and inter-academic agreements and memorandums in areas within the competence of the Office. Priority in the PR activities of the new department will be given to the active

¹<https://kun.uz/ru/news/2022/06/30/v-strukture-mid-obrazovano-novoye-upravleniye>

use of “soft power” tools, public, cultural and sports diplomacy. It also became known that from July 1, 2022, Anvar Abdukhalimov, who is also an adviser to the minister on improving the efficiency of spiritual and educational work and ensuring compliance with the legislation on the state language, was appointed head of the department.

In accordance with clause 10 of Appendix No. 1 to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 140 dated March 16, 1994. “On issues of organizing and improving the activities of the Ministry of Foreign Affairs of the Republic of Uzbekistan”, a board is being formed in the Ministry consisting of the Minister (chairman of the board), deputy ministers (by position), as well as heads of structural divisions of the Ministry coordinating the main directions of its activities. The number and personal composition of the board is approved by the Cabinet of Ministers of the Republic of Uzbekistan on the proposal of the Minister. Diplomacy is a completely non-public sphere. What the press secretaries of foreign affairs agencies, heads of state or government inform about, has in fact already moved from the sphere of diplomacy to the sphere of public policy. Hence the absolute misunderstanding by a significant part of society of the goals, objectives and methods of the press services of the Ministry of Foreign Affairs of states. In the minds of the average citizen, the task of the press service is to scold everyone that the average citizen of some foreign state doesn’t like, preferably using profanity, and also regularly threaten the enemies of the people and the state with punishments on earth and in heaven (at least a nuclear strike). In fact, as already mentioned, the press service of the foreign policy department is making every effort to maintain negotiation platforms and to find compromise options for resolving contradictions. The structure of the press service of the Ministry of Foreign Affairs of Uzbekistan has the position of coordinator for briefings and press conferences. Briefings and press conferences are an effective events for the press, which are also technologies used by the PR service of the Ministry of Foreign Affairs. The range of technologies that the press service uses in its work is quite well known (how effectively they are used is another matter). This includes preparing press releases, press conferences, briefings, as well as informal meetings with journalists, preparing comments from specialists, authoritative people - public opinion leaders. Most often and most willingly, the press service of the Ministry of Foreign Affairs of Uzbekistan resorts to organizing press conferences and briefings, which are based on communication between the leadership of the foreign policy department and invited journalists. Briefing is a meeting of officials or a press secretary with representatives of the media, which briefly outlines the position of the government or relevant organization on a particular issue or provides information on the progress of international negotiations, the positions of the parties, etc. In other words, a briefing is a short (lasting up to half an hour) working event for media representatives, during which officials of the Ministry of Foreign Affairs and its representatives report the news, express their attitude and indicate their position on a particular issue.

Briefings are usually promptly organized in cases of emergencies - terrorist attacks, political conflicts, etc., in order to explain, as far as possible, what happened, its reasons, to prevent panic, possible errors, distortions of facts and exaggerations in the media. As PR practitioners note, “a briefing is also the most convenient format for communicating sensational information designed to obtain the effect of surprise, since with this method the desired information message or ideological thesis, veiled by sensational news, will be uncritically perceived by an audience under the influence of strong emotions.” The peculiarity of the coordinator of briefings and press conferences is that, when organizing these PR events for the public, he coordinates the messages of the speakers in a publicizing manner, illustrating it with specific facts. Most often, the organizers of the briefing limit themselves to only the message, without entering into dialogue with representatives of the press. Especially if the briefing is organized when it is urgently necessary to inform the media on a significant issue in the activities of the Ministry of Foreign Affairs or individual diplomatic events. If questions are raised at such meetings, this happens on the initiative of the organizers themselves and only within the framework of the designated topic. However, depending on the goals and topics, sometimes a briefing “may be entirely devoted to answering quick questions from journalists, since there is no presentation

part in it. Before communicating with the press, a short – no more than 10–15 minutes – speech of one or more - The entire event is held standing. A press conference is a meeting of representatives of government agencies, socio-political organizations, commercial structures with journalists with the aim of informing the public on current issues of a certain topic, as well as attracting attention to the solution of a problem. Like any working event for journalists, organizing and holding a press conference includes three stages: preparatory, holding a press conference and the final stage, during which the results are summed up. At each of these stages, PR employees or the coordinator for briefings and press conferences have to carry out a number of steps, which determine how fully the goals of the event will be achieved. The work of the Public Relations Service of the Ministry of Foreign Affairs is not limited to the activities listed above. Other actions can also be very productive and mutually interesting, for example, holding presentations, round tables, thematic seminars, informal meetings, etc. At the same time, it is crucial. As a rule, they have a well-thought-out theme of the event, the composition of invited participants, the novelty of the information offered to journalists, and the level of possible business contacts that will ensure journalists' participation in such events. While writing the article, we learned that the press service of the Ministry of Foreign Affairs of Uzbekistan not only cooperates with the media, but is often forced to place advertisements in publications with warnings about the inadmissibility of unverified information on the pages of newspapers and magazines. Broadcast on radio stations and TV channels. Thus, on May 6, 2022, the press service of the Ministry of Foreign Affairs of the Republic of Uzbekistan published a statement about provocations in its Telegram channel. The statement said that many foreign publications continue to unreasonably replicate implausible information, as well as quote leaders of different countries on the topic related to the expansion of various Unions and the accession of our Republic to them. "The Ministry of Foreign Affairs notes the inadmissibility of such statements, which could lead to the destruction of Uzbekistan's friendly relations with foreign partners. The Ministry of Foreign Affairs declares that our state pursues exceptional goals of independent development and will continue to firmly follow this path to preserve our independence," writes the press service of the Foreign Ministry of the Republic of Uzbekistan. Often the press service of the Ministry of Foreign Affairs of the Republic of Uzbekistan publishes video reports from official meetings of representatives of the Ministry of Foreign Affairs of the Republic of Uzbekistan with foreign diplomats.² Thus, on May 12, 2023, Deputy Minister of Foreign Affairs of the Republic of Uzbekistan Bahromjon Aloev held negotiations via videoconference with Deputy Minister of Foreign Affairs of India Sanjay Verma. A video report from this meeting was posted on the Foreign Ministry's Instagram page.³

Thus, the main task of the press service of the Ministry of Foreign Affairs of the Republic of Uzbekistan is to make every effort to maintain negotiation platforms and to find compromise options for resolving contradictions between strategic partners.

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Rezyume: *Maqolada muallif O'zbekiston Tashqi ishlar vazirligining PR xizmati faoliyati, uning ustuvor vazifalari, maqsadlari va O'zbekiston Respublikasi Prezidentining Farmonida belgilangan huquqiy asoslarini o'rganadi.*

Резюме: *В статье автор рассматривает деятельность PR службы МИДа Узбекистана, ее приоритетные задачи, цели и правовые основы установленные Указом Президента Республики Узбекистан.*

Kalit so'zlar: *Tashqi ishlar vazirligi, PR, OAV, matbuot anjumani, brifing, matbuot kotibi*

Ключевые слова: *МИД, PR, СМИ, пресс-конференция, брифинг, пресс-секретарь*

MORPHOLOGICAL AND MORPHOGENETIC CHARACTERISTICS OF BARREN-MEADOW SOILS DISTRIBUTED ON THE RIGHT BANK OF THE LOWER AMUDARYA IN THE PROCESS OF CLIMATE CHANGE

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Summary: *The article describes the morphological structure and morphogenetic characteristics of the irrigated barren-pasture soils in the Bozatou massif of Chimboy district today in the process of climate change. As a result of sudden changes in the global climate in the studied area, in the last decade compared to 1990-2000, there was an increase in air temperature, a decrease in the amount of precipitation, and an increase in the processes of soil degradation and drought. This situation was manifested during field research when recording the morphogenetic characteristics of soil sections.*

Key words: *irrigated barren-pasture soils, morphological and morphogenetic characteristics, mechanical composition, climatic conditions, precipitation amount, air temperature, relative air humidity, soil temperature and wind.*

Introduction

Currently, about 2 billion hectares of land in the world, i.e. 23% of usable land, are subject to desertification and degradation processes (GEF, UNEP). The following widespread types of soil degradation are distinguished: technological (as a result of long-term use) - soil erosion (washing away); salting and brining; swamping; contamination; desertion. The total degraded land area in Uzbekistan is 70%, and 9.6% of the irrigated lands are in poor condition [1].

Climate change is a rapid and rapidly changing process. In recent years, we can see significant climate change. In particular, as a result of the sudden warming of the air temperature, the water evaporation coefficient increases and the water resources in the regions decrease, as a result, the number of days without precipitation increases throughout the year. Due to the decrease in moisture in the soil, the danger of repeated droughts is increasing, as a result, the productivity indicators are falling. The reduction of the water volume in the Aral Sea is increasing the desertification of the river delta and the emergence of new desert areas on the bottom of the dry sea, and we can observe the increase of dust in the atmospheric air. Events such as global climate change are causing the death of agricultural products and orchards, and the deterioration of soil composition. In order to prevent this, we should study the physical, physico-chemical properties of soils and evaluate and predict which direction they will change in the coming years. Formation and development of irrigated soils to date, determination of changes in them under the influence of long-term agricultural use, general characteristics, morphological and morphogenetic structure, maintenance of soil condition today and increase of soil productivity, qualitative assessment and prediction, the prevention of negative processes affecting productivity are among the current scientific researches. Many researchers have conducted scientific work on this. M.M. Toshkozyev [2], M.Y. Saidova [3], A.J. Ismanov [4], A.U. Akhmedov [5] on the chemical, physical-chemical, agrochemical, agrophysical, genetic-geographic and biological properties of the main soils of the Republic of Karakalpakstan., R.Q. Kurvontoyev [6], L. Tursunov [7] and other scientists.

Research object and methods

Old and newly irrigated barren-meadow soils, widely distributed in the Bozatou massif of the Chimboy district on the right bank of the Lower Amudarya, are the object of research.

Generally accepted genetic-geographical, profile-geicmic methods were used in the research [8]. The methodical basis of the conducted monitoring studies is geochemical, chemical-geographical, laboratory-analytical analysis methods published in our Republic [9]. Soil morphology research methods [10] were used. The methods of Climatology [11] were used in the analysis of climate data.

The obtained results and their analysis

During our field research, as a result of the research conducted on the study of the morphogenetic characteristics of barren grassland soils, which are widespread in the Bozatou massif of Chimboy district, it was found that the genetic structure of these soils is primarily related to the regime of the river beds in which they were formed, as well as the terrain of the area, the characteristics of soil-forming rocks, vegetation it was known that it is closely related to the cover, climatic conditions, depth of seepage waters and salinity levels. The high level of underground water excessively moistens the lower parts of the soil, causes anaerobic conditions, the development of oxidation-reduction processes, the formation of rust compounds of iron, aluminum, manganese, therefore, when we took soil sections, we saw rust compounds in the lower layers, and the underground water together with dissolved salts we observed that standing allowed the development of the secondary salinization process. Compared with previous years, we noticed that today, as a result of climate change, salts and mineral crystals remained in the upper layer of the section and did not wash down.

Climate. The climate and natural conditions of the Republic of Karakalpakstan, the processes of soil formation are unique, the climate changes dramatically. The climate and nature of Karakalpakstan has its own characteristics. Being thousands of kilometers away from the oceans and seas allows it to be included in the ranks of typical continental countries. Hot summers and cold winters, daily weather changes, low rainfall and dry air are the main characteristics of the climate of the Republic. These features of the climate depend on the geographical location of the territory of the Republic of Karakalpakstan, the incidence of sunlight (solar radiation) and the structure of the earth's surface. Sudden changes in climate and low humidity lead to high evaporation. Throughout the year, the wind blows mostly in the north-east direction. A strong wind brings soil and salt marshes in the Amudarya riverbed, high temperature, low humus content, soil salinity and corbanate level have a negative effect on the productivity of agricultural crops. Depending on the wind speed, the Republic of Karakalpakstan is divided into four regions; weak wind (5 m/s), partly active wind (5 m/s), active wind (10-15 m/s), very active wind (above 15 m/s). The Republic of Karakalpakstan is located in a partially active region, and the average annual wind speed is 5.2 m/s. Due to the rapid development of the desertification of the Aral Sea and the sharp increase in climate, the level of soil fertility is decreasing. Chimboy district is located in the northern part of the Republic of Karakalpakstan. The district is bordered by Kongirot district in the north, Karaozak district in the east, Kegeili district in the southwest and north-west. [12].

Average long-term indicators of Chimboy metrological station

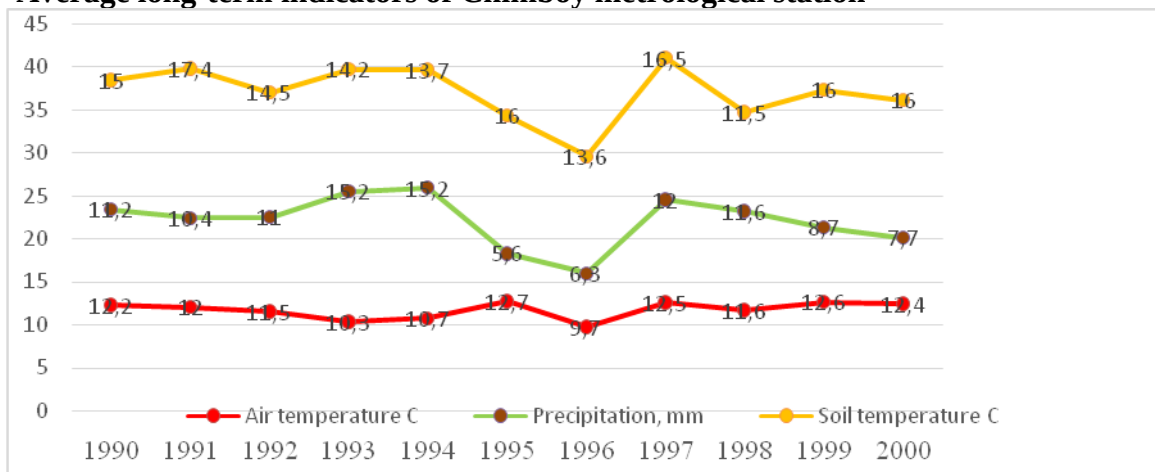


Figure 1. Climate data for the period 1990-2000.

According to the data obtained from Uzgidromed, the average annual rainfall was 10.4 mm between 1990 and 2000, and an average of 9.4 mm was observed between 2012 and 2022. It showed

that air temperature was 10.9 on average in 1990-2000 and 11.6 on average in 2012-2022, soil temperature was 13.3 in previous years, and 15 in last 10 years.

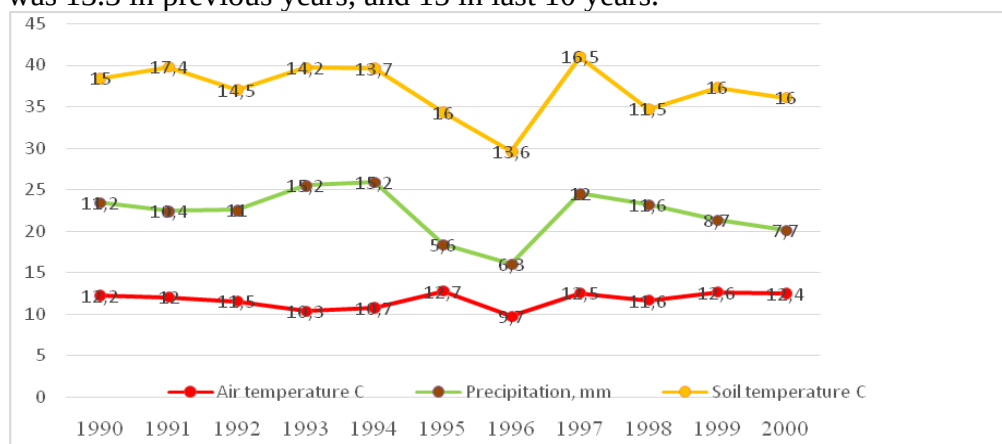


Figure 1. Climate data for the period 2012-2022.

As can be seen from the above results, we can see that the amount of precipitation has decreased by 1 mm, the air temperature has increased by 0.7 and the soil temperature by 1.7.

Sudden climate change leads to a decrease in soil fertility, a sudden warming of the air in the summer months, and abnormally cold weather in the winter months shows its effect on the soil. The problem of climate change is becoming more urgent every year.

In addition to global warming, it is observed that the rainfall is uneven, there is dryness, and sometimes there is an increase in rainfall and flooding of the areas. When we compare today with previous years, we can see that the air temperature, relative humidity and amount of precipitation have changed.

Irrigated barren-meadow soils. Which underwent the process of desertification in ancient times, are scattered in small areas on the ancient surface of the Amudarya delta in the remote parts of the oases of Kungiro, Chimboy, Takhtakopir and Qonlikol districts. Groundwater 2-3 m. oscillating between Barren soils have previously passed the hydromorphic stage during evolutionary development, and they still have residual signs of hydromorphism, and now this process is developing rapidly. Oxidation-reduction processes are activated in the lower part of the section. According to the mesanic composition, the soil section is sharply layered and uneven: from heavy loam and clay to sandy loam, the arable layer of 27-30 cm is mainly heavy and medium loam, rarely light loam and loam. In soils with a mechanical composition of heavy sand, an 8-10 cm thick compacted subsoil layer was formed. In the lower part of the section, there are signs of old and increasing hydromorphism in the form of rust-brown spots. The soil sareweak and moderately saline [13].

Section 2: Bozatau massif, Chimboy district, Republic of Karakalpakstan, modern delta of Amudarya, consisting of irrigated barren-pasture soil, alluvial deposits. Berdiev T.T., Aytmuratova G.U. 16.05.2023

0-28 cm. Gray, the surface of the soil towards the dry well, light sandy, moderately compacted coarse-grained structure, the middle layers of the soil are covered with white spots, there are many salt crystals in the layer, the remains of half-decayed plants are found between the layers, there are roots of large reeds and sedges and traces of insects. according to the composition of the layering mechanics.

28-49 cm. The soil layer is dark gray, dry, light sandy, medium-grained (lumpy), moderately compacted, traces of subterranean animals are scattered downwards, roots of reeds and roots of half-rotted reeds grow, there are salt crystals, depending on the mechanics and color of the transition to the upper layer.

49-70 cm. Yellowish, soil layer is dry, slightly sandy, granular, strongly compacted, semi-rotted veins of plants are rare, traces of insects are rare, distinguished by color.

70-93 cm. The soil layer is yellowish, dry, medium-sandy, tile-like, with few plant roots and few traces of underground animals, distinguished by its mechanics and color.

93-112 cm. The soil layer is yellowish, dry, medium sandy, plate-like, traces of plant roots and insects are rare, strongly compacted, and can be distinguished depending on the mechanics.

112-160 cm. Yellowish-gray, soil layer is dry, sandy and sandy plant roots and traces of insects are present, it is moderately compacted, separated according to its mechanical composition, seepage water is located deep.

As a result of the studies, we can see that in previous years, seepage water came from 1.5-2 meters, but today we can see seepage water at 2.5-3 meters, and with it, traces of plant remains and underground insects. little observed. Soils are compacted.

Table

Morphogenetic indicators of irrigated soils of Bozatau massif, Chimboy district

№ Section	Soil Description	Humus layer thickness sm				Threshold for initiation of new lesions		Starting level of Sizot waters (m)	The mechanical compositio n of the arable layer A	Driving layer color
		A _x	1	2	A+B ₁ +B ₂	Carbonate	laster			
2	Bozatau massif, Chimboy district, former irrigated barren meadow	28	1	1	160	-	-	2,5-3,0	medium	Gray
3	Bozatau massif, Chimboy district, former irrigated barren meadow	31	6	4	141	-		2,5-3	medium	Yellowis h gray
4	Bozatau massif, Chimboy district, former irrigated barren meadow	24	5	2	200	-		2,5-3	Light	Dark gray

Conclusion

According to the results of the study, we can see that in recent years, as a result of climate change, excessive precipitation is expected in a few days, which is equivalent to monthly or quarterly precipitation, and as a result of this, the soil physical , has a negative effect on water-physical properties.

In particular, the decrease of precipitation over the years affects the decrease of moisture in the soil and, as a result, the decrease of microorganisms, the burning of plant roots and traces of insects, the violation of the granularity of the soil, its densification, in addition to this, the beginning of the dehumification processes in the soil, the burning of the landscape, the accumulation of dust As a result of rising and falling to another place, the occurrence of secondary salinization processes in the soil and wind erosion of the soil. The increase in air temperature causes the death of plants and insects.

If we compare the soil morphology with the previous years, we have observed that seepage waters fall to the lower layer, where the level of seepage waters was 1.5-2 m in previous years, but by today it has decreased to 2.5-3 m.

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Rezyume: Maqolada bugungi kunda iqlim o'zgarishi jarayonida Chimboy tumani Bozatou massividagi sug'oriladigan taqir-otloqi tuproqlarning morfologik tuzilishi va morfogenetik xususiyatlari haqida yoritilib berilgan. O'rganilgan hududda global iqlimning keskin o'zgarishi natijasida 1990-2000 yillarga nisbatan so'nggi o'n yillikda havo haroratini ortishi, yogin miqdorini kamayishi va nomutanosib yog'ishi tuproqlarda qurg'oqchilik, degradatsiya jarayonlarining ortishi kuzatildi. Bu holat dala tadqiqotlari davrida tuproq kesmalarini morfogenetik belgilarini yozib borishda namoyon bo'ldi.

Резюме: В статье описаны морфологическая структура и морфогенетические характеристики орошаемых бесплодно-пастбищных почв Бозатууского массива Чимбойского района сегодня в условиях изменения климата. В результате резких изменений глобального климата на исследуемой территории в последнее десятилетие по сравнению с 1990-2000 гг. произошло повышение температуры воздуха, уменьшение количества осадков, усиление процессов деградации почв. и засуха. Такая ситуация проявилась в ходе полевых исследований при регистрации морфогенетических признаков почвенных разрезов.

Kalit so'zlar: sug'oriladigan taqir-otloqi tuproqlar, morfologik va morfogenetik xususiyatlar, mexanik tarkibi, iqlim sharoitlari, yog'in mug'dori, havo harorati, havoning nisbiy namligi, tuproq harorati va shamol.

Ключевые слова: орошаемые такыр-пастбищные почвы, морфологическая и морфогенетическая характеристика, механический состав, климатические условия, осадки, температура воздуха, относительная влажность, температура почвы и ветер.

THE ROLE OF DESERTIFICATION IN CLIMATE CHANGE

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Summary: *In the article the climatic are examined the forsings of dephorestization and drying out of large salt reservoirs. First the convective bearing-out of the heated particles of soil is presented as a factor of rise in temperature of regional climate. The conceptual model of influence of desertization is expounded on the change of regional climatic descriptions.*

Keywords: *desertification, Aral Sea region, climate change.*

Soil desertification is an urgent ecological problem of our time. Every year our planet loses 12 million hectares of land, and the global forest cover is reduced by 13 million hectares (Fig.1, 2, 3, 4).



Fig.1 Deforestation of North America [1].

The UN considers desertification not as a process of desert formation, but as any land degradation under the influence of natural or anthropogenic factors. The processes of soil degradation cover 95% of the territory of a country such as Swaziland, more than half of the territories of Angola, Gabon, Thailand, Zambia. The Sahel area, covering 27 countries, has undergone extremely rapid desertification. About 166 million hectares of land in the Sahel, which were previously covered with forests and meadows, degraded during the XX century. [2]

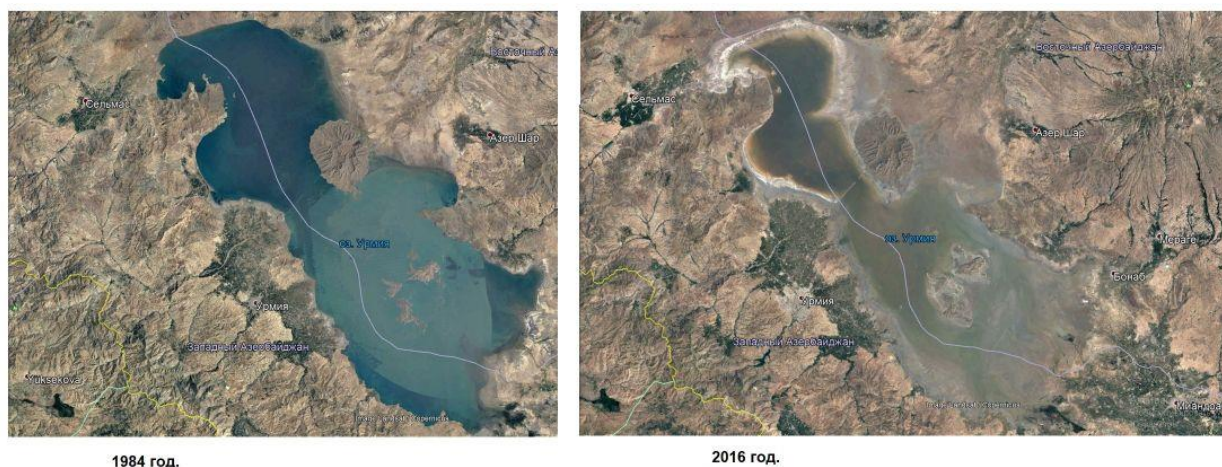


Fig.2 Lake Urmia is a drainless salt lake in the north-west of Iran, shallowed by more than 70% [3].

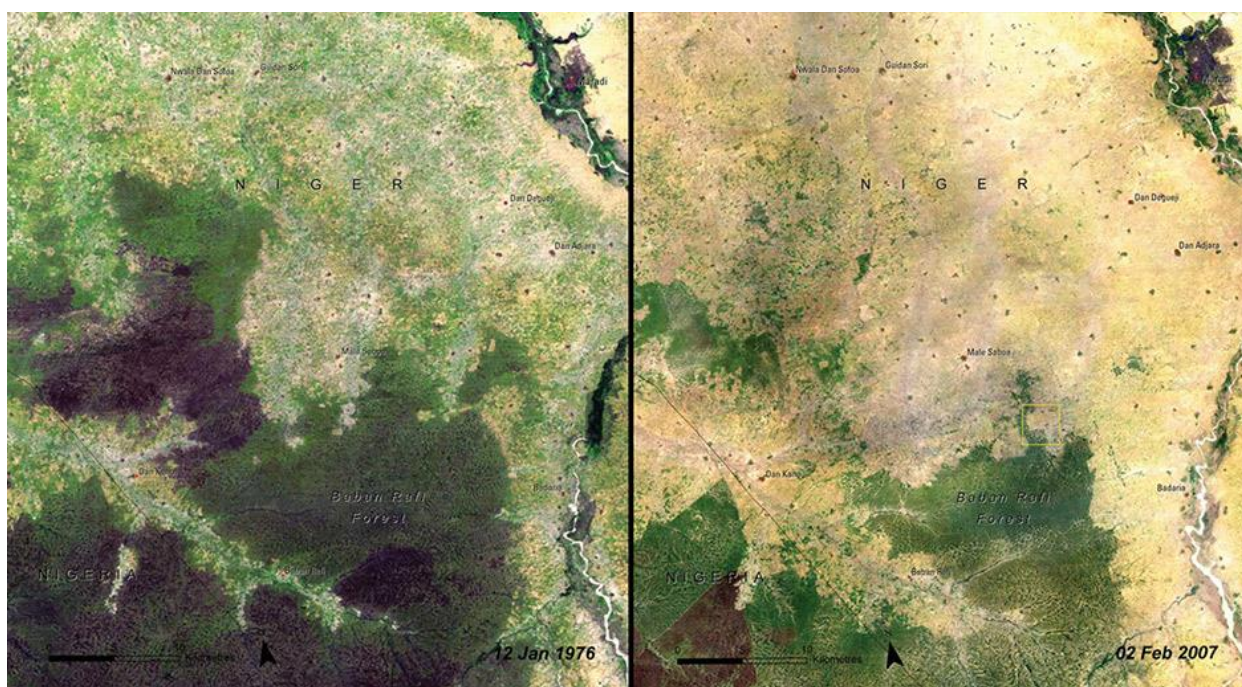


Fig.3.Baban Rafi Forest (Nigeria) in 1976 and 2007 [3].

Central Asia is a classic example of an arid and subarid region characterized by serious desertification problems. Nowhere at present is there an entire region with an area of more than four million square kilometers that faces a greater threat from desertification than the region between the Caspian Sea and the Pamirs.

Central Asia is one of the regions most vulnerable to climate change. According to climate forecasts, a noticeable increase in temperature (up to 2-4 degrees), uneven distribution of precipitation, intensive melting of glaciers – all this will lead to an increase in the desertification process in the long term. [4]

An example of desertification due to water balance disturbance is the drained bottom of the Aral Sea, formed under the influence of insufficient intake of surface runoff volume along the Syrdarya and Amudarya rivers. Due to the shortage of water resources within the Aral Sea basin, more than 200-250 small and medium-sized lakes and reservoirs were drained. The Aral Sea lost 85% of its water surface

as a result of increased irrigation of the rivers feeding it, as a result, the Aralkum desert was formed on the site of the former seabed. The microclimate of the region also changed in the direction of increasing continentality, which accelerated the erosion of coastal lands (Fig.4).[5]

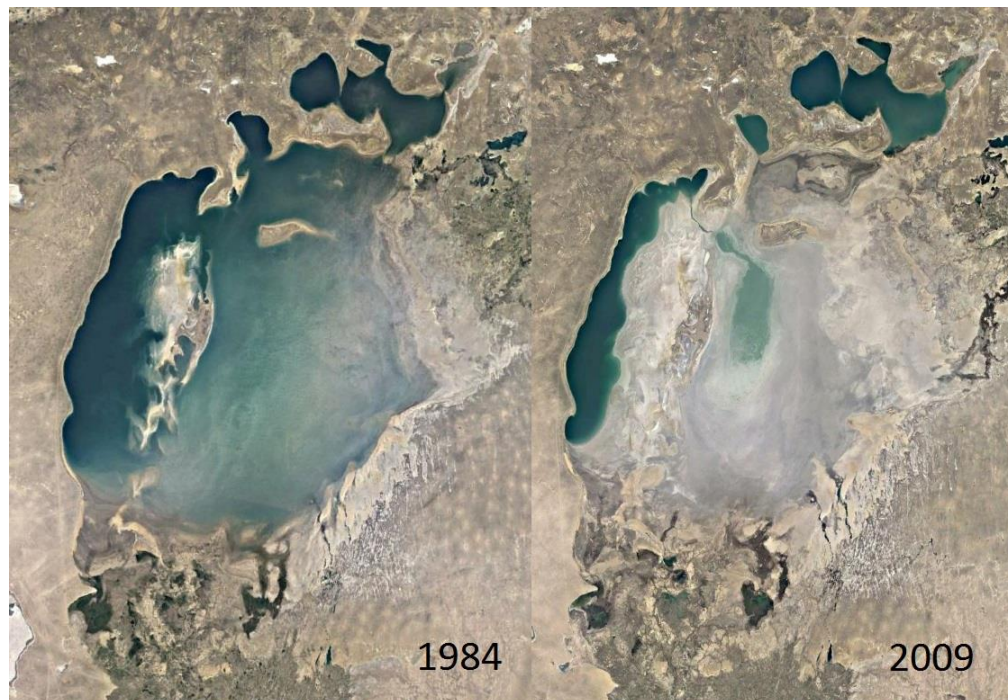


Fig.4 Transformation of the Aral Sea[3]

Desertification is synergistically linked to climate change, as there is an interaction between these two processes. The deserts of the world that have existed for thousands of years were formed as a result of climate change, so in this case we can talk about a direct genetic and causal relationship. There is also an inverse positive relationship, i.e. desertification increases aridity and climate warming. Desertification is a large-scale change in the underlying surface, which is the most important component of the climate system. Such cardinal changes in the landscape as the change of the water surface to land (drying of the Aral Sea), degradation of vegetation cover significantly change the climate-forming characteristics of the underlying surface (albedo, evapotranspiration, heat exchange). The nature of climate change depends on the type of desertification, of which there are about nine.[6] Our study examines the impact of two types of desertification on climate warming: 1) deforestation, i.e. the ecological situation depicted in Figures 1 and 3; 2) drainage of closed salt reservoirs (on the example of the Aral Sea).

The mechanism of influence of deforestation on the climate has three components: 1) degradation of vegetation cover, expressed in a reduction of the projective cover, 2) convective removal of soil aerosol, 3) wind removal of aerosol during dust storms. Thus, the change in summer (for middle latitudes) and average annual (for subtropics and tropics) air temperatures during deforestation is equal to:

$$\Delta T = \Delta T_p + \Delta T_c + \Delta T_w$$

where ΔT_p , ΔT_c , ΔT_w are the contributions to the temperature change of the 1,2,3 component, respectively. For example, for the north-east of Nigeria (Fig.3), ΔT_p is equal to the difference in air temperatures with a projective coating of 0.8 in 1976 and 0.1 in 2007, determined by the empirical formula [7]:

The effect of convective removal of soil aerosol on climate is considered in this paper for the first time. A two-block model has been developed to assess this effect. The 1st block is a modification

of the model [8] and is used to calculate the convective removal of soil particles depending on the temperature of the underlying surface. The 2nd block is designed to calculate the heat exchange of suspended submicron heated soil particles with ambient air and is a simplified version of the model given in [9].

To assess the forcing of dust storms, the results obtained in [7, 10] are used. ΔT_b has a negative value, since the mass of soil aerosol in the atmosphere, increasing the optical thickness, reduces the surface air temperature to 5-6°C, besides, high wind speed contributes to the cooling of the near-surface layer of the atmosphere.

The mechanism of influence of the 2nd type of desertification on the climate also has three components, with the difference that deforestation is replaced by the opposite process – partial overgrowth of the dried bottom for 3-5 years of drainage by halophytes. Remote sensing data processed by the LpSquare program is used to assess the degree of both deforestation and overgrowth. As for the 3rd component, in addition to dust (more precisely, in this case salt-dust) storms, the wind removal of salts at lower wind speeds (5-10 m/s) is considered, and the aerosol radiation effect is also taken into account.

The model can be applied in further studies to assess the contribution of desertification to global warming.

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Rezyume: Maqolada daraxtlarni uzliksiz kesish va katta tuzli ko'llarni qurishining iqlimga ta'siri qaraladi. Qizdirilgan tuproq zarralarini konvektiv ravishda ko'chishi mintaqaviy iqlim isishi omili bo'lishi birinchi marta isbotlanadi. Cho'llanishning mintaqaviy iqlim xususiyatlarining o'zgarishiga ta'sirining kontseptual modeli berilgan.

Резюме: В статье рассматриваются климатические форсинги дефорестизации и высыхания больших соленых водоемов. Впервые конвективный вынос нагретых частиц почвы представлен как фактор потепления регионального климата. Изложена концептуальная модель влияния опустынивания на изменение региональных климатических характеристик.

Kalit so'zlar: cho'llanish, Orolbo'yi, iqlim o'zgarishi

Ключевые слова: опустынивание, Приаралье, изменение климата.

ORGANIZING AND INITIATING PRIMARY SEEDING OF PROSPECTIVE WINTER SOFT WHEAT VARIETY "SHORTANBAY-1" IN KARAKALPAKSTAN."

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Summary: *In this article, it is said that the Shortanbay-1 variety of autumn soft wheat, which has high productivity and bread-making characteristics suitable for different soil and climate conditions of our republic, is produced on the basis of the establishment of the primary seed breeding system on a scientific basis, and it is ensured that high-yielding (original) seeds are grown and delivered to farms specializing in seed production.*

Keywords: *Winter soft wheat, plant, cultivar, nursery, typical family, quality, primary seed, original seed, selection, growth, development, phenology, cultivar purity, yield*

Introduction. Wheat (*Triticum aestivum* L) is the main crop that ensures food security in the world and is grown on the largest area. Wheat accounts for 40% of the world's daily food intake. To feed a growing world population, experts estimate that food production will need to increase by 60% by 2050, largely due to existing arable land and global climate change.

According to the UN and FAO data, in the following years, all grain-growing northern regions are affected by frost and the productivity indicators in saline lands are sharply decreasing. It is known that the level of salinity of land is increasing in recent years. Of course, in such cases, it is important to create salt-resistant varieties along with washing the land's salt.

In the Republic of Karakalpakstan, as a result of extremely cold and dry winter, the air temperature drops to -30 degrees, in some years there are cases of partial death of autumn grain crops. Therefore, the organization of their primary seeding in order to create local varieties of winter wheat that are resistant to cold, early, resistant to heat, drought and diseases, with a high yield and high grain quality, and to rapidly introduce them to its production, is one of the problems waiting to be solved.

In the Strategy of Actions for the further development of the Republic of Uzbekistan, the issue of "modernization of agriculture, creation and production of new selective varieties of agricultural crops and varieties with high productivity, resistant to diseases and pests" is specifically indicated. Therefore, it is possible to increase the yield and increase the export potential through the creation of the Shortanbay-1 variety of mirror wheat, which is resistant to diseases and environmental stress factors.

Creation of new, early-ripening, local varieties of winter wheat with high baking properties in our republic, acceleration of ecological testing of them in different soil and climate conditions of our republic, and establishment of a primary seed system of local varieties planted on the basis of scientific basis of primary seed production system, high-generation production of seeds at low prices, economy of our currency is one of the most urgent tasks of today.

It is finding its solution by ensuring food safety, choosing varieties resistant to different levels of salinity, rational placement of varieties and improving agrotechnology of cultivation, increasing the yield of winter wheat, improving grain quality and organizing seed production.

Classification of soil and climate conditions of the experimental area

The Republic of Karakalpakstan is geographically located in the north of Uzbekistan, and most of the cultivated area consists of moderately and strongly saline alluvial soils [Ismaylov U.E. et al., 2007].

The Republic of Karakalpakstan is one of the largest regions in Uzbekistan in terms of land resources, occupying 39% of its territory. 14% of it is suitable for farming.

The slope of the land in the lowland area of Amudarya is 0.1-0.2 meters. The depth of underground seepage water is about 3 meters, and in the summer months, as a result of irrigation of the

fields, it is filtered and this indicator is about 1.5-2.0 meters. The mineralization of groundwater is in the range of 1.3-3.2 g/l.

The climate of our republic is sharply continental and dry. During the summer months, the weather is constantly clear, the temperature changes dramatically during the day, and the air is very dry. The winter season is somewhat colder than other regions of Uzbekistan, because the cold wind from the north reaches this region without hesitation.

Due to the location of the territory of the republic in the arid zone, the terrain is flat, and there are many natural obstacles that prevent the winds. Therefore, the winter is cold due to the burden of the cold air masses, and the growing season is short due to the fact that the effective temperature necessary for the normal growth of spring crops is small.

In our area, there are no natural barriers to protect against the constant blowing winds that bring severe winter frosts, and there is little snow cover to protect the winter wheat plants from the winter cold.

In our republic, the average year-round temperature is 9.8-10.8 degrees, and the average monthly air temperature is above +20 degrees. In July, the air temperature is abnormally hot (47-52°C) in some years, and in some years the minimum temperature can drop to -32°C in winter.

Compared to other regions of Uzbekistan, the average daily air temperature +10 is higher, the period between spring and autumn is not enough for the growth and development of grain and other crops in our Karakalpakstan.

From the first ten days of April to the middle of October, the useful effective temperature will be extended from 196 days to 201 days. Duration of hot days corresponds to 175 days (Table 1.).

The time when the average daily air temperature does not exceed +10°C in spring and autumn. Data from weather stations in Karakalpakstan

Table 1.

Weather stations	Average daily temperature passing through +10		The length of the period is in days	Amount of useful temperature C
	Spring	Autumn		
Muynoq	21 / IB	11 / x	175	1937
Qungirot	10 / IB	14 / x	186	1902
Chimboy	8 / IB	14 / x	188	1958
Nukus	6 / IB	16 / x	192	2147
Turtkul	1 / IB	20 / x	201	2385

Average annual rainfall varies in different parts of the delta: 80 mm in the southern districts and 110 mm in the northern districts. Snowfall is not constant, in some years it does not fall at all. The time of precipitation and snow falls in spring and autumn.

Due to the high heat in summer, the amount of precipitation falling on the surface of the earth is several times greater than the amount of their evaporation from the surface of the earth.

Therefore, farming in these areas depends on irrigation methods and regimes.

The average length of days for the favorable temperatures necessary for the growth and development of plants is 200-210 days.

Research object

The creation and introduction of winter soft wheat varieties into production requires many years of work. Creation and introduction of newly created wheat varieties into production leads to further improvement of grain yield and baking quality of grain.

The Shortanbay-1 variety is suitable for the northern regions of our republic, the Republic of Karakalpakstan and the Khorezm region, and it was regionalized and included in the state list in 2020 because it showed that it is possible to get a high yield in the conditions of these regions.

The Shortanbay-1 variety was created by reciprocal crossing of the Yanbash and Kupova varieties.

This variety is medium-early, the growing period is 235-246 days, the plant is resistant to dormancy. The head is cylindrical, large. The species is lutescens.

Spike shell is egg-shaped, the teeth are straight and short. The grain is large, red in color, and elongated in shape. The grain seam is of medium depth. Potential grain yield is high, 85-90 centners. Resistant to cold, salt and drought. The weight of 1000 pieces of grain is 39-41 gr. Depending on the cultivation technology, it gives strong and "expensive" grain. Resistant to powdery mildew, black moth, yellow rust. Resistant to brown rust disease in the field.

Moderately resistant to stem rust and septoria diseases. The rate of planting is 4.5-5.0 million, depending on the period of planting. one grain is due to the germinal seed.

• **Brief description of the "Shortanbay-1" variety of soft winter wheat.**

• **The origin of the autumn soft wheat "Shortanbay-1" variety**

♀ Yanbash x ♂ Kupova hybridization in combination	2003 year
F ₂ Single selection	2005 year
Breeding nursery	2006 year
Control nursery	2008 year
Shortanbay-1navi Competitive variety testing nursery	2009-2011 year
Shortanbay-1navi submitted to DNS	2016 year
Shortanbay-1 DNS	2016-2018 year

The "Shortanbay-1" variety was created at the Karakalpakstan scientific-experimental station of the Research Institute of Cereals and Legumes (previous name).

Origin: created by individual selection from ♀Yanbash x Kupova♂ hybrid combination.

The grain is red, long-oval, medium-sized, shiny, does not shed, weight of 1000 grains is 40.5 g, grain volume weight is 791-797 g/l. The protein content of the grain is 17.6%, the gluten content is 30.0%, the gloss is 90.0%, and the quality of the bread is good (Table 2.).

Valuable economic and biological properties of Shortanbay-1 variety

Table 2.

Indicators	Unit of measure	Shortanbay-1		
		2017	2018	2019
Productivity	c/a	51,9	51,8	59,8
Agroecological variety testing	c/ga	50,3	61,6	52,1
The nature of the grain	g/l	786	791	797
1000 grain weight	Gr	39,4	40,0	42,0
Grain luster	%	90	89	90
Gluten	%	30,0	29,3	30,7
Protein	%	17,4	17,3	18,1
Ripening day	day	239	234	239
Plant height	Sm	73,0	75,0	70,0
Resistance to lying down	Ball	5	5	5
Coefficient of accumulation	Piece	2,8	3,3	3,0
The number of grains in one spike	Piece	38,0	32,0	35,0

Agrobiological description. The height of the plant is 70.0-75.0 cm, strong, lodging-resistant, leaves of medium length, green, hairless. It is well packed, the stem is straight. The variety is resistant to early, dry heat, frost, winter frost, yellow and brown rust diseases. Productivity is 51.8-59.8 tons/ha.

Biological characteristics of the variety. It belongs to the genus *Lutescens* (AL), the biological lifestyle is autumn, the ear is cylindrical, the color is white, the length of the ear is 8-10 cm, the number of grains in the ear is 46.4-48.6, without axils, the ear shell is hairless, egg-shaped, the length is 15- 20 mm, width 5-6 mm, shoulder straight, slightly raised, spike tip slightly curved.

Planting rate. 4.5-5.0 million per hectare. determined on the basis of one germinating seed.

Planting period. The second ten days of September is the first ten days of October.

Nutrition. Before plowing, 90 kg of phosphorus and 60 kg of potash fertilizers per hectare are fed, 100 kg during the first feeding period, and 110-150 kg of nitrogen fertilizers during the second feeding period.

Results of the research conducted on the Shortanbay-1 variety of winter wheat

Today, in the main grain fields of our republic, the weight of varieties belonging to Krasnodar selection is 60-65 percent, and the weight of local varieties is 35-40 percent. Some of the high-generation super-elite, elite breeds of foreign varieties grown in our republic are prepared at the institute, and most of them are brought from the Krasnodar region at high prices for foreign exchange.

When we conducted phenological observations and analyzed shortanbay-1 short wheat wheat in the first year of the test incubator, the average ripening time was 237 days on June 16. In some months, this indicator varied until June 25. Based on the changes in the phases of the growing season, the plants in this month were taken out, reaped by slaves, and brought to the edge of the field, and they were renewed into commercial grain.

The germination phase of wheat is important for the crop, because it is during this phase that the activity of the rhizome declines and the main root system is formed. In general, in the field of agricultural farming, wheat varieties that are biologically faster provide an opportunity to intensify farming in different soil and climate conditions of our country.

The following phases of development were determined (germination, budding, earing and ripening).

The results of research on phenological monitoring of promising winter wheat variety Shortanbay-1 are given in table 3.

Results of phenological observation of promising winter wheat variety Shortanbay-1

Table 3.

	Days					
Planting	Full germination	Tumble	Spring Awakening	Spike	Ripe (full)	Vegetation period
30.09.2020	7	20	135	46	32	240
28.09.2021	7	17	133	42	30	234

From the data in table 3. we can see that the duration of the growing season according to the phenological observations in the nursery of the first year of the trial of the variety corresponded to the main characteristics of the Shortanbay-1 variety in terms of phases.

One of the main factors affecting the yield of the Shortanbay-1 variety of winter wheat is complete germination. Based on this, the germination density of the Shortanbay-1 variety of winter wheat in the experimental plot was determined (Table 4.).

The growth potential of the promising winter wheat variety Shortanbay-1 was determined in the periods of full germination, spring awakening and storage until harvest. The obtained results

showed that during the period of full growth, the variety's density was 287 plants per 1 sq.m. during 2 years, while the number of plants decreased by 24 plants per 1 sq.m. during the spring revival period. on the field was 263 units. Frost resistance was 95.4%.

Breeding of plants in families in the first-year test incubator of promising winter wheat variety Shortanbay-1

Table- 4.

Years	Plants in families, units/sq.m.			of plants retention rate, %
	Plants in families, units/sq.m	Wake up to spring awakening	Before harvest	
2021	278	254	223	95,2
2022	297	272	252	95,6
Average	287	263	237	95,4

The results of the analysis of the growth height of the plant and the accumulation of above-ground dry mass of the plant for 2 years on the promising Shortanbay-1 variety of winter wheat are given in Table 5.

Dry matter accumulation and growth dynamics in the above-ground part of the promising winter wheat variety Shortanbay-1

Table-5.

Years	Plant height according to growth phases, cm		Weight of one plant, g.	
	Spring awakening phase	Tubing	A period of spring awakening	Tubing
2021	20,1	78,1	0,34	9,0
2022	18,7	74,6	0,29	9,8
Average	19,4	76,3	0,32	9,4

In table 5 the height of the plant in the spring awakening phase is 19.4 cm, and by the germination phase, this indicator has increased to 76.3 cm.

Accumulation of protective substances in the above-ground organs of the plant is 0.32 g in the spring awakening phase. increased to 9.4 grams.

During the morphovisual evaluation of the promising shortanbay-1 variety of winter wheat from the stage of earing to the full ripening phase, all the morphological characters of the variety corresponded to the basic characteristics of the variety. Before the harvest period, some differences were detected in the spikes in the lateral tubers of wheat, so they were considered non-typical and discarded (Table 6). The experiment was conducted on an area of 0.29 hectares.

Analyzing the data in the table, we can say that 37.5 families were evicted during two years. The main reason for this is that in some families, due to the small number of plants, the typical undeveloped lateral branches, which are not fully perfected and sprouted, did not ripen at the same time, resulting in the appearance of seeds of different quality. Therefore, non-typical families were excluded.

Results of release work on the promising Shortanbay-1 variety of winter wheat

Table-6.

Years	Number of months planted	Number of months of absence	Number of months remaining	Productivity, c/ga
2021	800	48	772	54,1

2022	800	27	783	58,6
average	800	37,5	777	56,3

Non-varietal families were hand-harvested, removed to the edge of the field, and cleaned. The seeds of the rest of the fields were collected and harvested, and 1700 kg of high-quality original seeds were grown. They were cleaned, put in bags, stored, planted in the breeding ground for the 2023 harvest, and are currently being cared for.

Before harvesting, the next year's progeny were selected for biometric analysis from the super-elite boosters to establish the first-year booster. Based on the characteristics of the least variability, plants that correspond to the description of the variety were drawn up and selected, and violent first-year test plots were established and planted. Grasses germinated evenly during the experimental periods.

According to plant height indicators, it was 81.5 cm on average, from 78.4 cm in 2021 to 84.6 cm in 2022.

It was observed that the "sowing-germination" period of wheat samples varies by 1-3 days depending on the average daily temperature in the autumn months.

Conclusions

In the conditions of the Republic of Karakalpakstan, the delay in planting winter wheat varieties is the reason for the shortening of the ripening period among the varieties. In the conditions of Nukus district, the sharp increase in air temperature and decrease in relative air humidity in the last spring and early summer months led to forced ripening of the plant.

800 elite plants were selected from the elite and superelite planting areas to establish a nursery for the first year of testing the offspring of the newly created drought- and salt-tolerant wheat variety Shortanbay-1 in primary seed production. They were analyzed on the basis of their biometric parameters in laboratory conditions, and variation lines were drawn up. X-3S class plants with the most varietal characteristics were selected and planted for 548 months.

In order to effectively carry out appropriate variety replacement and variety renewal in the seed production system of our country, it is necessary to determine the amount of high-quality seeds required for the wheat planting areas and the cultivated area, and systematically increase the seed production.

It is necessary to continue the scientific work on the organization of the primary seeding of the shortanbay-1 variety of winter wheat, which is suitable for the soil-climatic conditions of the region of the Republic of Karakalpakstan, with high productivity and breadmaking properties, and is resistant to diseases, on a systematic scientific methodical basis.

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Rezyume: Bu maqolada respublikamizning tur xil tuproq-iqlim sharoitlariga mos hosildorlik va nonboplik xususiyalari yuqori bo'lgan, kasalliklarga chidamli kuzgi yumshoq bug'doyning Shortanbay-1 navini birlamchi urug'chilik tizimini ilmiy asosda tashkil etish asosida yuqori navdor (orginal) urug'liklar etishtirib, urug'chilikka ixtisoslashgan fermer xo'jaliklariga etkazib berilishini ta'minlashi aytilgan.

Резюме: В данной статье говорится, что на основе создания первичного семенного предприятия выведен сорт осенней мягкой пшеницы Шортанбай-1 обладающий высокой продуктивностью и хлебопекарными характеристиками, пригодный для различных почвенно-климатических условий нашей республики. система селекции на научной основе, обеспечивается выращивание и поставка высокоурожайных (оригинальных) семян в хозяйства, специализирующиеся на семеноводстве.

Kalit so'zlar: Kuzgi yumshoq bug'doy, o'simlik, nav, ko'chatzor, tipik oila, sifat, birlamchiurug'chilik, orginal urug', tanlash, o'sish, rivojlanish, fenologiya, nav tozaligi, hosildorlik.

Ключевые слова: Озимая мягкая пшеница, растение, сорт, питомник, типичное семейство, качество, первичная семенная продуктивность, исходные семена, селекция, рост, развитие,

UDC: 631.675.2

STUDY OF THE INFLUENCE OF CEREALS ON SOIL PROPERTIES

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Summary: The influence of the Durdon Mosh variety, sesame Black Prince variety, Orzu soybean variety from leguminous grain crops of the OM-BAG Kadirbay farm located in the Nukus district of the Republic of Karakalpakstan on the agrophysical properties of the soil, depending on irrigation and fertilizer standards, has been determined.

Key words: leguminous crops, mash, sesame, soy, Black prince, Durdon, Orzu, specific gravity, porosity, volumetric weight.

Introduction. In recent years, the area of cotton fields has been growing year by year and has been cultivated for many years. A decrease in soil productivity, a deterioration of its structure, and a deterioration of agro-physical and water-physical properties are observed in the cultivated lands with such aggregates. The decrease in the productivity properties of the land will not fail to affect the quantity and quality of the harvest.

In recent years, our scientists have been conducting various scientific researches to increase soil productivity. However, one of the urgent issues is to study the effect of legumes on the agrophysical properties of the alluvial soils of the saline meadows of the Republic of Karakalpakstan.

For this purpose, in 2023, in the saline meadow alluvial soils of the OM-BAG Kadirbay farm, located in the Nukus district of the Republic of Karakalpakstan, the pre-irrigation soil moisture of grain leguminous plants, sesame, and soybean varieties was 70-70-60%, 75-75-60% compared to LCMF, at the beginning of the season when irrigated, after the first irrigation and at the end of the season, the effect on the agrophysical properties of soils was determined.

The result obtained; At the beginning of the season, in the 0-30 cm layer of the soil, the volume mass was 1.40 g/cm³, the specific mass was 2.72 g/cm³, and the porosity was 51.6%. The first option, after the first irrigation of the Orzu soybean variety, the pre-irrigation soil moisture to LCMF when applied at 70-70-60%, the volume mass decreased by 0.2 g/cm³ and porosity by 2.2 % compared to the beginning of the season, in the second option, the soil moisture of the Orzu soybean variety before irrigation was 75-75-60% compared to LCMF, compared to the beginning of the period of operation, there was almost no change in volume mass and specific mass after the first watering, and the porosity decreased by

1-table

Agrophysical properties of meadow-alluvial soils (2023 й.)

Varieties	Soil layer cm	At the beginning of the period of action			70-70-60% to LCMF after the first water			Pre-irrigation soil moisture at the end of the application period relative to LCMF 75-75-60 %		
		Bulk density, g/cm ³	Relative mass, g/cm ³	Porosity, %	Bulk density, g/cm ³	Relative mass, g/cm ³	Porosity, %	Bulk density, g/cm ³	Relative mass, g/cm ³	Porosity, %
Orzu soya type	0-30	1,40	2,72	51,6	1,42	2,72	49,4	1,40	2,72	51,1
	0-50	1,39	2,72	50,8	1,42	2,73	48,5	1,37	2,71	49,1
	0-70	1,43	2,71	48,2	1,43	2,76	47,2	1,39	2,73	47,8
	0-100	1,38	2,71	46,8	1,38	2,73	45,9	1,35	2,73	46,2
Qorshahzoda sesame type	0-30	1,41	2,69	50,4	1,43	2,74	48,8	1,40	2,73	49,2
	0-50	1,41	2,73	49,7	1,42	2,72	48,8	1,39	2,70	48,4
	0-70	1,39	2,70	49,1	1,43	2,72	47,5	1,41	2,73	47,3
	0-100	1,39	2,72	46,8	1,42	2,74	46,1	1,38	2,73	45,9
Durdona mosh type	0-30	1,39	2,71	50,8	1,41	2,70	48,7	1,41	2,71	50,3
	0-50	1,39	2,70	50,1	1,43	2,71	47,8	1,39	2,71	48,6
	0-70	1,40	2,72	49,2	1,40	2,72	48,5	1,41	2,71	47,5
	0-100	1,39	2,73	47,4	1,40	2,72	45,9	1,38	2,73	47,0

0.5%, and at the end of the season, compared to LCMF, it was 70-70- In the version watered at 60%, it was observed that the volume mass increased by 0.3 g/cm³, the specific mass increased by 0.1 g/cm³, and the porosity decreased by 2.5%.

In the third option, after the first irrigation of the sesame variety in Karashakhzo, when it was applied at 70-70-60% compared to LCMF, the volume mass was 1.43 g/cm³, the specific mass was 2.74 g/cm³, and the porosity decreased by 48.8%, irrigation compared to LCMF When used at 75-75-60%, these indicators are usually 1.40; 2.73 and 49.2%, and 1.41, 2.73, 48.1% in 70-70-60% against LCMF at the end of the season.

By the end of the season, it was observed that the soil moisture before irrigation was 1.39, 2.72, 49.2% in the variant carried out at 75-75-60%.

At the beginning of the season, the volume mass of Durdona mosh variety in the arable layer was 1.39 g/cm³, the specific mass was 2.71 g/cm³, and the porosity was 50.8%. 1.41; 2.70; is 48.7, the soil moisture before irrigation is 75-75-60% compared to LCMF, the volume mass is 1.41 g/cm³, the specific mass is 2.71 g/cm³, and the porosity is 50.3%. At the end of the season, LCMF in comparison with 70-70-60% it is 1.41; 2.74; This indicator is 48.9%, soil moisture before irrigation is 75-75-60% compared to LCMF, 1.39; 2.70; It was 49.7%.

Summary. Compared to the beginning of the season, volume mass, increase of specific mass and decrease of porosity after the first watering were observed for all options at pre-irrigation soil moisture of 70-70-60% compared to LCMF. Soil moisture before irrigation was irrigated at 70-70-60% compared to LCMF, requiring one additional irrigation more than LCMF at 75-75-60%, but the irrigation rate was 250-300 m³ water less. After the first watering and at the end of the season, it was observed that the volume mass, specific mass and porosity from the agrophysical properties remained in normal condition.

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Rezyume: *Qoraqalpog'iston Respublikasi Nukus tumanida joylashgan OM-BAG Qadirbay fermer xo'jaligi dukkakli don ekinlardan bo'lgan Durdona mosh navi, Qorashaxzoda kunjut navi, Orzu soya navlarining sug'orish va o'g'itlash me'yorlariga bog'liq tuproqlarining agrofizik xossalari ta'siri aniqlangan.*

Резюме: *Определено влияние сорта Дурдона мош, сорта кунжута Черный принц, сорта сои Орзу из зернобобовых зерновых культур фермерского хозяйства «ОМ-БАГ Кадирбай», расположенного в Нукусском районе Республики Каракалпакстан, на агрофизические свойства почвы в зависимости от норм орошения и удобрений.*

Kalit so'zlar: *dukkakli don, mosh, kunjut, soya, o'g'it, Qorashaxzoda, Durdona, Orzu, solishtirma og'irlig, g'ovaklig, hajm vazni.*

Ключевые слова: *зернобобовые зерновые культуры, маш, кунжут, соя, Черный принц, Дурдона, Орзу, удельный вес, пористость, объемный вес.*

THE FACTOR OF INCREASING SUMMER TEMPERATURES IN THE DESERT ZONES OF THE ARAL SEA REGION

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Summary: *In the article, the convective removal of soil microparticles from desert surfaces is considered for the first time as a potential factor for an increase in summer air temperatures in the Southern Aral Sea region. The paper presents the results of calculations of the mass concentration of aerosol in the surface layer of the atmosphere, caused by convective flows. Calculations have shown the importance of convective aerosol transport in the Southern Aral Sea region, which increases the aerosol concentration to 1.2 mg/m^3 . Conclusions are made about the features of the process under consideration in the conditions of the Southern Aral Sea region. The absence of precipitation in the Southern Aral Sea region in July-August, which counteracts the convective removal of soil aerosol by washing out the aerosol from the atmosphere and wetting the underlying surface, ensures a continuous supply of aerosol particles into the atmosphere, which increases the climate-forming effect of the process under consideration. Strengthening the wind (3 m/s and higher) suppresses free convection. Thus, a significant convective aerosol carryover occurs only at a small range of wind speed (0-2 m/s).*

Key words: *convective removal, aerosol, climatic forcing, Southern Aral Sea region.*

Relevance. Environmental pollution in the modern world has become one of the most important intractable problems of mankind. The main aspect of this problem is aerosol pollution of the atmosphere, which affects both the environmental situation and climatic characteristics. In the Southern Aral Sea region, this problem is exacerbated by the fact that in this agricultural region, the polluting aerosol carried out from the drained bottom of the Aral Sea consists of 60-70% toxic sulfate and chloride salts, which significantly affect the health of the population, salinization of already saline soils, as well as the climate [1.78].

Massive and large-scale removal of salts occurs during dust storms. In addition to the wind removal of aerosol during dust storms, there is another, almost daily operating mechanism for the removal of fine aerosol by convective air flows due to the heating of the earth's surface by the Sun [2.43]. Convective removal is the cause of the accumulation of salt aerosol in the entire thickness of the lower troposphere directly above the foci of removal. The everyday nature of the convective mechanism of particle rise makes it possible to consider it responsible for the formation of background aerosol pollution of the atmosphere of natural origin and background dry precipitation on the surface [3]. A radiation-balance model of aerosol formation was created to determine the background dry aerosol precipitation. Calculations based on it allowed us to obtain the values of the average long-term background dry precipitation caused by convective flows in the Aral Sea region, which, for example, in Tachyatash reach 79 t/km^2 per year [3].

Convective aerosol removal was investigated by mathematical modeling methods in [4,5]. In [4] the fluctuations of aerosol concentration in the Aral Sea region under convective conditions were analyzed. It is shown that the statistical characteristics of the concentration fluctuation, including the coefficient of variation, asymmetry, kurtosis, empirical distribution functions and fluctuation spectra, differ significantly for the modes of burst and quasi-continuous aerosol generation by the underlying surface.

In [5], based on the data of field measurements in the Caspian desert and estimates of hydrodynamic parameters in a viscous thermal boundary layer near the soil surface, asymptotics for the mass concentration of fine aerosol were obtained.

Convective aerosol removal in the aspect of climatic forcing is being investigated by us for the first time. Scientific studies of climate change are particularly relevant for regions with a predominance of the agricultural sector in the economy, which largely depends on the temperature and humidity regimes of soils and the surface layer of the atmosphere, such as the Southern Aral Sea region.

Climate change in the Aral Sea region is mainly associated with a decrease in the water area of the Aral Sea, which significantly softened the continentality of the temperature regime. Meanwhile, climate change largely depends on aerosol pollution of the atmosphere, recognized by the world scientific community as the most important factor of climate change, including global warming.

Aerosol forcing of the climate in the Aral Sea region is divided by us into two types: 1) the influence of sulfates carried out by wind from the drained bottom of the Aral Sea on atmospheric processes of the boundary layer and 2) the influence of soil particles carried out by convective currents from heated desert surfaces on the temperature of adjacent air layers. The genesis of the first type of forcing is dust storms on the drained bottom of the Aral Sea. The genesis of the second type of aerosol forcing of the climate is desert surfaces that heat up to 70-80 degrees in the summer, which causes significant convection of small soil particles that increase the temperature of the near-surface layers of the soil by heat exchange.

The desertification factor in numerous studies is considered only as an influence on the climate of a large-scale reduction in the area of vegetation cover, i.e. deforestation, through significant changes in albedo and heat and moisture exchange. For the first time, we consider desertification as a generator of aerosol forcing of climate change, the significance of which is determined by the fact that the evolution of landscapes in the Aral Sea region goes in the direction of the formation of desert complexes. Thus, the area of reeds decreased from 600 thousand hectares to 30 thousand hectares, and tugai forests – from 1300 thousand to 50 thousand hectares.

The importance of convective aerosol removal in climatic changes is increasing due to the increasing processes of desertification, characteristic not only in the Aral Sea region, but also on a global scale. Thus, the results of the study of convective outflow can also be used to assess global warming.

Convection is an important factor of heat and mass transfer in the atmosphere, and is capable of raising large amounts of salt and dust into the upper atmosphere. With a weak wind and hot weather (surface temperature 50-60 degrees, relative humidity 20-30%, wind 2-3 m/s), the mechanism of air mixing in the near-surface layer practically does not differ from the mechanism of free convection of a finely dispersed (less than 0.4 microns) desert aerosol.

This paper presents part of the results concerning the determination of the mass concentration of fine aerosol carried out by convective currents in the conditions of the Southern Aral Sea region.

Methods and conditions of the study. Empirical relations obtained in [5] by simulation modeling were used for calculations for the dependence of the deviation Δp from the background mass concentration in mg/m^3 of aerosol particles with a size of 0.15-5 microns on the temperature difference δT on the soil surface and at a height of 0.2 m:

$$\Delta p = 0,12 \delta T^{0,58}, \quad u_* < 20 \text{ cm/s} \quad \text{correlation } r = 0.47 \quad (1)$$

The dynamic velocity u_* is calculated based on measuring the average horizontal velocity $u(z)$ at a height of $z = 3 \text{ m}$ by the formula

$$u_* = \frac{\chi u(z)}{\ln\left(\frac{z}{y_0}\right)} \quad (2)$$

where $y_0 = 10^{-4} \text{ m}$, $\chi = 0.4$ is the Karmann constant;

The calculations used standard weather data for the Southern Aral Sea region for July and August, months characterized by calm conditions and lack of precipitation, i.e. the most favorable

conditions for the formation of free convection. To determine the temperature of the Earth's surface, data from remote sensing of the Earth for the Aral Sea region were also used [6] (Fig.1):

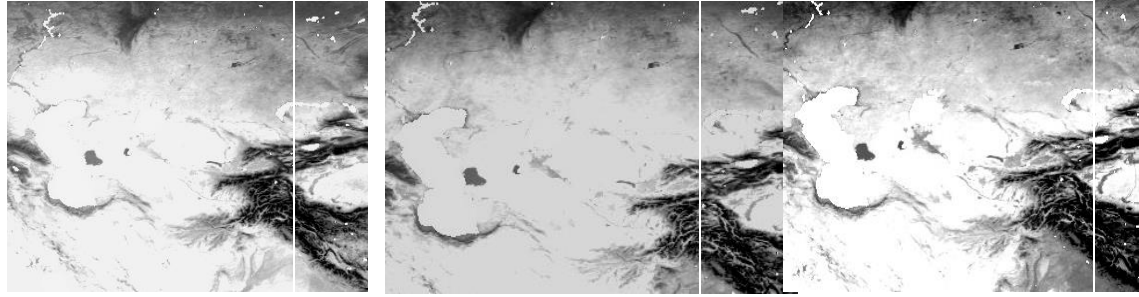


Fig.1 a) June 2019 (Earth surface temperature 69°C)

b) July 2019 (Earth surface temperature 70°C)

c) August 2019 (Earth surface temperature 67°C)

Results and discussion. With a weak wind (1-2 m/s), the values of the dynamic velocity are small ($u_* \approx 1-2$ cm/s) and the amplitude of the wind velocity δT , calculated according to the formulas given in [5], in the layer 0-3m takes the following value:

$$u_T \sim \left(\frac{\delta T}{T_0} \right)^{2/3} \cdot C_1 \quad C_1(l, \nu, k_T) = \frac{gl}{(g\nu)^{1/3}} \cdot \text{Pr}^{-1/3} \quad (3)$$

Here $g=9.8$ m/s², viscosity coefficient $\nu=0.13 \cdot 10^{-4}$ m²/s, for air the dimensionless Prandtl number $\text{Pr} = 0.72$, l is the horizontal scale of velocity field disturbances, T_0 is the temperature of the earth's surface.

From formulas (3) we find the values of the dimensional multiplier $C_1 = 218.75$ cm/s ≈ 2.19 m/s and δT . Substituting the values of δT into the formula (1), we calculate the deviation of the mass concentration from the background values of the aerosol concentration (Table 1).

Table 1

Deviation of mass concentration (mg/m³) for the desert regions of the Southern Aral Sea

Months	Air temperature, °C	Soil temperature, °C	u_T , m/s	$\Delta\rho$, mg/m ³
June	32	60	1,32	0,829
July	40	80	1,38	1,02
August	36	70	1,352	0,928

Calculations have shown the significance of convective aerosol removal in the Southern Aral Sea region. For comparison: the average aerosol concentration during dust storms is 2-3 mg/m³. As can be seen from the table, the maximum concentration of aerosols carried out by convective currents in the summer months in the conditions of the Southern Aral Sea reaches in the hottest and windless July.

Comparison of the calculation results with the calculation data in [5] for the Caspian deserts in the Republic of Kalmykia (maximum $\Delta\rho = 0.7$ mg/m³) showed significant variability of convective aerosol removal depending on the climatic conditions of different regions, which should certainly be taken into account when calculating the contribution of this process to global climate warming.

Numerical experiments with various combinations of air temperature and soil temperature have revealed that in the range of their variations indicated in Table 1, the dependence of the deviation of the mass concentration approaches linear.

Conclusions

1. Convective removal of aerosol from a heated desert surface is determined by micro-processes occurring in a thin (about m⁻⁷) near-surface viscous sublayer.

2. There is a critical value of the dynamic velocity ≈ 30 cm/s, at which the vertical gradient of the mass concentration changes sign (from "+" to "-").

3. Increased wind ($>3\text{m/s}$) suppresses free convection. Thus, significant convective aerosol removal occurs only at a small range of wind speed ($0\text{--}2\text{m/s}$).

4. The absence of precipitation in the Southern Aral Sea region in July-August, which counteracts the convective removal of soil aerosol by leaching the aerosol from the atmosphere and wetting the underlying surface, ensures a continuous flow of aerosol particles into the atmosphere, which increases the climate-forming effect of the process under consideration.

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Rezyume: Maqolada cho'l sathidan tuproq mikrozarachalarini konvektiv ravishda olib chiqish birinchi marta Janubiy Orol dengizi mintaqasida yozgi havo harorati ko'tarilishining potentsial omili sifatida ko'rib chiqilmoqda. Maqolada konvektiv oqimlar oqibatida atmosferaning sirt qatlamidagi aerzolning massa kontsentratsiyasini hisoblash natijalari keltirilgan. Hisoblash natijalari Janubiy Orol dengizi mintaqasida konvektiv aerosol transportining muhimligini ko'rsatdi, bu esa aerzol kontsentratsiyasini $1,2\text{ mg/m}^3$ ga oshiradi. Janubiy Orol dengizi mintaqasi sharoitida ko'rib chiqilayotgan jarayonning xususiyatlari to'g'risida xulosalar qilingan. Iyul-avgust oylarida Janubiy Orol dengizi mintaqasida yog'ingarchilikning yo'qligi, bu aerzolni atmosferadan yuvish va uning ostidagi yuzasini namlash orqali tuproq aerzolini konvektiv ravishda olib chiqishga qarshi turadi, bu ko'rib chiqilayotgan jarayonning iqlim hosil qiluvchi ta'sirini oshiradigan aerzol zarralarining atmosferaga doimiy oqishini ta'minlaydi. Shamolni kuchaytirish (3 m/s va undan yuqori) erkin konvektsiyani bostiradi. Shunday qilib, sezilarli konvektiv aerzolni tashish faqat shamol tezligining kichik oralig'ida ($0\text{--}2\text{ m/s}$) sodir bo'ladi.

Резюме: В статье конвективный вынос почвенных микрочастиц с пустынных поверхностей впервые рассматривается, как потенциальный фактор увеличения летних температур воздуха в Южном Приаралье. В работе приведены результаты расчетов массовой концентрации аэрозоля в приземном слое атмосферы, обусловленной конвективными потоками. Расчеты показали существенность конвективного выноса аэрозоля в Южном Приаралье, увеличивающего концентрацию аэрозоля до $1,2\text{ мг/м}^3$. Сделаны выводы об особенностях рассматриваемого процесса в условиях Южного Приаралья. Отсутствие в Южном Приаралье осадков в июле-августе, противодействующих конвективному выносу почвенного аэрозоля вымыванием аэрозоля из атмосферы и смачиванием подстилающей поверхности, обеспечивает непрерывное поступление аэрозольных частиц в атмосферу, что увеличивает климатообразующий эффект рассматриваемого процесса. Усиление ветра ($>3\text{м/с}$) подавляет свободную конвекцию. Таким образом, существенный конвективный вынос аэрозоля происходит только при небольшом диапазоне скорости ветра ($0\text{--}2\text{ м/с}$).

Ключевые слова: конвективный вынос, аэрозоль, климатический форсинг, Южное Приаралье.

Kalit so'zlar: konvektiv olib chiqish, aerzol, iqlimni majburlash, Janubiy Orolbo'yi.

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HEAT TRANSFER DURING CONTACT OF GAS AND LIQUID PHASES ON A TUBULAR-GRID NOZZLE MADE OF TWISTED PIPES

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Summary: *The issues of process intensification in a distillation column are discussed in the article. It was revealed that the placement of 2-4 trays on a tubular-grid nozzle made of twisted pipes makes it possible to equalize the temperature along the height of the column and create a stable and efficient process. It was established that depending on the step of their placement s/d, heat transfer increased by 1.1 - 2.45 times.*

Keywords: *rectification, tubular-grid nozzle, twisted pipe, heat transfer, Kirpichev criterion, intensification, heat transfer.*

Numerous final products are obtained in the chemical, gas processing, oil, food, and other industries, using the rectification process, the requirements for the quality of these products are increasing every year [1].

The rectification process, in its physicochemical properties and calculation methods, is one of the most complex mass transfer processes. Therefore, before proceeding with calculations, it is recommended to acquire deep knowledge in the field of the theory of the rectification process, paying special attention to the physical meaning of the main laws and to individual parameters of the process.

Due to the high energy intensity of the process [1, 4, 5], the researchers are in a constant search for rectification methods that will reduce energy costs.

In this regard, nonadiabatic rectification, conducted in adiabatic columns [6-8], in which heat outflow or supply is realized in heat exchangers placed on trays, is of great interest.

Energy saving during non-adiabatic rectification occurs due to partial heat transfer at the inlet or outlet of the installation under a moderate temperature load, which allows the use of cheaper coolants [9, 10].

A literature review on calculating the energy balance of such columns shows that adiabatic columns with heat exchangers in height significantly reduce energy by reducing the temperature difference between the coolant and steam at the stage [11]. Some of these devices were previously studied and are of great interest [12].

It is known that a transversely streamlined bundle of pipes with cylindrical sections of the outer surface periodically arranged along the axis and sequentially alternating along the flow with different outer diameters, used in a heat exchanger, has staggered or corridor patterns of division.

When implementing this scheme, the following technical and economic results can be obtained:

1. Increase in the efficiency of heat transfer by additional turbulization of the coolant flow during transverse flow around sections of the tubular surface with different outer diameters;
2. Reduction in metal consumption and increase in the compactness of the heat exchange surface [13].

Intensification of heat transfer using periodic annular projections is one of the most effective and deep-studied identification methods. It is worth noting that the rolling up of calcium channels is quite technologically advanced since it does not increase the outer diameter of the pipes, allowing these pipes to be used in tight bundles and does not change the existing technology for assembling heat exchangers. Annular diaphragms and grooves turbulize the flow near the wall and provide

intensification of heat exchange outside and inside the pipes [14].

In connection with the above, references [15, 16] are of great interest, as the authors of these publications proposed to use as heat transfer intensifiers, the relief formed when an ordered system of spherical depressions is applied to an initially smooth surface. The authors of [15] discovered and studied (when a coolant flow flows around such reliefs) self-organizing dynamic vortex structures flowing from the depressions in the form of jets and providing intense mass transfer from the surface to the core of the main flow. Such intensive transfer of coolant mass is the main reason for the intensification of heat transfer. In addition, the authors of [16] noted that the flow around such reliefs is not accompanied by an increase in friction losses, and in some cases, a decrease in these losses is observed.

It is well known that the flow around pipes in a tube bundle differs from the flow around a single pipe because it is significantly affected by the pipes located nearby [3, 14]. Only the first row of pipes can be taken as the flow around a single pipe. When a tube bundle flows transversely, narrowings are formed between the rows of pipes, which contribute to the occurrence of a pressure drop. Therefore, when flowing around a tube bundle, the efficiency of heat transfer depends on the tube placement pattern (corridor or staggered types) and the geometric parameters of the bundle (transverse and longitudinal steps). In a staggered bundle, the fluid flow corresponds to some extent to the flow along a curved channel, when narrowing and expansion alternately occur [17].

In corridor bundles, the flow of liquid in its nature approaches the flow in a straight channel, and the distribution of velocities mainly depends on the ratio of steps.

All of the above applies to bundles of smooth pipes. However, all researchers in the field of heat transfer intensification note that an increase in the Reynolds number Re causes a significant change in the flow in the bundle. The flow in the inter-tubular space becomes vortex-like with high turbulence. Turbulence and its occurrence in the inter-tube space depend on the bundle configuration and the Re number [2, 3, 14, 17, 20].

Therefore, in order to increase turbulence in the inter-tubular space, studies were conducted to intensify heat transfer to equalize the temperature along the height of distillation columns using a model “ethanol-water” mixture. The experiments were conducted by changing the pipe placement step $s/d=1.13-3.0$, with a staggered and corridor pattern of arrangement.

Experimental studies have shown that with staggered placement of twisted pipes in a tubular-grid nozzle, regardless of the step of their arrangement, the Kirpichev criterion Ki has higher values (Fig. 1). So, for example, with the Reynolds number for the liquid phase $Re_{ж}=60$ and the pipe placement step $s/d=1.13$, the value of the Kirpichev criterion for corridor pattern is $Ki=115$, and for staggered pattern, it is $Ki=134$.

A similar pattern will remain for all values of the pipe placement step, differing only in numerical values. The effect of the placement step on heat transfer can be revealed by comparing experimental data at different s/d . Thus, at a staggered placement of pipes for $Re_{ж}=80$ and pipe placement step $s/d=3.0$, the value of the Kirpichev criterion is $Ki=71$, at $s/d=2.0$ the value is $Ki=78$, at $s/d=1.5$ the value is $Ki=101$, at $s/d=1.3$ the value is $Ki=121$, and at $s/d=1.13$ the value is $Ki=174$ (Fig. 1a). As can be seen, the influence of the step is significant and ranges from 1.1 to 2.45 times depending on the step of their placement s/d .

A comparison of the staggered and corridor patterns of pipe placement in a tube grid shows the relative effectiveness of staggered placement of pipes. With the same operating parameters, i.e. Reynolds number $Re_{ж}=100$ and geometric parameters $s/d=1.13$, the value of the Kirpichev criterion for the staggered pattern of pipe placement is $Ki=199$, and for the corridor pattern, it is $Ki=176$. Analysis conducted using the Kirpichev criterion and other placement steps shows a 5-13% intensification. It should be noted that when the liquid and gas phases move in the inter-tube space of tubular-grid nozzles, the contact is more intense than in the nozzles of smooth pipes.

a)

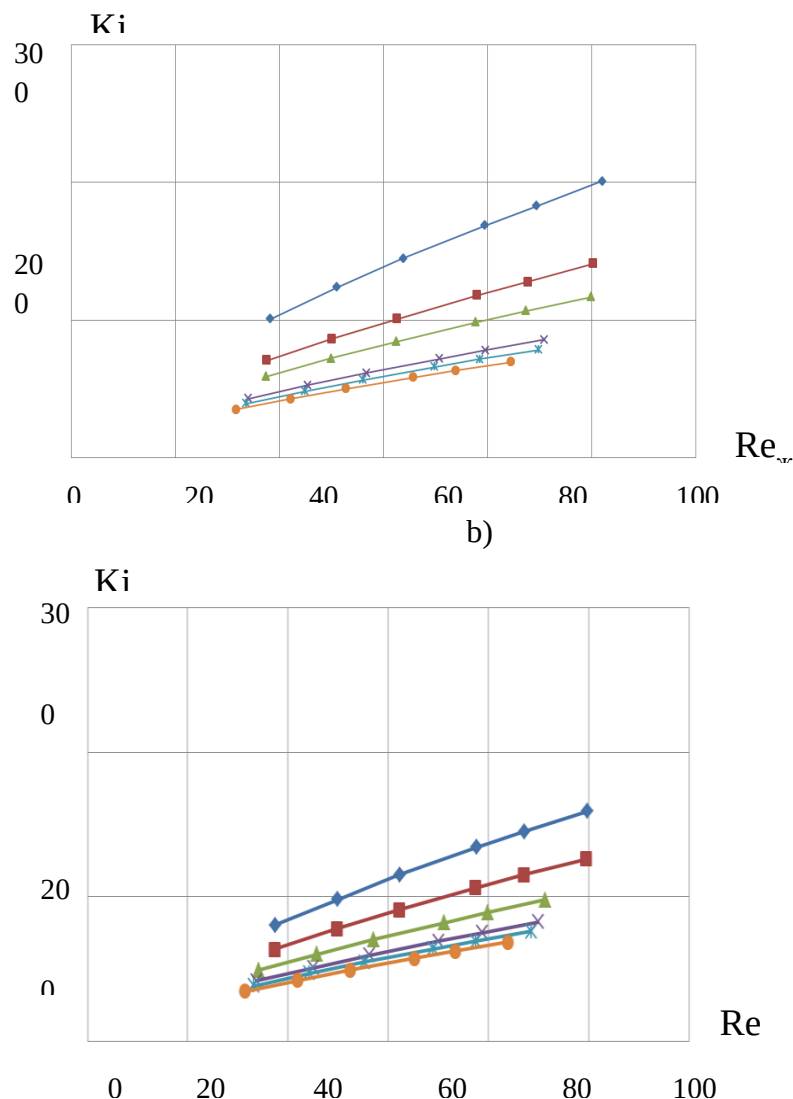


Fig.1. Dependence of the Kirpichev criterion Ki on the fluid flow rate Re_k when flowing around a tubular-grid nozzle made of twisted pipes at rectification of ethanol-water mixture. (a - staggered pattern; b - corridor pattern)

◆ - $s/d=1,13$; ■ - $s/d=1,3$; ▲ - $s/d=1,5$; × - $s/d=2$; * - $s/d=2,5$; ● - $s/d=3$;

Under staggered placement of twisted pipes, large transverse and relatively small longitudinal steps occur. As a result, in staggered bundles at Reynolds numbers $Re > 1000$, a stable flow passes into a mixed state in the transverse direction. According to researchers, when pipes are arranged in staggered patterns in bundles, the transition from a stable state to a highly mixed state occurs at lower values of the Reynolds number [18, 19].

In conclusion, it should be noted that the higher the turbulence of the gas-liquid flow when flowing around pipes, the higher the heat and mass transfer during distillation. The design of twisted pipes is such that at small values of the winding pitch of the turbulators and the pipe placement step, the mixing and turbulization of the flow is greater, and therefore the transfer of heat and mass increases.

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Rezyume: Maqolada rektifikatsiya kolonnasida jarayonni intensivlashtirish masalasi ko'rib chiqiladi. 2-4 tarelka urnini buralgan trubalardan yasalgan truba – panjarali nasadkalar bilan almashtirish kolonna balandligi bo'ylab haroratni tenglashtirishga, jarayonning barqaror va samarali oqimini yaratishga imkon berishi aniqlandi. Ularni joylashtirish qadaming s/d o'lchamiga qarab, issiqlik uzatish 1,1 - 2,45 baravar ko'payishi aniqlandi.

Резюме: В статье рассмотрен вопрос интенсификации процесса в ректификационной колонне. Выявлено, что замена 2-4 тарелок на трубчато-решетчатую насадку из витых труб позволяет выровнять температуру по высоте колонны, создать устойчивое и эффективное протекание процесса. Установлено, что в зависимости от величины шага их размещения s/d перенос тепла возрастает в 1,1 - 2,45 раза.

Kalit so'zlar: rektifikatsiya, truba-panjarali nasadka, burama truba, issiqlik uzatish, Kirpichev kriteriyasi, intensivlashtirish, issiqlik almashinish.

Ключевые слова: ректификация, трубчато-решетчатая насадка, витая труба, теплопередача, критерий Кирпичева, интенсификация, теплобмен.

UDC 677.024

TECHNOLOGY FOR PRODUCING GAUZE FROM FLAT BLEACHED COTTON YARN

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Summary: The article developed a technology for the preparation and production of gauze from bleached flat cotton yarn. The optimal parameters for the transitions of weaving production have been selected. The reasons for the breakage of warp threads on a loom are investigated.

Key words: thread, warp, weft, fabric, breakage, gauze.

Until now, enterprises of weaving production have been producing gauze on looms from a straightened base. This technology requires additional expenses for the preparation of the bases (the process of dressing, applying and fixing the dressing on the thread) and then removing the dressing from the threads in the fabric (the process of loosening the fabric) in the finishing production. For this reason, research on the possibilities of processing the warp from non-straightened flat cotton yarn on a loom is very relevant, and is of interest to weaving enterprises [1].

The aim of the work is to develop a technology for preparing the bases and producing gauze from bleached flat cotton yarn with a linear density of 29.4 tex on pneumatic polyester looms.

To solve this problem, it is planned: to develop technological modes of preparation of the base in the process of warping; to develop technological modes of preparation of the base in the process of wading and tying; to develop technological modes of fabric production on a pneumatic polyester loom [2].

The technology for producing gauze involves three processes:

- tape warping, which provides a low percentage of carbon monoxide, effective accumulation of warp threads (in the form of tapes) and obtaining directly weaving stock;
- wading and tying the warp threads, possibly prisuchivanie warp threads directly on the loom (instead of binding the warp), due to the small number of warp threads on the loom (about 600-700 warp threads);
- weaving on a pneumatic rapier loom, which provides high production of fabric, for a shorter time of passing the warp threads from navoi to earning them into the fabric, small rapier sizes that reduce the size of the throat, this favorably affects the deformation of the warp threads and as a result leads to a decrease in the breakage of the warp threads and the use of a bobbin in the weft causes a lag on the machine during the production of fabric.

Table 1 shows the results of the filling calculation for bleached medical gauze [3]. The main criterion that determines the level of efficiency of the existing production technology is thread breakage. According to the standards [4], the breakage for gauze is 0.1 breakage per 1 meter of fabric on the base and 0.02 breakage per 1 meter of fabric on the weft. We conducted an experiment to control the breakage of threads on the weft base on a pneumatic taper loom, the results of which are presented in Table 2 [5-6]. As you can see, the breakage on the base and weft significantly exceeds the standard breakage. Exceeding the breakage on the weft is due to defects in the rapiers (right and left).

Also, studies were conducted on the causes of breakage of warp threads on a pneumatic polyester loom, the results of which are presented in Table 3.

Table 1

Filling calculation for bleached medical gauze

№	Name	of The Unit. measurements	Indicators

I Based			
1.1	Linear yarn density	tex	29,4
1.2	Number of threads	pcs	600
1.3	Including in the edge	pcs	30
1.4	Byrd number	tooth / dm	60
1.5	Byrd filling width	cm	95
1.6	Number of background threads made their way into the byrd tooth	pcs	1
1.7	Number of edge threads made their way into the byrd tooth	pcs	2
1.8	Working hours	%	3
1.9	Carbon monoxide	%	0,63
1.10	Yarn consumption per 1 meter without carbon monoxide	gr	18,2
1.11	Yarn consumption per 1 meter with carbon monoxide	gr	18,3
II Weft II			
2.1	Linear yarn density	tex	29,4
2.2	Work time	%	5
2.3	Carbon monoxide	%	0,40
2.4	Yarn consumption per 1 meter without carbon monoxide	gr	24,8
2.5	Yarn consumption per 1 meter with carbon monoxide	gr	24,9
III On fabric			
3.1	Fabric width on bird	cm	95
3.2	Surface density	gr /m ²	43±3
3.3	Fabric density on the base	thread/per 10cm	60
3.4	Fabric density on the weft	thread/per 10cm	80
3.5	Width of the finished fabric	cm	93,5

Table 2

Breakage control results

Number		of breaks Worked out meters	Average breakage per 1 meter of fabric	
warp	weft		warp	weft
60	8	94	0,64	0,09

About 78% of breaks occur due to the preparation of the warp for weaving and 22% occur due to the quality of the yarn. Therefore, careful preparation of the basics for weaving (the warping process) is the key to effective weaving on looms. In addition, the physical and mechanical properties of bleached flat cotton yarn with a linear density of 29.4 tex were studied.

Table 3

Breakage of warp threads due to various reasons

№	Cause of breakage	Number of breaks	
		of breaks breakage	%
1	Yarn defects-nooh, bumps, neprostryadki, etc	13	22
2	Warping errors-cstroke, crisscross, weak thread, etc	47	78
	Total	60	100

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Rezyume. Maqolada oqartirilgan tekis paxta ipidan doka tayyorlash va ishlab chiqarish texnologiyasi ishlab chiqilgan. To'quv dastgohida o'ralgan ipning uzilish sabablari o'rganildi.

Резюме. В статье разработана технология подготовки и выработки марли из отбеленной пологой хлопчатобумажной пряжи. Подобраны оптимальные параметры по переходам ткацкого производства. Исследованы причины обрывности нитей основы на ткацком станке.

Kalit so'zlar: ip, arqoq, tanda, to'qima, sinish, doka.

Ключевые слова: нить, основа, уток, ткань, обрывность, марля.

UDK 662.2.035

EFFICIENCY OF GRANULATION WITH PRELIMINARY GRINDING OF SOLID MATERIALS IN A TURBOLAVE GRANULATOR

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Summary: This article is devoted to the problem of effective granulation of bulk materials, in particular lime powder. It has been experimentally established that at rotational speeds of the working shaft $n=1400$ rpm, spherical granules are obtained. Experiments have revealed that preliminary grinding of the material makes it possible to increase the efficiency of the granulation process and obtain granules of good presentation with a particle size distribution of 96.2%.

Keywords: lime powder, grinding, granulation, granule, binding suspension, turbulized layer, presentation, granulometric composition.

Currently, industrial enterprises all over the world have a significant anthropogenic impact on the environment and, in connection with this, it becomes relevant to find optimal and economical methods for purifying industrial emissions, regardless of their state of aggregation.

It is well known that in addition to the main product, a certain amount of solid waste is produced, which form multimillion-dollar dumps, occupying large cultivated areas.

Naturally, this waste requires disinfection or, in extreme cases, neutralization of harmful substances and subsequent granulation to give the finished product a marketable appearance. Common methods for processing solid waste are thermal, which make it possible to use the fuel potential of the waste, and in the complex processing of solid mixtures, extract various substances used in industry (ferrous and non-ferrous metals, glass) from heat treatment products. The process is carried out in furnaces of various designs. A significant disadvantage of the combustion method is the formation of toxic gaseous substances, which raises the problem of additional cleaning of waste gases. Sometimes various technical methods are used to neutralize solid waste, in particular, the waste encapsulation method, which consists of enveloping toxic waste with an inert film, and the vitrification method.

In some cases, during the thermal processing of solid waste, organic compounds are subjected to pyrolysis to produce products used as fuel (liquid and gaseous).

Chemical methods make it possible to obtain new products from solid waste. For example, solid organic waste is converted into liquid and gaseous fuels by hydrogenation.

However, there is still ground storage of solid waste - a potential raw material for chemical and other industries: halite dumps (~ 500 million tons), phosphogypsum (120 million tons), cinder (28 million tons), various slags (~ 500 million tons). To date, rational ways of processing some land waste have already been found.

Currently, complete recycling of solid waste, dumps and pelletized materials is widely used, including processes such as preliminary crushing followed by granulation. Grinding is widely used in chemical engineering, since the use of crushed solids can significantly accelerate dissolution, chemical interaction, roasting, granulation and other processes, which proceed faster the larger the surface of the solids involved [1,2].

Consequently, one of the promising directions for solving such problems is the granulation of bulk or paste-like materials and waste from chemical and other industries in turbo-blade granulators, as

well as the determination of the optimal geometric parameters of the apparatus and technological process modes.

To intensify the granulation process, increase the productivity of the apparatus and reduce its size, as well as improve the granulometric composition and presentation of the product, preliminary grinding of the granulated material is necessary [1,2].

In the technique of granulating solid, bulk and pasty materials, numerous studies have been carried out and various methods and devices have been created to carry out the granulation process [2, 3, 4, 5, 6, 7, 8, 9, 10].

In the work of Barinsky E.A. the process of recycling industrial and municipal waste by the granulation method to obtain enamels and fertilizers has been studied [11].

So, in the work of Kuts P.S. and collaborators obtained sodium tripolyphosphate granules by the soft granulation method, Holm P. and T. Schaefer determined the relationship between the plastic strength of the granules and the dynamic loads acting on them, and also obtained tripolyphosphate granules by the soft granulation method [2, 3, 12], at the Kokand MZhK on In the Orbit-300 granulator, meal cubes were obtained by pressing. Japanese scientist Kasamatsu T. studied the designs of drum granulators [4, 13], Escherwyss and Lodige developed a granulator for protein-vitamin concentrates [3], J.M. Huber corporation" studied the production of kaolin granules in turboblade granulators [3, 5], AdichiR. and HayashiT. developed devices and apparatus of various designs for granulating bulk materials [6]. Along with traditional methods - rolling, spraying and pressing, one of the most promising and effective methods has often begun to be used - high-speed granulation in turbo-blade granulators [3, 5].

For an experimental study of the grinding and granulating process, a turbo-blade, high-speed, horizontal-type apparatus designed for granulating solid materials was designed and manufactured.

An experimental installation of a turboblade type, horizontal design, is designed for granulating solid, bulk and pasty materials. The device has 5 zones: loading "A", grinding "B", granulating "C", compacting "E", and unloading "F" (Fig. 1) [14].

Feedstock, pelletized or solid materials in the form of pieces of conglomerates of solid waste from chemical production enter through the nozzle, and granular material is discharged through the nozzle.

A device for producing granules from bulk materials or pelletized particles of solid material consists of a cylindrical body made of stainless steel pipe X18N10T with a diameter of 0.133 m, a thickness of 0.006 m and a length of 1.2 m, inside of which a shaft with wedge-shaped round rods is located along the horizontal axis. The shaft is mounted on bearings on both sides and is seated in a sleeve, which rotates inside the sleeve using a sliding fit.

To carry out the rotational movement, the end of the shaft located on the side of the loading zone is connected to a DC electric motor using a coupling. The reciprocating movement of the shaft is carried out using a pneumatic cylinder, which is connected to the other end of the shaft using a flexible coupling.

The results of testing a pilot plant for granulating bulk materials of a 3-phase turbulent layer were carried out using a turboblade type pilot plant. The design of the granulating apparatus received a patent from the Intellectual Property Agency of the Republic of Uzbekistan No. 04222 [14].

The apparatus for entering the feedstock and binding suspension, as well as for unloading the finished product, has appropriate fittings.

The composition of the curing suspension is determined based on the type of granulated substance; in particular, an aqueous suspension of a 1.8% solution of carboxymethylcellulose (CMC) is prepared in a mixer for lime powder. To obtain the required temperature of the binder, the mixer is equipped with an external steam jacket. The flow rate of the suspension was measured with a rotameter, and its regulation was carried out by a valve.

Before starting the experiments, the moisture content of the starting material and the concentration of the binding solution were preliminarily determined. In addition, during the research, the consumption of the initial granulated material and the binding solution was measured. The pilot plant is designed in such a way that the grinding and granulating processes are combined in one apparatus. Moreover, the source material sequentially passes from one zone to another in the body of one granulator.

The results of experiments in enterprise conditions are illustrated in Fig. 1. The experiments were carried out at working shaft rotation numbers $n=1400$ rpm. The suspension consumption during the experiments was 3.2 l/h.

Figure 1 shows the granulometric composition of the original lime powder after grinding and after granulation.

From the diagram in Fig. 1 it is clear that after grinding the fraction with dimensions of 0.08-0.16 mm prevails, whose share is 47%. The number of particles up to 1.0 mm is 16.5%, and the granulometric composition is 99.3%. This indicates a fairly high degree of grinding.

The picture is similar after granulation, i.e. the fraction of granules from 2 to 4 mm is 63%. At the same time, the granulometric composition is 96.2%, and the lime powder granules mainly consist of spherical particles and have a good presentation.

It should be noted that granulation of bulk, powdery materials in turbo-blade devices makes it possible to obtain a product with a good presentation and granulometric composition. In addition, the elimination of the dust fraction has a positive effect on the environmental situation of the enterprise and surrounding areas, and also improves the working conditions of the enterprise's workers.

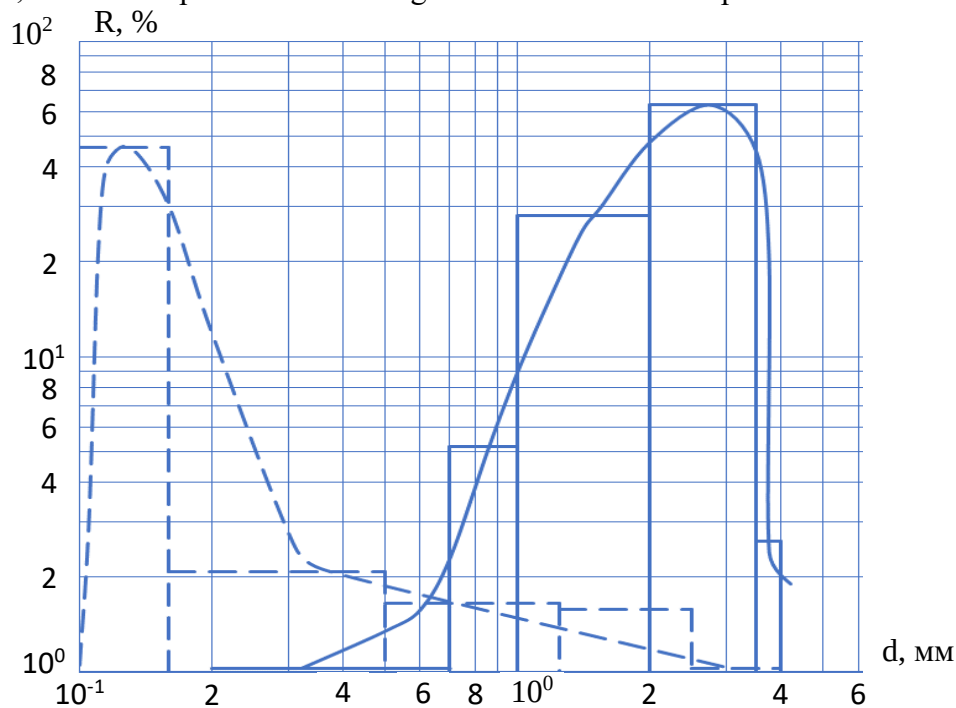


Fig.1. Experimental density distribution curves

granules according to the size of lime powder.

- - - - after the chopper; ____ - after the granulator.

Moreover, devices of similar designs are multi-stage, all processes proceed sequentially, are compact and consume much less energy compared to classic granulators for bulk materials.

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Rezyume: Ushbu maqola sochiluvchan materiallarni, xususan oxaktosh kukunini granullashga bag'ishlangan. Tajriba asosida aniqlandiki ishchi valning aylanishlar soni $n=1400$ ayl/min bo'lganda sharsimon shaklli granula olindi. Tajribalar shuni ko'rsatdiki, materialni oldindan maydalash granullash jarayoni samaradorligini oshiradi va granulometrik tarkibi 96,2% bo'lgan sifatli maxsulot chiqishini taminlaydi.

Резюме: Данная статья посвящена проблеме эффективного гранулирования сыпучих материалов, в частности, известкового порошка. Экспериментально установлено, при числах вращения рабочего вала $n=1400$ оборотов в минуту получены гранулы шарообразной формы. Опытами выявлено, что предварительное измельчение материала позволяет повысить эффективность процесса гранулирования и получить гранулы хорошего товарного вида с гранулометрическим составом 96,2%.

Kalit so'zlar: oxaktosh kukuni, maydalash, granullash, granula, bog'lovchi suspenziya, turbulizatsiyali qatlam, maxsulot sifati, granulometrik tarkib.

Ключевые слова: известковый порошок, измельчение, гранулирование, гранула, связующая суспензия, турбулизированный слой, товарный вид, гранулометрический состав.

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GENERALIZED THEORY OF ELECTRON ENERGY STATES IN TUNNEL-CONNECTED SEMICONDUCTOR QUANTUM WELLS

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Summary: *The kinetic properties of both symmetrical and asymmetrical in relation to the geometric dimensions of multilayer and nano-sized semiconductor structures have been studied. The theory was created in different models using different mathematical methods for solving the Schrödinger matrix equation for a system of electrons.*

The problem was solved taking into account the Bastard condition: the difference in the effective masses of current carriers in adjacent layers of the structure.

Tunnel-bound electronic states in quantum wells, between which there is a narrow tunnel-transparent potential barrier, are analyzed.

Key words: *multilayer and nano-sized semiconductor structures, Schrödinger matrix equation, Hamiltonian, electrons, Bastard condition.*

INTRODUCTION

The study of the electronic properties of both symmetrical and asymmetrical with respect to the geometric dimensions of layers of a semiconductor structure is relevant in connection with the use of these structures in micro- or nanoelectronics and in other areas of solid-state physics [1]. In [2–9], the kinetic properties of multilayer and nano-sized semiconductor structures were studied. The theory was created in different models using different mathematical methods for solving the complete Schrödinger equation for a system of electrons. In the above-mentioned works, the problem was solved without taking into account the Bastard condition: the difference in the effective masses of current carriers in adjacent layers of the structure was not taken into account. And they also did not study tunnel-bound electronic states in quantum wells, between which there is a narrow tunnel-transparent potential barrier. This work is devoted to this case.

GENERAL RELATIONSHIPS

In structures with two (or more) closely spaced potential wells, the wave functions of neighboring wells overlap each other in the region of the barrier between the wells, so that the probability of detecting an electron in the barrier region is noticeably different from zero. Consequently, current carriers can move from one well to another with a noticeable probability, despite the fact that their energies do not exceed the barrier value. This quantum phenomenon is called the tunnel effect [9-10]. Quantum wells in which the probability of a tunnel effect is not small are called tunnel-coupled.

The emergence of a tunnel connection as the wells approach each other affects the position of the energy levels in them and the shape of the wave functions. To calculate the size quantization levels and the wave functions that belong to them, we must solve the Schrödinger equation for the chosen potential with Bastard boundary conditions, where the wave function $\psi(x)$ and value $\frac{1}{m} \frac{d\psi}{dx}$ remain continuous at the interface of the potential well (A layer) and the barrier (B layer), i.e.

$$\psi|_A = \psi|_B, \quad \frac{1}{m} \frac{d\psi(x)}{dx} \Big|_A = \frac{1}{m} \frac{d\psi(x)}{dx} \Big|_B \quad (1)$$

Therefore, in further calculations it is necessary to take into account (1) at each heterointerface

(and it is necessary to take into account the decrease in wave functions at $x \rightarrow \pm\infty$ if the wave vector of the current carriers is real). There are two interfaces in a two-well nanostructure. Therefore, conditions (1) give a relatively cumbersome system of equations for eight unknowns.

Let $U_1(x)$ and $U_2(x)$ be single-well potentials (left and right wells), considered independently of each other. Here it is convenient to assume that the energy reference point is chosen at the barrier level, and each of the functions $U_1(x)$ is nonzero only within its own layer. Then the potential $U(z)$ for a structure with two wells will be written as the sum of $U_1(x)$ and $U_2(x)$, and the Schrödinger equation in a two-well problem with an effective mass m independent of the coordinate will take the form:

$$H\psi = E\psi, \quad (2)$$

where $H = H_1 + H_2 + U_1 + U_2$, $H_1(U_1)$ and $H_2(U_2)$ the Hamiltonian (potential) operator for the left and right potential wells. Then the general Schrödinger equation takes the form

$$\left(-\frac{\hbar^2}{2m_1} \vec{\nabla}^2 - \frac{\hbar^2}{2m_2} \vec{\nabla}^2 + U_1 + U_2 \right) \psi = E\psi$$

and for the one-dimensional case we have

$$\left(-\frac{\hbar^2}{2\mu_{12}^+} \frac{\partial^2}{\partial z^2} + U_1 + U_2 \right) \psi(x) = \left(E - \frac{\hbar^2 k_{\perp}^2}{2\mu_{12}^+} \right) \psi(x) \quad (3)$$

where $\frac{1}{\mu_{12}^+} = \left(\frac{1}{m_1} + \frac{1}{m_2} \right)$, $k_{\perp}^2 = k_x^2 + k_y^2$. Then we write the Schrödinger equation for the left and right potential wells as

$$\left(-\frac{\hbar^2}{2m_1} \frac{\partial^2}{\partial z^2} + U_1 \right) \psi_1 = \left(E_1 - \frac{\hbar^2 k_{\perp}^2}{2m_1} \right) \psi_1, \quad \left(-\frac{\hbar^2}{2m_2} \frac{\partial^2}{\partial z^2} + U_2 \right) \psi_2 = \left(E_2 - \frac{\hbar^2 k_{\perp}^2}{2m_2} \right) \psi_2. \quad (4)$$

If we take into account the principle of superposition, then we have

$$\psi(x) = C_1 \psi_1(x) + C_2 \psi_2(x) \quad (5)$$

Then substituting (5) into equation (3) and taking into account (4), we obtain:

$$\begin{aligned} & C_1 \left(\frac{m_1}{\mu_{12}^+} \left[-\frac{\hbar^2}{2m_1} \frac{\partial^2 \psi_1(x)}{\partial z^2} + U_1 \psi_1(x) \right] + \left(1 - \frac{m_1}{\mu_{12}^+} \right) U_1 \psi_1(x) + U_2 \psi_1(x) \right) + \\ & + C_2 \left(\frac{m_2}{\mu_{12}^+} \left[-\frac{\hbar^2}{2m_2} \frac{\partial^2 \psi_2(x)}{\partial z^2} + U_2 \psi_2(x) \right] + U_1 \psi_2(x) + \left(1 - \frac{m_2}{\mu_{12}^+} \right) U_2 \psi_2(x) \right) = \\ & = C_1 \left(E - \frac{\hbar^2 k_{\perp}^2}{2\mu_{12}^+} \right) \psi_1(x) + C_2 \left(E - \frac{\hbar^2 k_{\perp}^2}{2\mu_{12}^+} \right) \psi_2(x) \end{aligned} \quad (6)$$

Then multiplying (6) on the left side by $\psi_1^*(x)$ and $\psi_2^*(x)$ alternately, as well as carrying out integration, we obtain

$$\begin{cases} C_1 \left[\tilde{E}_1 \sigma + \left(1 - \frac{m_1}{\mu_{12}^+} \right) U_1^{(21)} + U_2^{(21)} - \tilde{E} \sigma \right] + C_2 \left[\tilde{E}_2 + U_1^{(22)} + \left(1 - \frac{m_2}{\mu_{12}^+} \right) U_2^{(22)} - \tilde{E} \right] = 0, \\ C_1 \left[\tilde{E}_1 + \left(1 - \frac{m_1}{\mu_{12}^+} \right) U_1^{(11)} + U_2^{(11)} - \tilde{E} \right] + C_2 \left[\tilde{E}_2 \sigma + U_1^{(12)} + \left(1 - \frac{m_2}{\mu_{12}^+} \right) U_2^{(12)} - \tilde{E} \sigma \right] = 0. \end{cases} \quad (7)$$

Here

$$U_1^{(21)} = \int \psi_2^*(x) U_1 \psi_1(x) \cdot dx, \quad U_2^{(21)} = \int \psi_2^*(x) U_2 \psi_1(x) \cdot dx, \quad U_1^{(22)} = \int \psi_2^*(x) U_1 \psi_2(x) \cdot dx,$$

$$U_2^{(22)} = \int \psi_2^*(x) U_2 \psi_2(x) \cdot dx, \quad U_1^{(11)} = \int \psi_1^*(x) U_1 \psi_1(x) dx, \quad U_2^{(11)} = \int \psi_1^*(x) U_2 \psi_1(x) dx,$$

$$U_1^{(12)} = \int \psi_1^*(x) U_1 \psi_2(x) dx, \quad U_2^{(12)} = \int \psi_1^*(x) U_2 \psi_2(x) dx, \quad \sigma = \int \psi_2^*(x) \psi_1(x) \cdot dx,$$

$$\tilde{E} = E - \frac{\hbar^2 k_{\perp}^2}{2\mu_{12}^+}, \quad \tilde{E}_a = E_a - \frac{\hbar^2 k_{\perp}^2}{2m_a}, \quad \tilde{E}_1 = \frac{m_1}{\mu_{12}^+} \left(E_1 - \frac{\hbar^2 k_{\perp}^2}{2m_1} \right), \quad \tilde{E}_2 = \frac{m_2}{\mu_{12}^+} \left(E_2 - \frac{\hbar^2 k_{\perp}^2}{2m_2} \right).$$

In order for the system of homogeneous equations (7) to have a nonzero solution, it is necessary to equate its determinant to zero. Then

$$\begin{bmatrix} \tilde{E}_1 \sigma + \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(21)} + U_2^{(21)} - \tilde{E} \sigma & \tilde{E}_2 + U_1^{(22)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(22)} - \tilde{E} \\ \tilde{E}_1 + \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(11)} + U_2^{(11)} - \tilde{E} & \tilde{E}_2 \sigma + U_1^{(12)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(12)} - \tilde{E} \sigma \end{bmatrix} = 0. \quad (8)$$

Where do we get the algebraic equation of the second degree for variable $\tilde{E}$

$$a\tilde{E}^2 - b \cdot \tilde{E} + c = 0, \quad (9)$$

which has two of its roots, $\tilde{E}_{\pm}$, representing the desired energy levels of the electron in the double-well potential $U(x)$

$$\tilde{E}_{+} = \frac{b}{2a} \left(-1 + \sqrt{1 - 4 \frac{ac}{b^2}} \right), \quad \tilde{E}_{-} = \frac{b}{2a} \left(-1 - \sqrt{1 - 4 \frac{ac}{b^2}} \right) \quad (10)$$

where

$$a = (1 + \sigma^2), \quad b = (1 + \Xi_6 + \Xi_2 + \Xi_3), \quad c = \Xi_4 - \Xi_1,$$

$$\Xi_1 = \left(\tilde{E}_1 \sigma + \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(21)} + U_2^{(21)} \right) \left(\tilde{E}_2 \sigma + U_1^{(12)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(12)} \right),$$

$$\Xi_2 = \left(\tilde{E}_2 \sigma + U_1^{(12)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(12)} \right) \sigma, \quad \Xi_3 = \left(\tilde{E}_1 \sigma + \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(21)} + U_2^{(21)} \right) \sigma,$$

$$\Xi_4 = \left(\tilde{E}_1 + \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(11)} + U_2^{(11)} \right) \cdot \left(\tilde{E}_2 + U_1^{(22)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(22)} \right),$$

$$\Xi_5 = \left(\tilde{E}_2 + U_1^{(22)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(22)} \right), \quad \Xi_6 = \left(\tilde{E}_1 + \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(11)} + U_2^{(11)} \right)$$

By substituting these roots one by one into (7), we can find two solutions to the system, $(C_1/C_2)_{+}$ and $(C_1/C_2)_{-}$, which, according to (7), determine the wave functions $\tilde{\psi}_1(z), \tilde{\psi}_2(z)$ belonging to energy levels $\tilde{E}_{+}$ and $\tilde{E}_{-}$.

CONCLUSION

Thus, in tunnel-connected wells, energy levels are shifted relative to the levels of isolated wells, and wave functions arise from the wave functions of isolated wells as a result of them. We can simplify system (7), preserving the main features of its solutions, if we neglect contributions from $U_{1,2}^{(mn)}$, where

$n = 1, 2$. Then (7) takes the form

$$\begin{cases} \Re_1 C_1 + C_2 (\tilde{E}_2 - \tilde{E}') = 0, \\ C_1 (\tilde{E}_1 - \tilde{E}') + \Re_2 C_2 = 0, \end{cases} \quad (11)$$

where $\Re_1 = \left(1 - \frac{m_1}{\mu_{12}^+}\right) U_1^{(21)} + U_2^{(21)}$, $\Re_2 = U_1^{(12)} + \left(1 - \frac{m_2}{\mu_{12}^+}\right) U_2^{(12)}$. Then, by equating the determinant of the system of equations (11) to zero, we obtain, instead of (8), a less cumbersome equation

$$\tilde{E}'^2 - (\tilde{E}_1 + \tilde{E}_2) \tilde{E}' + \tilde{E}_1 \tilde{E}_2 + \Re_1 \Re_2 = 0, \quad (12)$$

whose roots are equal

$$\tilde{E}'_{\pm} = \frac{1}{2} \left[\tilde{E}_1 + \tilde{E}_2 \pm \sqrt{(\tilde{E}_1 - \tilde{E}_2)^2 + 4\Re_1 \Re_2} \right]. \quad (13)$$

The expression for the gap between energy levels (13), i.e. value $\Delta E = |\tilde{E}'_+ - \tilde{E}'_-|$. The quantity $\Delta E_{asym} = |\tilde{E}_1 - \tilde{E}_2|$ is a measure of the asymmetry of two quantum wells, and it is zero for symmetric wells. If its square dominates the root sign in (4), then $\Delta E \approx \Delta E_{asym}$. In this case, the solutions to system (11) correspond to wave functions $\Delta E \approx \Delta E_{asym}$ close to the original functions ψ_1, ψ_2 , that is, there is almost no mixing of wave functions. In the opposite case, when the asymmetry of the wells is negligible, then the gap between the levels (13) in tunnel-connected wells is $\Delta E \approx \sqrt{4\Re_1 \Re_2}$, where this value characterizes the tunnel splitting of energy levels. In this case, solutions to system (11) correspond to strong mixing of the original wave functions, where the coefficients C_1 and C_2 are comparable in absolute value to each other.

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Rezyume: Geometrik o'lchamlariga nisbatan simmetrik va assimetrik bo'lgan ko'p qatlamli va nano o'lchamli yarimo'tkazgichli strukturalarning kinetik xususiyatlari taqiq qilingan. Nazariy hisoblashlarda elektronlar tizimi uchun Shredingerning matritsaviy tenglamasini yechish uchun turli matematik usullardan foydalangan holda turli modellar yaratilgan.

Masala Bastard sharti - strukturaning qo'shni qatlamlarida tok tashuvchilar effektiv massalarining farqini e'tiborga olingan holda yechilgan.

Bir biri bilan tunnel bog'langan, ya'ni tor tunnel-shaffof potensial bilan ajratilgan kvant o'ralarda elektronli holatlar nazariy tahlil qilingan.

Резюме: Исследованы кинетические свойства как симметричных, так и асимметричных по отношению геометрических размеров многослойных и наноразмерных полупроводниковых структур. Теория создавалась в разных моделях с использованием различных математических способов решения матричного уравнения Шредингера для системы электронов.

Задача решена с учетом условия Бастарда: разность эффективных масс носителей тока в соседних слоях структуры.

Проанализированы туннельно – связанные электронные состояния в квантовых ямах, между которыми находится узкий - туннельно-прозрачный потенциальный барьер.

Kalit so'zlar: ko'p qatlamli va nano o'lchamli yarimo'tkazgichli strukturalar, Shredingerning matritsaviy tenglamasi, gamiltonian, elektronlar, Bastard sharti.

Ключевые слова: многослойные и наноразмерные полупроводниковые структуры, матричное уравнение Шредингера, гамильтониан, электроны, условие Бастарда.

UDC 519.722

ON THE ISSUE OF DIAGNOSTICS OF THE STATE OF TECHNOLOGICAL SYSTEMS WITH HIGH ENTROPY

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Summary: *The properties of the entropy of the system have been studied, which justify its choice as a characteristic of the degree of uncertainty. Technical diagnostics of the technological process has been studied. The factors influencing the state of technological systems with high entropy are analyzed.*

Key words: *Technological diagnostics, entropy, predictive diagnostics, television monitoring, machine learning, Internet of things, forecasting.*

A message as an object about which information is transmitted; in information theory, a physical system is considered, which is characterized by a degree of uncertainty [1]. The degree of uncertainty of a physical system is determined by the number of its possible states and the probabilities of states. As a measure of a priori uncertainty of a system, information theory uses a characteristic called entropy [2].

The task of technological diagnostics is to determine the degree of deviation of the technological process in the normal mode. The main goal of such diagnostics is to bring the process to an optimal state and prevent possible failures or accidents [3].

To determine the state of technological systems with high entropy, it is necessary to determine the factors influencing the process and develop a diagnostic algorithm.

The entropy of the system $H(X)$ has a number of properties that justify its choice as a characteristic of the degree of uncertainty [4].

Property 1. Entropy of a system with equally possible states $p_i = \frac{1}{n}$ equal to the logarithm of the number of states n .

Property 2. When independent systems are combined, their entropies add up.

Property 3. If two arbitrary systems X and Y are combined into one, then the entropy of the complex system (X,Y) is equal to:

$$H(X,Y)=H(X)+H(Y/X), \quad (1)$$

where $H(Y/X)$ is the conditional entropy of the second part Y relative to the first X .

Property 4. The total conditional entropy of the system $H(Y/X)$ does not exceed its unconditional entropy $H(Y)$.

Consequence. From the above properties it follows that entropy can serve as a measure of the uncertainty of the state of a physical system.

Technical process diagnostics are an important part of ensuring the continuity and efficiency of production operations [5]. The main areas in this area include the following: Equipment condition monitoring, Data analysis and machine learning, Using the Internet of Things (IoT), Television monitoring, Preventative maintenance, Predictive diagnostics, Forecasting and warning, Regular maintenance and diagnostics of equipment, Automation and monitoring systems, Data management.

№	Areas of diagnostics of technological process	Determining the direction of diagnosis

1.	Equipment condition monitoring	Constant monitoring of the condition of machines and equipment makes it possible to identify preconditions for failures and carry out preventive technical diagnostics. This includes the use of various sensors and systems such as vibration, wear, temperature and pressure monitoring systems.
2.	Data analysis and machine learning.	Applying machine learning techniques to analyze equipment health data can help in early detection of anomalies or changes that may indicate potential problems in the process.
3.	Using the Internet of Things (IoT)	The introduction of Internet of Things technologies allows you to receive data in real time from various equipment, which simplifies monitoring and makes it possible to diagnose technical problems much faster.
4.	Television monitoring	The use of television cameras to monitor the thermal parameters of equipment helps detect overheating, malfunctions and other anomalies, allowing timely action to be taken.
5.	Preventative maintenance	Perform regular preventive maintenance and diagnostics on equipment to identify early signs of wear and problems, thereby preventing serious failures.
6.	Predictive diagnostics	Using a variety of data to develop models that predict expected equipment behavior and warn of potential failures based on given predictions.
7.	Forecasting and warning	Using prediction and modeling techniques to identify hidden problems and prevent potential failures.
8.	Regular maintenance and diagnostics of equipment	Perform preventive inspections, maintenance and diagnostics to identify potential problems and prevent failures.
9.	Automation and monitoring systems	The use of automated monitoring and diagnostic systems that allow for real-time diagnostics and notification of possible problems.
10.	Data management	Providing storage and management of data on the condition of equipment and its technical diagnostics for subsequent analysis and decision-making.

Overall, process diagnostics plays an important role in ensuring the reliability and efficiency of manufacturing operations by identifying and correcting problems before they become critical failures.

To determine the state of technological systems with high entropy, factors become more specific and diverse. In the context of high entropy systems, high levels of complexity and uncertainty require deeper analysis and clarification of factors, including [6]:

Regular monitoring of parameters. It is necessary to regularly monitor the main parameters of the system, such as temperature, pressure, electrical parameters and other important parameters that may affect its functioning.

Time series analysis. Time series analysis reveals patterns and trends in system parameters. In the context of high entropy, this analysis will help identify nonlinear dynamics and changes that may be indicative of the state of the system.

Processing big data. Accumulating and analyzing large amounts of data from various sources is key to understanding high entropy. This allows you to see the full picture of processes and identify common patterns, anomalies and outliers.

Predictive diagnostics. The use of predictive diagnostics and forecasting methods helps determine possible future states of the system based on current data and trends.

Taking into account external factors. In the context of high entropy, it is important to consider the influence of external factors such as the environment, suppliers, customers, legislation and other external stimuli that can influence the state of the system.

Definition of "normal". Understanding "normality" in the context of high entropy also becomes important. Instead of clearly defined rules, normality can be defined as the range of parameters where the system is usually located.

Risk and vulnerability analysis. Identification of potential risks and vulnerabilities of a system in high entropy conditions requires special attention to a variety of factors and the consequences of their interaction.

These areas are important to ensure efficient operation of equipment and anticipate possible problems in the process. Work in this direction involves the use of advanced technologies, analytics and predictive methods to ensure stability and efficiency of production operations.

Thus, the entropy of information can be used to assess the stability, reliability and efficiency of technological processes. High entropy may indicate abnormal situations or potential problems, while low entropy may indicate stability and sustainability of the process. This makes information entropy a useful tool for technical diagnostics of technological processes.

In general, for systems with high entropy, clarification of factors becomes an important aspect of the diagnostic process, requiring a deeper and more diverse approach.

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Rezyume: Tizim noaniqlik darajasining xarakteristikasi sifatida tanlanishini asoslaydigan xususiyati tizim entropiyasi o'rganildi. Texnologik jarayonning texnik diagnostikasi tadqiq etildi. Yuqori entropiyaga ega bo'lgan texnologik tizimlar holatiga ta'sir qiluvchi omillar tahlil qilindi.

Резюме: Изучены свойства энтропии системы, которые оправдывают выбор её в качестве характеристики степени неопределенности. Исследовано техническое диагностирование технологического процесса. Анализированы факторы, влияющие на состояния технологических систем с высокой энтропией.

Kalit so'zlar: Texnologik tashhishlash, entropiya, prognostic tashhis, televizion monitoring, mashinali o'qitish, Internet buyumlari, bashoratlash.

Ключевые слова: Технологическая диагностика, энтропия, прогностическая диагностика, телевизионный мониторинг, машинное обучение, интернет вещей, прогнозирование.

LITERARY JUSTIFICATION OF FOUNDRY WASTE AS ADDITIVES FOR CEMENT

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Summary: *The article studied the literary justification of cement production using the maximum amount of waste raw materials as an additive to cement.*

Key words: *gypsum, porosity, silica, gas processing, gas sludge, clinker.*

Currently, an empirical approach is used in the selection of technological additives for cement grinding, based only on the results of industrial tests. The existing information and results of the practice of using a particular technological additive are insufficient for generalization and its reasonable application in the technology of cement production based on clinker of different mineralogical composition. The focus of the work on conducting a comprehensive study of the mechanisms and effectiveness of the effect of the composition of technological additives on the grinding process and the physico-mechanical properties of cement, depending on the mineralogical composition of the clinker, determines its relevance.

When using concrete and reinforced concrete structures, it is necessary to overcome the problems associated with the quality of concrete during solidification and drying to decrease in size and experience shrinkage. To solve shrinkage problems, special attention is paid to materials that, when added to conventional Portland cement, make it possible to obtain non-shrinkable, expanding cements. A well-known method for producing expanding cements is the joint grinding of cement clinker, gypsum and a special additive. In addition, the introduction of active mineral additives with pozzolan properties makes it possible to compact the structure of cement stone, reduce porosity, increase strength and reduce shrinkage. They also save clinker for cement production, contribute to cost reduction and help reduce environmental stress [1].

The paper [2] presents the results of research on the creation of a high-strength cement composite using a complex additive. The optimal concentrations of additives of the hyperplasticizer Odolit-K in combination with bentonite have been determined. A significant decrease in the I/c ratio and an increase in the strength of the cement stone were obtained. High-strength cement composites were obtained with the optimal content of the complex additive. This paper discusses the use of microsilicon and methods of its activation for modifying the structure of cement stone and concrete based on it. With regard to any type of filler, in particular microsilicon, the following issues are relevant: how and how much to introduce, what mechanisms are involved in the process of structure formation, how much does the achieved effect of modifying the structure cost, and others [3].

The effect of the additive content on the deformation property of the composite binder was studied using the experimental planning method. In [4], the author studied the effect of mineral additives, namely the meta-properties of Portland cement. The study conducted by Ryshchenko and Vyatkin considers the use of gas sludge, waste from processing gas condensate, as an organomineral additive to increase the energy efficiency of Portland cement production and save resources, not inferior to the quality of the final product.

A review of the literature indicates the relevance of using gas processing waste to increase the clinker temperature and accelerate mineral formation during the synthesis of Portland cement. The conducted research shows the need for further study of the effect of organomineral additives on the construction and technical properties of Portland cement, as well as on the optimization of firing processes in cement production.

The purpose of the work was to theoretically substantiate and experimentally confirm the use of gas sludge to reduce the temperature of clinker synthesis, which includes studying the effect of sludge

on the physical and mechanical properties of Portland cement, as well as evaluating the economic efficiency of the proposed technology.

Experimental studies included thermodynamic analysis and the use of hardware physico-chemical methods to analyze the phase composition of clinker and hydration products. Technical conditions and technological regulations for the production of Portland cement with an organomineral additive were developed, requirements for the composition and characteristics of cement with such an additive were determined.

The importance of confirming the effectiveness of the use of an organomineral additive, as well as the absence of a negative effect on the properties of concrete, has been emphasized in studies, which requires appropriate tests.

Information is provided on the effect of synthesized aluminosilicates on the properties of cement systems. The effectiveness of the use of aluminosilicates in lime and cement systems has been shown [5]. The acceleration of the cement setting time in the presence of additives of synthesized aluminosilicates has been established. The amorphous structure of the synthesized additives and their high hydraulic activity were revealed.

Despite the large number of works aimed at improving the efficiency of cement, the literature data of foundry waste theoretically corresponds as additives for cement. Clinker savings, hardening rates and reduction of energy consumption in the production of cement, concrete and reinforced concrete products depend on the success of its solution.

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Rezyume: *Maqolada tsementga qo'shimcha sifatida chiqindi xom ashyoning maksimal miqdoridan foydalangan holda tsement ishlab chiqarishning adabiyotlar taxlili o'rganilgan.*

Резюме: *в статье изучалось литературная обоснования производства цемента с использованием максимального количества отходов сырья в качестве добавки к цементу.*

Kalit so'zlar: *gips, g'ovaklilik, kremniy, gazni qayta ishlash, gaz loyi, klinker.*

Ключевые слова: *гипс, пористость, микрокремнезема, газопереработки, газошлам, клинкер.*

UDC 541.123:54621

THEORY OF LINEAR-CIRCULAR DICHROISM IN MONOLAYERS OF DICHALCOGENIDE METALS WITH SINGLE AND MULTI-PHOTON ABSORPTION OF POLARIZED LIGHT

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Summary: The polarization and frequency dependences of the probabilities of one-, two-, and three-photon optical transitions occurring between the valence band and the conduction band in monolayers of transition metal dichalcogenides have been calculated. The calculation was carried out in the four-band approximation taking into account the spin states of current carriers.

One-, two-, and three-quantum interband optical transitions are analyzed, differing from each other in the type of virtual states that can appear both in the subbands of the valence band and in the conduction band.

It is shown that with increasing light frequency, the coefficient of single- and multi-photon linear-circular dichroism first increases and reaches a maximum, then decreases in the region of low frequency values, and then increases slightly.

Key words: polarized photon, matrix element, linear-circular dichroism, optical transitions, four-band approximation, current carriers, electron, hamiltonian, momentum operator, spin states.

INTRODUCTION

The discovery of a method for producing graphene [1] aroused great interest in the study of various two-dimensional atomically thin layers of transition metal dichalcogenides with unique physical properties. Transition metal dichalcogenides (TMDs) are chemical compounds designated as MX_2 , where M is a transition metal (Mo, W etc.) and X is a chalcogen (S, Se etc.) [2-8].

In the last few years, there has been a special place in two-dimensional structures such as graphene, monolayers of transition metal dichalcogenides (TMDs), monolayers of hexagonal boron nitride and van der Waals heterostructures based on them, semiconductor nanosystems [5,6]. The most common representatives of TMD $MoS_2, MoSe_2, WS_2$ are monolayers of materials WSe_2 [7-10] and such two-dimensional systems are actively studied both experimentally and theoretically [2]. Note that the boundaries of the hexagonal Brillouin zone are formed at the points $K_{\pm}$. In such cases, in the dipole approximation, σ^+ or σ^- polarized light is absorbed in the K_+ or K_- valleys, respectively [2, 9].

Currently, a number of studies are being carried out on the physical properties of various structures of metal dichalcogenides [9], however, the absorption of polarized radiation by the structures has so far been poorly studied. In this regard, the theoretical study of single- and multiphoton absorption and linear-circular dichroism in monolayers of dichalcogenides is relevant, to the theoretical study of which this work is devoted.

ENERGY SPECTRUM OF CURRENT CARRIERS IN MONOLAYERS OF TRANSITION

The monomolecular layer of TMD D_{3h} is characterized by a point group in which the horizontal plane of specular reflection passes through the layer of metal atoms. The elementary lattice contains a metal atom and two chalcogen atoms located in planes above and below the metal plane. The Brillouin zone is described as a regular hexagon. The correct band gaps are at points $K_{\pm}$. In the region of the $K_{\pm}$ points, the dispersion of electrons in the valence band and conduction band has a parabolic form. In this case, symmetry with respect to the time inversion operator allows us to associate states with

opposite spins in different valleys. Then the Hamiltonian describing states in the conduction and valence bands with parallel spins [9] will be written in the form of a 2x2 matrix

$$H_+ = \begin{pmatrix} E_g / 2 & \gamma(k_x - ik_y) \\ \gamma(k_x + ik_y) & -E_g / 2 \end{pmatrix}. \quad (1)$$

Here $k_\perp = (k_x, k_y)$ is a two-dimensional wave vector, calculated from point K_+ , γ parameter, proportional to the interband matrix element of the momentum operator, E_g is the band gap. For spin levels in the same valley, $s = -1/2$ (1) $E_g \rightarrow E_g + \Delta$ is determined by changing the shape of the Hamiltonian, where Δ is the sum of the energy gaps corresponding to the spin-orbit splittings of the conduction and valence bands. Note that the band gaps in structures based on molybdenum and tungsten are quantitatively different [7-11]. The effective Hamiltonian in the valley K_- is determined by the change in (1) $k_x \pm ik_y \rightarrow k_x \mp ik_y$ [1]. The energy spectrum of the electron (1), belonging to the Hamiltonian, is expressed as follows (it is also called the Dirac energy spectrum [11])

$$\varepsilon_{\lambda,k} = \lambda \varepsilon_k, \quad \varepsilon_k = \sqrt{(E_g / 2)^2 + \gamma^2 k_\perp^2} \quad (2)$$

where $\tau = +$ corresponds to the conduction band and $\tau = -$ to the valence band. Since the numerical values of the band gap are different [7-13], therefore the $E_\pm(\vec{k}_\perp)$ energy spectrum is shown in Fig. 1 in relation to different values of the band gap (Fig. 1 a) and effective electron mass (Fig. 1 b).

In a number of literary sources, in particular in [6], the numerical values of the effective mass of electrons and the band gap in monolayers of metal dichalcogenides are given differently. Therefore, Fig. 1 $E_\pm(\vec{k}_\perp)$ shows graphs of the energy spectra of current carriers for various values of the band parameters mentioned above: the energy spectrum band gap for a specific value of the effective mass and the results in relation to a two-dimensional wave vector. The energy spectrum depending on the effective mass and two-dimensional wave vector for a fixed value of the band gap is shown in Fig. 2.

LINEAR CIRCULAR DICHROISM OF POLARIZED LIGHT IN MONOLAYERS OF METAL DICHALCOGENIDES. FOUR-ZONE APPROACH

The study of nonlinear optical processes in semiconductors opens up wide opportunities for a detailed analysis of the symmetry of the structure, the properties of the energy spectrum of current carriers, and the rules for choosing optical transitions [2, 13]. In particular, the study of linear-circular dichroism in crystals of cubic or tetrahedral symmetry with isotropic linear optical properties makes it possible to determine the anisotropy of absorption depending on the degree of polarization [13]. Below we will consider linear-circular dichroism under conditions of two- and three-photon absorption in monolayers of metal dichalcogenides within the framework of the four-band approximation.

First, let us analyze the nonlinear absorption of light, neglecting the Coulomb interaction of the electron and hole. In this case, K_τ the probability of an N -photon transition between the valence band and the conduction band in the valley ($\tau = \pm$) is determined by the relation

$$W_{cv,\tau}^{(N)}(e) = \frac{2\pi}{\hbar} \left(\frac{eA_0}{c} \right)^{2N} \sum_{\vec{k}} \left| M_{cv,\tau}^{(N)}(\vec{e}) \right|^2 \delta(N\hbar\omega - 2E_k). \quad (3)$$

Here A_0 – is the amplitude of the electromagnetic wave potential vector, ω and $\vec{e}$ are the frequency and complex vector of light polarization, E_k is the energy of current carriers (see (2)), $2E_k$ is the energy of a photoexcited electron-hole pair, $M_{cv,\tau}^{(N)}(\vec{e})$ is the matrix element N - photon absorption of light in the K_τ valley, where it was assumed that light falls normally to the plane of the monolayer.

It is known [14-16] that the coefficient of linear-circular dichroism

$$L^{(N)} = \frac{W_{cv,+}^{(N)}(circ) + W_{cv,-}^{(N)}(circ)}{W_{cv,+}^{(N)}(lin) + W_{cv,-}^{(N)}(lin)} \quad (4)$$

is determined by the ratio of the probabilities of optical transitions upon absorption of linearly and circularly polarized light. Next, we will analyze in more detail the spectral dependence of single- and multiphoton linear-circular dichroism in the TMD.

In the two-band approximation, the Hamiltonian of current carriers in monolayers of metal dichalcogenides is written in the following form [1-4]

$$\mathcal{H} = \begin{bmatrix} \frac{E_g}{2} & \vartheta_0 \hbar \vec{\sigma} \cdot \vec{k} \\ \vartheta_0 \hbar \vec{\sigma} \cdot \vec{k} & -\frac{E_g}{2} \end{bmatrix}, \quad (5)$$

Here $\vec{\sigma} = (\sigma_x, \sigma_y, \sigma_z)$ is the Pauli matrix. In this case, the energy spectrum of current carriers is expressed as

$$E_{c,v}(\vec{k}) = \pm \varepsilon, \quad \varepsilon = \sqrt{\left(\frac{E_g}{2}\right)^2 + \hbar^2 v_0^2 k^2} \quad (6)$$

the eigenfunction of Hamiltonian (5) will be written as

$$\psi_{+s} = \frac{1}{\sqrt{2\varepsilon}} \begin{bmatrix} \sqrt{\varepsilon + \frac{E_g}{2}} \alpha_s \\ \sqrt{\varepsilon - \frac{E_g}{2}} \frac{\vec{\sigma} \cdot \vec{k}}{k} \alpha_s \end{bmatrix}, \quad \psi_{-s} = \frac{1}{\sqrt{2\varepsilon}} \begin{bmatrix} -\sqrt{\varepsilon - \frac{E_g}{2}} \frac{\vec{\sigma} \cdot \vec{k}}{k} \alpha_s \\ \sqrt{\varepsilon + \frac{E_g}{2}} \alpha_s \end{bmatrix}. \quad (7)$$

As a result, the velocity operator is determined by the relation

$$\hat{v} = v_0 \begin{bmatrix} 0 & \vec{\sigma} \\ \vec{\sigma} & 0 \end{bmatrix},$$

Here $v_0 = \gamma/\hbar$ is a constant value that is determined by the band parameters of the semiconductor. Then the intraband matrix elements of the velocity operator, calculated from the wave function and corresponding to interband optical transitions, are defined as

$$\vec{e} \cdot \vec{v}_{cs',cs} = -\vec{e} \cdot \vec{v}_{vs',vs} = \frac{1}{\hbar} \frac{\partial \varepsilon}{\partial \vec{k}} \delta_{s's} = \frac{\hbar v_0^2 \vec{e} \cdot \vec{k}}{\varepsilon} \delta_{s's}, \quad (8)$$

and the interband matrix element of the velocity operator has the form

$$\begin{aligned} \vec{e} \cdot \hat{v}_{c,v} &= \vec{e} \cdot \hat{v}_{v,c} = v_0 \left[\vec{\sigma} \cdot \vec{e} - \frac{\hbar^2 v_0^2}{\varepsilon \left(\frac{E_g}{2} + \varepsilon\right)} (\vec{\sigma} \cdot \vec{k})(\vec{e} \cdot \vec{k}) \right] = \\ &= v_0 \left[\vec{\sigma} \cdot \vec{e} - \frac{\varepsilon - \frac{E_g}{2}}{\varepsilon} \left(\vec{\sigma} \cdot \frac{\vec{k}}{k} \right) \left(\vec{e} \cdot \frac{\vec{k}}{k} \right) \right]. \end{aligned} \quad (9)$$

Then the constituent matrix elements of two- and three-photon optical transitions are defined as:

$$M_{cs,vs}^{(2)} = \frac{\vec{e} \cdot \vec{v}_{cs',cs'} - \vec{e} \cdot \vec{v}_{vs,vs}}{\hbar \omega} \vec{e} \cdot \vec{v}_{cs',vs} = 2 \frac{\vec{e} \cdot \vec{v}_{cs,cs}}{\hbar \omega} \vec{e} \cdot \vec{v}_{cs',vs}, \quad (10)$$

$$\begin{aligned} M_{cs,vs}^{(3)} &= \frac{v_{cs',vs} v_{vs,cs_1} v_{cs_1,vs}}{-4(\hbar \omega)^2} + \frac{v_{cs',cs'}^2 + v_{vs,vs}^2 - 2v_{cs',cs'} v_{vs,vs}}{2(\hbar \omega)^2} v_{cs',vs} = \\ &= -\frac{v_{cs',cs_2} v_{vs,cs_1} v_{cs_1,vs}}{4(\hbar \omega)^2} + 2 \frac{v_{cs',cs'}^2}{(\hbar \omega)^2} v_{cs',vs}, \end{aligned} \quad (11)$$

where $v_{n's',ns} = \vec{e} \cdot \vec{v}_{n's',ns}(\vec{k})$. If we take into account the following relationship,

$$\hat{v}_{c,v} \hat{v}_{v,c} = v_0^2 \left[\vec{e} \cdot \vec{e} - \frac{\varepsilon^2 - \left(\frac{E_g}{2}\right)^2}{\varepsilon^2} \left(\frac{\vec{e} \cdot \vec{k}}{k} \right)^2 \right] \hat{I}_{2 \times 2} \quad (12)$$

then the composite matrix element of three-photon optical transitions takes the following form

$$M_{cs,vs}^{(3)} = \frac{v_0^2}{(2\hbar\omega)^2} \left(-\vec{e} \cdot \vec{e} + 9 \frac{\varepsilon^2 - \left(\frac{E_g}{2}\right)^2}{\varepsilon^2} \left(\frac{\vec{e} \cdot \vec{k}}{k} \right)^2 \right) v_{cs',vs}. \quad (13)$$

According to the latest expressions (7-10), the probabilities of one-, two- and three-photon optical transitions are described by the following relations:

$$W_{cv}^{(1)} = \frac{2\pi}{\hbar} \left(\frac{eA_0}{c} \right)^2 \frac{1}{V} \sum_{s'sk} |\vec{e} \cdot v_{cs',vs}|^2 (f_{vs}^{(1)} - f_{cs}^{(1)}) \delta(2\varepsilon - \hbar\omega), \quad (14)$$

$$W_{cv}^{(2)} = \frac{2\pi}{\hbar} \left(\frac{eA_0}{c} \right)^4 \frac{1}{V} \sum_{s'sk} |M_{cs,vs}^{(2)}|^2 (f_{vs}^{(2)} - f_{cs}^{(2)}) \delta(2\varepsilon - 2\hbar\omega) = \quad (15)$$

$$= \frac{2\pi}{\hbar} \left(\frac{eA_0}{c} \right)^4 \frac{1}{V} \sum_{s'sk} \frac{4v_0^2}{(\hbar\omega)^2} \frac{\varepsilon^2 - \left(\frac{E_g}{2}\right)^2}{\varepsilon^2} \left| \frac{\vec{e} \cdot \vec{k}}{k} \right|^2 |\vec{e} \cdot v_{cs',vs}|^2 (f_{vs}^{(2)} - f_{cs}^{(2)}) \delta(2\varepsilon - 2\hbar\omega).$$

$$W_{cv}^{(3)} = \frac{2\pi}{\hbar} \left(\frac{eA_0}{c} \right)^6 \frac{1}{V} \sum_{s'sk} |M_{cs,vs}^{(3)}|^2 (f_{vs}^{(3)} - f_{cs}^{(3)}) \delta(2\varepsilon - 3\hbar\omega) =$$

$$(16) = \frac{2\pi}{\hbar} \left(\frac{eA_0}{c} \right)^6 \frac{1}{V} \sum_{s'sk} \frac{v_0^4}{(2\hbar\omega)^4} (f_{vs}^{(3)} - f_{cs}^{(3)}) \left| \vec{e} \cdot \vec{e} - 9 \frac{\varepsilon^2 - \left(\frac{E_g}{2}\right)^2}{\varepsilon^2} \left(\frac{\vec{e} \cdot \vec{k}}{k} \right)^2 \right|^2 |\vec{e} \cdot v_{cs',vs}|^2 \times \delta(2\varepsilon - 3\hbar\omega).$$

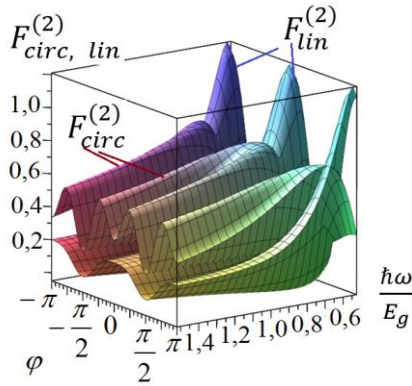


Fig. 1. Spectral and angular dependences of the quantities $F_{lin}^{(2)}$ and $F_{circ}^{(2)}$, describing the probability of two-photon interband optical transitions (the contribution of the coherent saturation effect is not taken into account).

Fig.1 shows the spectral ($\frac{\hbar\omega}{E_g}$) and angular dependences of the quantities $F_{lin}^{(2)}$ and $F_{circ}^{(2)}$, which describe the probabilities of a two-photon interband optical transition, calculated using (14-16) expressions. In this case, φ is the angle between the polarization vector of light and the wave vector of current carriers (photon) for linearly (circularly) polarized light. From this figure it is clear that the probabilities of two-photon interband transitions vanish at certain values of the photon energy and angle φ . It follows that two-photon interband circular dichroism can be observed at certain values of photon energy and angle.

Then, after averaging the values over the solid angles of the wave vector of the current carriers, we obtain expressions for $F_{lin,circ}^{(3)}$, with the help of which we can determine the coefficient of three-photon linear-circular dichroism

$$F_{lin}^{(3)} = 1 - \frac{19}{2} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right) + \frac{297}{8} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)^2 - \frac{405}{16} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)^3, \quad (17)$$

$$F_{circ}^{(3)} = \frac{81}{8} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)^2 \left(1 + \left(\frac{E_g}{3\hbar\omega} \right)^2 \right). \quad (18)$$

The linear-circular dichroism coefficient (η) for three-photon optical transitions is determined using the relation

$$\eta = \frac{F_{lin}^{(s)}}{F_{circ}^{(s)}} = \frac{1 - \frac{19}{2} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right) + \frac{297}{8} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)^2 - \frac{405}{16} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)^3}{\frac{81}{8} \left(1 - \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)^2 \left(1 + \left(\frac{E_g}{3\hbar\omega} \right)^2 \right)} \quad (19)$$

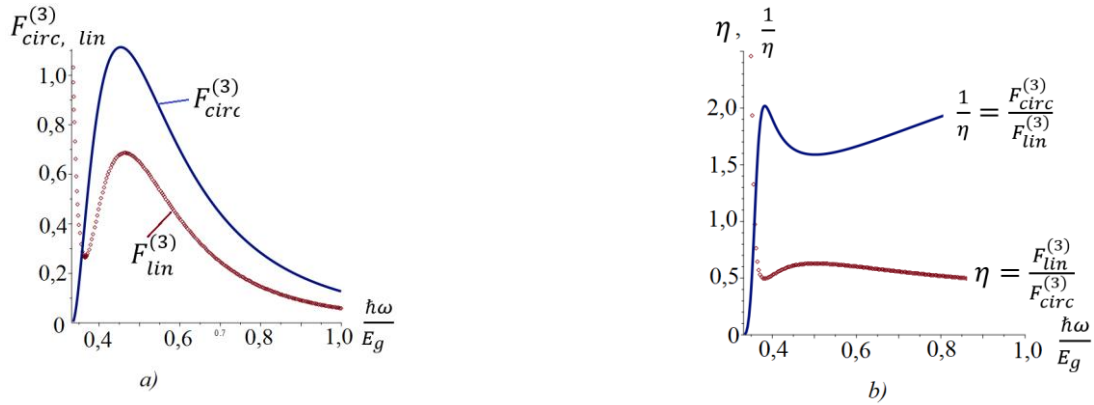


Fig. 2. Spectral dependence of the quantities $F_{circ, lin}^{(3)}$ (a), $\eta = \frac{F_{lin}^{(s)}}{F_{circ}^{(s)}}$ and $\frac{1}{\eta} = \frac{F_{circ}^{(s)}}{F_{lin}^{(s)}}$ (b). In the calculations, the maximum value of $F_{lin}^{(3)}$ is normalized to unity.

Sometimes (for example, [13]) instead of the coefficient of linear circular dichroism of multiphoton absorption ($\eta = \frac{F_{lin}^{(s)}}{F_{circ}^{(s)}}$), the coefficient ($\frac{1}{\eta} = \frac{F_{circ}^{(s)}}{F_{lin}^{(s)}}$). Therefore, in Fig. Figure 2 shows graphs of the spectral dependence ($\frac{\hbar\omega}{E_g}$) of the values $F_{circ, lin}^{(3)}$ (a), $\eta = \frac{F_{lin}^{(s)}}{F_{circ}^{(s)}}$ and $\frac{1}{\eta} = \frac{F_{circ}^{(s)}}{F_{lin}^{(s)}}$ dependence of the coefficient of circular linear dichroism (b).

From Fig. 2 it can be seen that with increasing light frequency, the coefficient of linear-circular dichroism first increases and reaches a maximum, then decreases in the region of low frequency values, and then increases slightly. This occurs due to the complexity of the band structure of monolayers of metal dichalcogenides.

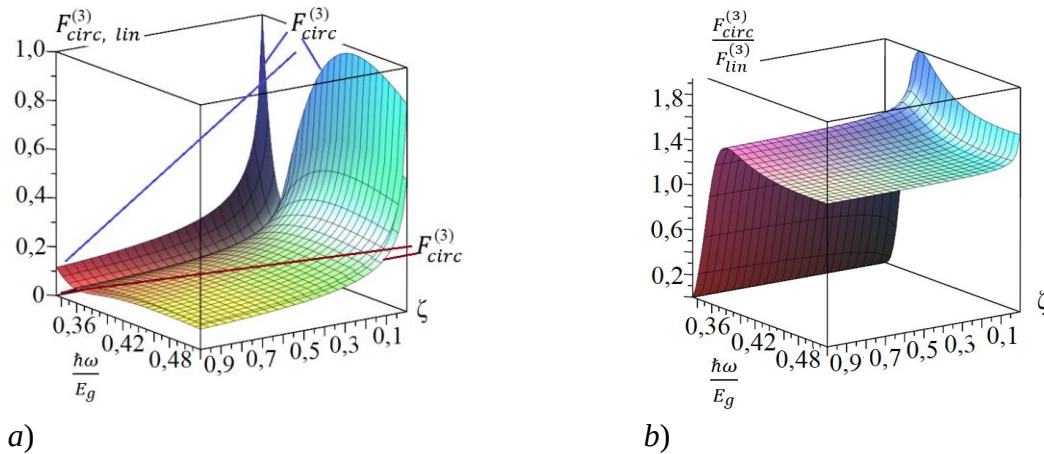


Fig. 3. Graph of the spectral dependence (on $\frac{\hbar\omega}{E_g}$) and the dependence of the Rabi parameter of the quantities $F_{lin}^{(3)}$ and $F_{circ}^{(3)}$, which describe the probabilities of three-photon interband optical transitions.

Calculations show that the optical parameters of TMD monolayers depend not only on the frequency of light, but on the Rabi parameter (see Fig. 3). From Fig. 3 it can be seen that the optical quantities associated with interband optical transitions, in particular, the coefficient of three-photon linear-circular dichroism, decrease with increasing Rabi parameter.

CONCLUSION

The theory of nonlinear absorption of polarized radiation [14-16] in two-dimensional atomically thin TMD layers has been developed.

It is shown that if we do not take into account the contribution of the coherent saturation effect to the coefficient of interband single-photon absorption of polarized radiation, then linear-circular dichroism does not arise in atomically thin TMD layers, since in this case the probabilities of single-photon optical transitions do not depend on the polarization state of the light.

It is shown that with increasing light frequency, the coefficient of single- and multi-photon linear-circular dichroism first increases and reaches a maximum, then decreases in the region of low frequency values, and then increases slightly. This occurs due to the complexity of the band structure of monolayers of metal dichalcogenides.

It was found that optical quantities associated with interband optical transitions, in particular, the coefficient of three-photon linear-circular dichroism, decrease with increasing Rabi parameter.

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Rezyume: *O'tish metalli dikalkogenidlarining monoqatlamlarida valent va o'tkazuvchanlik zonalari o'rtasida sodir bo'ladigan bir, ikki va uch fotonli optik o'tishlar ehtimolining qutblanish va chastotaga bog'liqligi hisoblangan. Hisoblash tok tashuvchilarning spin holatlarini hisobga olgan holda to'rt zonali yaqinlashuvda amalga oshirilgan.*

Virtual holatlar valent va o'tkazuvchanlik zonalarida bo'lgan hol bir, ikki va uch kvantli zonalararo optik o'tishlarga nisbatan nazariy tahlil qilingan.

Yorug'lik chastotasining ortishi bilan bir va ko'p fotonli chiziqli sirkular dixroizm koeffitsienti dastlab ortishi va maksimal qiymatga erishiub, so'ngra kamayishi aniqlangan, keyin biroz ortishi hisoblangan.

Резюме: *Рассчитаны поляризационные и частотные зависимости вероятностей одно-, двух и трех фотонных оптических переходов, происходящих между валентной зоны и зоной проводимости в монослоях дихалькогенидов переходных металлов. Расчет проведен в четырехзонном приближении с учетом спиновых состояний носителей тока.*

Проанализировано одно-, двух и трехквантовые межзонные оптических переходы, отличающиеся друг от друга типом виртуальных состояний, которые может оказаться как в подзонах валентной зоны, так и в зоне проводимости.

Показано, что с ростом частоты света коэффициент одно-и многофотонного линейно-циркулярного дихроизма сначала увеличивается и достигает максимума, затем уменьшается в области малых значений частоты, а далее незначительно увеличивается.

Kalit so'zlar: *qutblangan foton, matritsa elementi, chiziqli aylana dixroizm, optik o'tishlar, to'rt diapazonli yaqinlashish, tok tashuvchilar, elektron Gamiltonian, impuls operatori, spin holatlari*

Ключевые слова: *поляризованный фотон, матричный элемент, линейно-циркулярный дихроизм, оптические переходы, четырехзонное приближение, носители тока, гамильтониан электронов, оператор импульса, спиновые состояния.*

SYNTHESIS OF DRILLING MUDS STABILIZERS

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Summary: *The article presents the optimal conditions for the synthesis of polyacrylamide polymer as a stabilizer for drilling fluids. The optimal conditions for the temperature of the synthesis process, pH value, monomer concentration and initiator consumption were studied.*

Keywords. *Acrylamide, initiator, polyacrylamide, viscosity, drilling fluid, monomer, persulfate.*

Introduction. Nowadays, scientific research is underway to create new stabilizers for drilling fluids based on high-grade natural and synthetic raw materials all over the world. In this regard, special attention is paid to the synthesis of water-soluble polymers based on acrylamide as structure builders of clay and clay-free drilling fluids.

Polyacrylamide (PAA) and its water-soluble acrylic polymers are the most widely used polymers in industry, characterized by high molecular weight and low cost. Hydrophobic fragments of the hydrophilic chain impart high surface and interfacial activity to PAA, increasing its adsorption capacity. PAA is a very effective flocculant for water purification [1]. In addition, polyacrylamides modified with hydrophobic moieties are used as rheology modifiers in various aqueous drilling fluids [2], paints, biomedical applications [3], and other fields. The use of acrylic polymer additives in the preparation of drilling fluids makes it possible to reduce the construction time of a well, reduce emerging difficulties and solve other problems [4].

The purpose of this research work is to study the optimal conditions of temperature, pH value, monomer concentration and initiator consumption for the synthesis of polyacrylamide polymer as drilling fluid stabilizers and obtaining high molecular weight polymer in the synthesis processes.

Part of the experience

Acrylamide (AA) (JSC Navoiyazot) was chosen as a raw material for the synthesis of polyacrylamide. AA was purified by recrystallization in a benzene solution until high purity was achieved. To recrystallize 15 g of AA, 100 ml of benzene was added, then the mixture was heated to 64°C. The resulting solution was filtered through filter paper and left for 48 ± 1 h to remove a known amount of solvent from the resulting liquid. The resulting crystals were filtered and placed in a Petri dish to obtain white acrylamide [5]. Before using technical AA, it was recrystallized from a solution in benzene and dried in vacuum to constant weight at room temperature. AA purified in this way had the following properties: $t_{\text{tech}} = 84,65^{\circ}\text{C}$, $\rho = 1,13 \text{ g/cm}^3$.

Available data indicate that a 6-8% aqueous solution is traditionally used for the polymerization of acrylamide. 10-15% aqueous solutions of AA were used in the experiments. A mixture of potassium persulfate and sodium sulfite, which has oxidizing and reducing properties, was used as an initiator. The use of this redox mixed system makes it possible to reduce the temperature of the polymerization process compared to a monoinitiator system.

To obtain polyacrylamide of the required composition and structure, the radical polymerization of AA was carried out in a weakly and strongly alkaline environment at pH values of aqueous solutions consisting of mixtures of initial monomers and initiators. The polymerization process was carried out in the temperature range from 20 to 50°C and at a molar ratio of persulfate and sulfite initiators of 1:1,5 with concentrations of 0,01-0,2%. The synthesis process was carried out as follows: 100 cm³ of a solution containing 0,14 mol of AA and a mixture of initiators was poured into a 500 ml four-neck round-bottom flask equipped with a nitrogen purge system, a thermometer, a stirrer and a reflux condenser. The air in the system was purged with nitrogen, and the pressure in the flask was controlled by introducing and releasing a certain amount of nitrogen. The mixture was heated at 20-50°C for 1-6 hours with constant stirring. The pH value of the original solution is 2,4. As a result of the reaction, a thick, homogeneous transparent mass with a pH value of 2,1-2,2 was formed.

Discussion of the results obtained

To extract the polymer from the synthesized polymer solution, acetone was added to the polymer solution at room temperature and the polymer was precipitated. The precipitate was separated from the liquid medium and washed with acetone. It was dried in vacuum to constant weight, and the yield and composition of the polymer were determined. The composition of the residual monomer was determined by the bromide-bromate method [6].

Figures 1 and 2 show the dependence of the polymerization yield of the initial monomer and the viscosity of a 0,5% aqueous polymer solution on the duration of the process. From these curves it can be seen that at each temperature there are different output values of the process and there is a certain temperature with the highest output value. When this temperature is exceeded, the degree of polymerization decreases rapidly. This can be explained by diffusion limitation of elementary reactions, which increases with increasing solution viscosity.

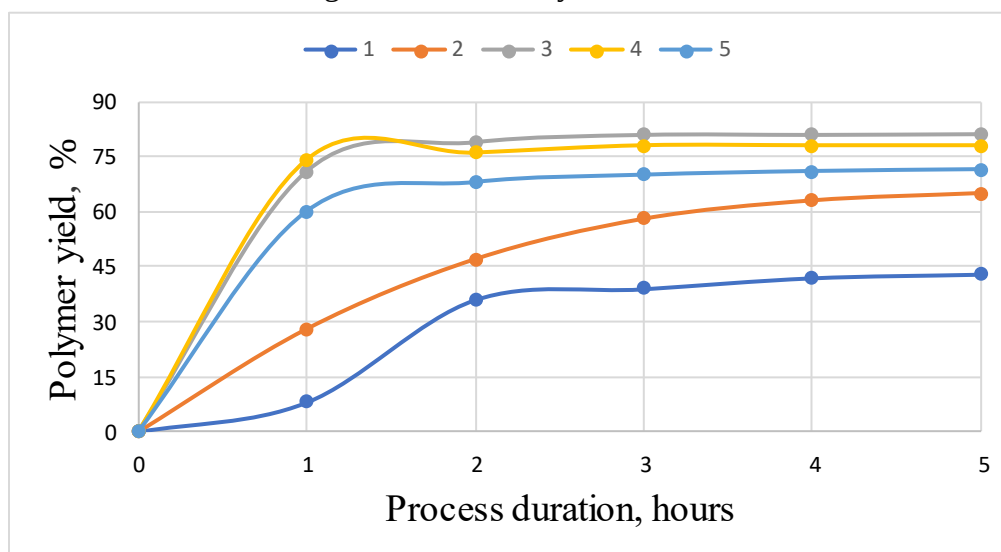


Figure 1. °C at different temperatures: 1) 30; 2) 35; 3) 40; 4) 45; 5) 50 Dependence of polymer yield on process duration. The initiator consumption is 0,05% by weight of the monomer.

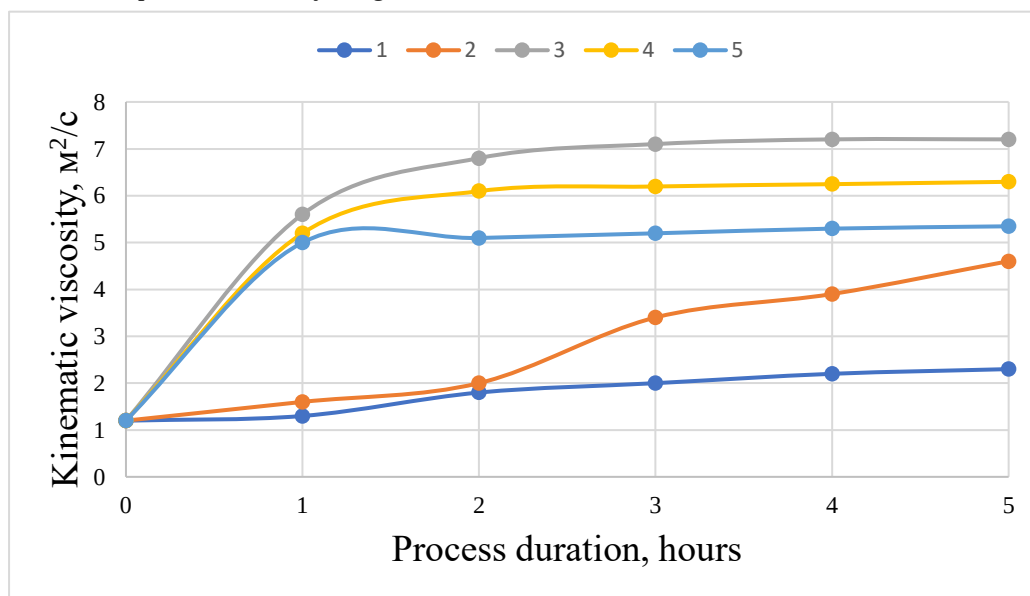


Figure 2. °C at different temperatures: 1) 30; 2) 35; 3) 40; 4) 45; 5) 50 Change in kinematic viscosity of a 0,5% polymer solution depending on the duration of the process. The initiator consumption is 0,05% by weight of the monomer.

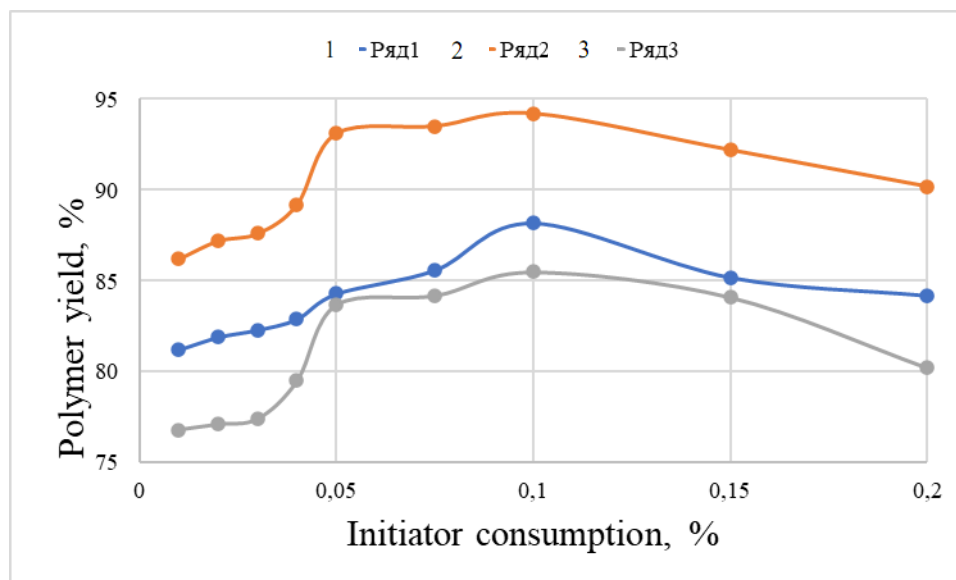


Figure 3. °C at different temperatures: 1) 50; 2) 40; 3) 30 Dependence of polymer yield on initiator consumption in the system.

In Figure 3 shows the dependence of the yield of polymer formation on the concentration of initiators in the system. Laboratory studies have shown that changing the amount of initiators affects the reaction yield regardless of monomer consumption. The concentration of initiators above 0,15% does not significantly affect the increase in the molecular weight of the polymer. By reducing the concentration of initiators to 0,05%, it is possible to synthesize a polymer with a high molecular weight, but it is known from experience that the process requires a long time (more than 4,5 hours). It was found that by increasing the initiator concentration from 0,05 to 0,1% (by weight of monomers), it is possible to increase the speed of the polymerization process and reduce the time from 4,5 to 1,5-2,5 hours. It was found that the polymer yield increased from 82,2 to 95,4%.

From the curves of the diagram it is clear that an increase in the number of initiators by 0,1% relative to the mass of monomers, on the contrary, leads to a decrease in the polymer yield and molecular weight. This change in polymer yield is likely due to an increase in the concentration of the initial active sites and free radicals, which, in turn, leads to recombination and breaking of the growing chain. It has been determined that it is desirable to maintain the amount of initiator at an average level of 0,05-0,1% relative to the weight of the monomer.

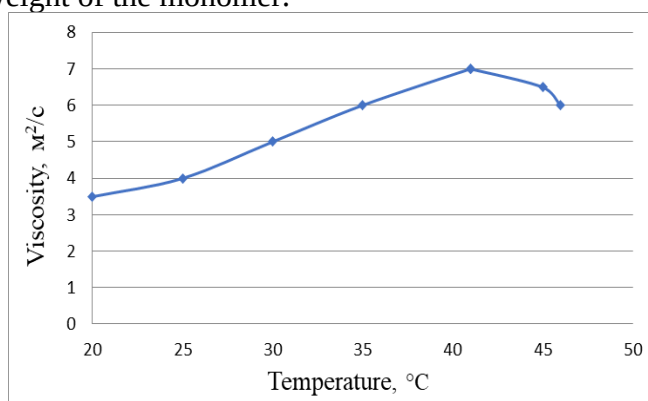


Figure 4. Dependence of the viscosity of a 0,5% PAA solution on the process temperature. Initiator consumption 0,05%, process duration 2 hours.

In Fig. Figure 4 shows the temperature dependence of the viscosity of a 0,5% aqueous solution of PAA. The graph shows that the degree of polymerization monotonically increases with increasing temperature, and the viscosity of the solution decreases after 40-41°C. Above these temperatures, the viscosity of the solution decreases, which is associated with a significant decrease in the molecular

weight of the resulting polymer. The viscosity of a polymer solution depends on the degree of polymerization and the molecular weight of the resulting polymer.

The influence of environmental pH on the polymerization of AA was studied. To do this, we first calculated the pH values of AA solutions and increased its value by adding a 10% NaOH solution. The results obtained are presented in Table 1.

Table 1

The influence of changes in environmental pH values on the polymerization process of AA*

pH	Process temperature, °C	Reaction yield, %	$\eta_x, \text{M}^2/\text{c}$
2,2	25	43,1	1,3
	40	81,2	7,1
	45	71,3	6,2
8,1	25	44,2	3,4
	40	89,3	7,5
	45	82,3	6,9
11,5	25	41,1	2,1
	40	80,9	6,9
	45	72,2	6,4

* initiator consumption is 0,05% by weight of monomers.

As a result of studies carried out in this way, the maximum value of the molecular weight of PAA, obtained under isothermal conditions, was achieved at a process temperature of $40 \pm 1^\circ \text{C}$ and when using redox initiators in an amount of 0,1% relative to the mass of the monomer. The increase in viscosity of the medium increases with increasing molecular weight of the polymer. Increasing the pH of the medium to 8,1 led to an increase in the yield of the polymer.

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Rezyume: Maqolada burg'ilash eritmalarining stabilizatorlari sifatida poliakrilamid polimerini sintez qilib olishning maqbul sharoitlari keltirilgan. Bunda sintez jarayonining harorati, pH qiymati, monomer kontsentratsiyasi va initsiator sarfining maqbul sharoitlarini o'rganildi.

Резюме В статье представлены оптимальные условия синтеза полиакриламидного полимера в качестве стабилизатора буровых растворов. При этом изучались температура процесса синтеза, значение pH, концентрация мономера и оптимальные условия расхода инициатора.

Kalit so'zlar. Akrilamid, initsiator, poliakrilamid, qovushqoqlik, burg'ilash eritma, monomer, persulfat.

Ключевые слова. Акриламид, инициатор, полиакриламид, вязкость, буровой раствор, мономер, персульфат.

UDC 666.942

INFLUENCE OF BARNED TUFFITE IN THE HARDENING OF PORTLAND CEMENT IN SULFATE ENVIRONMENT

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Summary: Fired tuffites at 600°C improve the water resistance of Portland cement and favorably affect the process of their hardening in fresh and mineralized water. All studied Portland cements with a saturation coefficient of 0.80-0.94 and with a content of 4-13% C₃A both in sulfates and in other salt solutions, similar in composition to natural waters, turned out to be unstable. But the introduction of a 20% addition of tuffite, obtained by firing at a temperature of 600°C, gives Portland cement salt resistance in mineralized sulfate waters.

Keywords: Portland cement, tuffite, aggressive solution, sulfate resistance, calcium hydrosulfoaluminate.

INTRODUCTION.

Sulfate resistance was studied by the generally accepted method of immersing cement samples in an aggressive solution. A 5% sodium sulfate solution was used as an aggressive medium. The amount of aggressive solution and water for storing samples was taken at the rate of 30 ml per sample. Changes of water and solutions were made after 1, 2 and 3 months. Each batch of cement samples was stored separately in closed flasks. The strength of all cements with the addition of fired tuffites, both in the initial and final periods, is increased compared to the original Portland cements. The behavior of these cements in sulfate solutions is different (Table 1). In a 5% Na₂SO₄ solution, the original Portland cement collapsed. The remaining cements with the addition of fired tuffites had high sulfate resistance [1-2].

Jizzakh clinker with an increased amount of C₃A was taken for the study. Tuffite was used as a hydraulic additive, which was fired at a temperature of 600°C.

Cement mixtures were prepared with 20 and 30% tuffite fired at 600°C. 4% gypsum dihydrate was added to all mixtures.

The process of accumulation of free and bound calcium hydrosulfoaluminate and gypsum was studied by determining SO₃ in hydrated cement. To do this, after testing with filter paper, the samples were placed in absolute alcohol for two days, then dried at 70°C and ground into powder until they completely passed through a sieve of 4900 holes/cm².

Table 1.

Effect of tuffite fired at 600 and 800°C on the sulfate resistance of Portland cement

Composition of cement, %		Roasting temperature, °C	Bending strength, MPa									cop with
			Water					5% solution of Na₂SO₄				
			curing time									
Clinker	Tuffit		14	28	60	90	180	28	60	90	180	
100	-	-	1.5	1.5	1.6	2.0	2.0	1.8	collapsed			-
80	20	600	2.9	2.9	3.1	3.4	3.6	2.9	3.0	3.2	3.1	0.85
70	30	600	2.4	2.3	3.0	3.1	3.6	2.8	4.1	4.2	3.6	1.00
80	20	800	1.8	2.0	2.4	2.4	2.5	2.4	3.0	2.2	1.5	0.70
70	30	800	1.7	1.9	2.1	2.1	2.2	2.3	2.2	1.8	1.4	0.65

To determine free gypsum, the amount of cement powder being studied 4,5g was transferred into a flask and shaken for one hour in 200 ml of a saturated lime solution containing 0.3111 g/l of CaSO_4 .

The total amount of SO_3 in the samples was determined from another sample by the gravimetric method. The difference between the total amount of SO_3 and SO_3 in the form of CaSO_4 (free gypsum) was the amount of **SO_3 bound** in the form of calcium hydrosulfoaluminate.

In samples stored in a solution of sodium sulfate (table 2), the content of CaSO_4 significantly exceeds the amount of the original Portland cement; as the addition of burnt tuffite increases, its amount decreases. It should be noted that the accumulation kinetics of gypsum and calcium hydrosulfoaluminate in pure Portland cement sharply differs from the accumulation kinetics of these substances in Portland cement with the addition of tuffite fired at 600 and 800°C (Table 2).

Table 2.

The content of free and bound gypsum in samples hardened in a 5% solution of Na_2SO_4

Composition of cement, %		Firing temperature	Total CaSO ₄				CaSO ₄ free				CaSO ₄ in the form hydrosulfoaluminate calcium					
			Hardening time, days													
Portland cement	Tuffit		28	60	90	180	28	60	90	180	28	60	90	180		
		100	-	-	15.07	20.10	24.46	26.85	7.38	15.23	15.46	17.26	7.69	8.77	8.90	9.47
		80	20	600	12.47	13.00	17.88	20.59	4.48	5.15	8.52	10.96	7.98	7.84	8.35	8.62
		70	30	600	11.64	14.01	14.1	15.98	2.62	1.92	1.03	0.98	8.01	11.07	12.06	13.10
		80	20	800	8.90	12.29	17.10	18.26	3.24	3.44	8.03	9.09	4.64	6.82	8.03	8.16
		70	30	800	7.55	9.60	11.84	11.84	2.56	2.82	4.54	4.95	3.95	5.75	6.77	6.87

In Portland cement, the rate of gypsum crystallization is greater than the rate of formation of calcium hydrosulfoaluminate. In Portland cement with the addition of burnt tuffite, the picture becomes reversed, i.e. gypsum crystallization proceeds more slowly than the formation of calcium hydrosulfoaluminate, which is due to the binding of free lime by the addition of tuffite. The process of formation of gypsum and calcium hydrosulfoaluminate in some samples continues until the end of the experiment, in others (highly fired tuffite - 800°C) basically ends by three months. In Portland cement containing high-fired tuffite, calcium hydrosulfoaluminate is formed much less than in Portland cement with tuffite fired at 600°C. This is due, on the one hand, to the lower activity of highly burned tuffite, which does not have time to bind the lime released during hardening of Portland cement, and on the other hand, to a very small amount of active alumina. The progressive accumulation of the total amount of gypsum in the samples with a 20-30% addition of fired tuffite suggests that this amount of addition is not enough to obtain sulfate-resistant cement in a 5% sodium sulfate solution: the samples cracked or greatly reduced strength. Analysis of the solutions in which the samples were stored reveals an interesting picture of chemical processes. Table 3 shows the results of determining the amount of lime released during hardening of cement samples in water [3-4].

As can be seen, the largest amount of lime is released from the original Portland cement, and for cements with the addition of burnt tuffite, it decreased to varying degrees. Thus, in Portland cement containing 35% highly burnt tuffite, lime leaching is much greater than in Portland cement containing 30% tuffite fired at 600°C. This is obviously due to the lower activity of highly fired tuffite. Thus, judging by lime leaching, Portland cement with 20-30% addition of tuffite fired at 600°C is the most water resistant.

Table 3.

Lime leaching from hardening samples during water storage

Composition of cement, %			Temperature firing, °C	Change in lime concentration in water after sample storage, g/l					The amount of released CaO (in % on the binder from the beginning of the experiment)				
				Day									
HRC	Tuffit		14	28	60	90	180	14	28	60	90	180	
100	-	-	1.101	1.498	1.265	1.243	1.150	2.20	5.14	7.68	10.16	12.46	
80	20	600	0.959	0.908	0.790	0.387	0.241	1.90	3.72	5.30	6.08	6.56	
70	30	600	0.649	0.548	0.414	0.213	0.194	1.29	2.39	3.22	3.44	3.82	
80	20	800	1.042	0.989	0.799	0.372	0.307	2.08	4.05	5.65	6.40	7.02	
70	30	800	0.940	0.699	0.452	0.299	0.269	1.86	3.26	4.17	4.76	5.31	

Table 4 presents the results of the analysis of sodium sulfate solutions in which cement samples were stored. The data in table 38 indicate a strong change in the composition of the solution. Due to the exchange reaction between $\text{Ca}(\text{OH})_2$ and Na_2SO_4 , CaSO_4 is **formed**. It should be noted that the concentration of gypsum in the solution where the Portland cement samples were stored differs sharply from the concentration of the solution in which the Portland cement samples with the addition of tuffite were stored. In the first case, the solution is saturated with gypsum, in the second it is clearly unsaturated. When the concentration of gypsum is far from saturation, its crystallization in hardening samples is unlikely. This fully agrees with the kinetics of the formation of gypsum and calcium hydrosulfoaluminate in hardening cements (Table 2).

Table 4.

The results of the analysis of sodium sulfate solutions in which the samples were stored

Composition of cement, %		Timing shifts solutions, day	Initial con- tradition SO_3 in solution Na_2SO_4 , g/l	Concentrated tradition CaSO_4 in solution, g/l	Quantity absorbed CaSO_4 on binder, %	
Portland cement	Tuffit				By the timing of the change of solutions	From the beginning of the experience
100	-	14	34.10	1.74	11.4	11.4
100	-	44	34.10	1.90	7.4	18.8
100	-	74	27.93	1.98	2.8	21.5
100	-	164	27.93	1.82	2.0	24.7
70	30	14	34.10	0.39	8.6	8.6
70	30	44	34.10	0.42	1.1	9.7
70	30	74	27.93	0.68	0.9	10.6
70	30	164	27.93	0.68	0.3	12.9

The introduction of tuffite fired at 600°C to Portland cement, the amount of hydrosulfoaluminate does not decrease in the Na_2SO_4 solution, but increases significantly, which indicates the additional formation of calcium hydrosulfoaluminate due to the participation of active alumina of tuffite fired at 600°C in the reaction. The accumulated gypsum is mainly in the form of calcium hydrosulfoaluminate. Despite this, the samples show full sulfate resistance. Obviously, this

phenomenon is associated with the formation of calcium hydrosulfoaluminate as a result of the interaction of low-basic hydroaluminates with gypsum through a solution [5-6].

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Rezyume: 600°C haroratda pishirilgan tufit portland tsementining suvga chidamliligini axshilaydi va ularning toza va mineralashgan suvda qotish jarayoniga ijobiy ta'sir qiladi. To'yinganlik koeffitsienti 0.80-0.94 bo'lgan va sulfatlarda, boshqa tuz eritmalarida 4-13% C₃A tarkibiga ega bo'lgan barcha o'rganilgan portland tsementlari beqaror bo'lib chiqqan. Ammo 600 ° C haroratda kuydirish natijasida olingan 20% tufit qo'shilishi minerallashgan sulfatli suvlarda Portland tsement tuziga chidamliligini beradi.

Резюме: Обожженные туффиты при 600°C улучшают водостойкость портландцемента и благоприятно влияют на процесс твердения их в пресной и минерализованной воде. Все изученные портландцементы с коэффициентом насыщения 0,80-0,94 и с содержанием в пределах 4-13% С₃А как в сульфатах, так и в других солевых растворах, по составу близких к природным водам, оказались нестойким. Но введение 20% добавки туффита, полученного обжигом при температуре 600°C, придает портландцементу солестойкость в минерализованных сульфатных водах

Kalit suzlar: Portland tsement, tufit, agressiv eritma, sulfatga chidamlilik, kaltsiy gidrosulfoalyuminat.

Ключевые слова: портландцемент, туффит, агрессивный раствор, сульфатостойкость, гидросульфоалюминат кальция.

ANALYSIS OF WIND POWER DEVICES GENERATING LOW SPEED WIND POWER

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Summary: By studying wind resources, it is possible to estimate the potential of wind energy for a specific area of our country and country or region. The potential of wind resources in our country has been studied in more detail, and precautions and possibilities of wind power devices that produce electricity from low-speed wind have been studied. The analysis of wind power devices that work even at low wind speeds created today and comments on their achievements and existing shortcomings are presented. some projects on the design of working wind electric devices were recommended. The characteristics of devices working at low wind speed were studied through the conducted experiment.

Keywords: Wind power, wind, potential, power, small turbines, towers, land turbines, blade length, pole location, analysis of wind power plants that generate electricity from low-speed wind

Introduction. Wind turbines have been used to generate electricity for more than a hundred years, but concerns over fuel costs and environmental impacts have led to a wide range of wind power installations. Today we are familiar with many types of wind power systems. We know that even low-power turbines are usually designed for relatively high wind speeds, usually 10-15 m/s. Because of its commercial availability in the low wind speeds typical of many inland areas in Central Asia wind energy systems will not produce if the power is significantly low. This leads to a decrease in their operating efficiency and can lead to very inefficient power generation in areas with lower wind speeds. More power can be produced from the additional turbines of the turbine and generator in low wind. This makes it possible to use wind energy in remote areas of Central Asia and around the world where wind speed is low. This includes remote meteorological telemetry stations, radio receivers, rural houses and power for schools, as well as applications requiring non-sparking power sources, such as oil production, refining, fueling and transportation, and including electricity near military posts. Today, there is a wide range of researches and practical results dedicated to the design of turbine systems with low wind speed. expected to be used For this, in the wind since the available power is significantly lower at low wind speeds we need to focus on smaller turbines in the sub-1kW range.

From the wind power extracted by the turbine, usually from the blade side of the turbine and the coefficient of performance, expressed as a function of wind speed in terms of air density and velocity.

$$P_{turb} = \frac{1}{2} C_p \cdot R \cdot A \cdot V$$

here is P_{turb} – mechanical power of the turbine in watts; C_p - dimensionless performance coefficient; R – air density in kg/m³; A – the swept area of the turbine in m²; V – wind speed m/s.

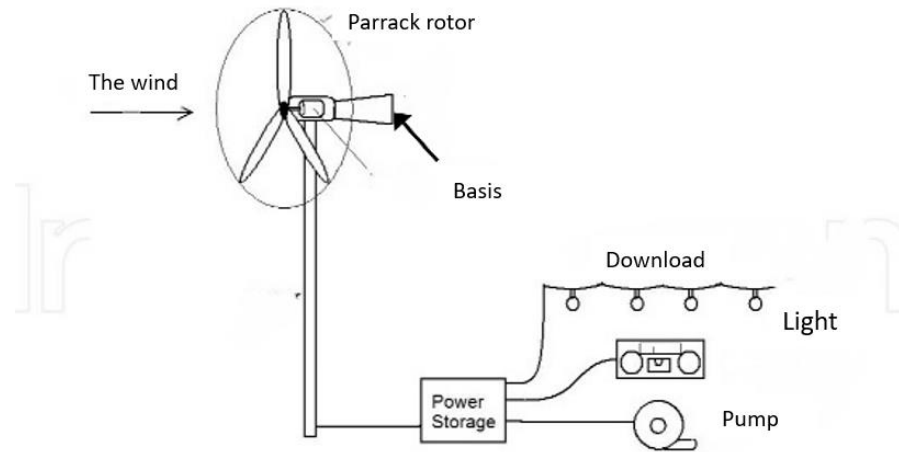


Figure 1. Scheme of the wind energy system

Atmospheric pressure for windy areas near sea level is about 1.18 kg/m^3 and decreases with altitude. The coefficient of performance is related to the design of the turbine and has a theoretical upper limit of 0.593, called the Betz limit. Most 10 kW wind turbines have speeds between 8 and 12 m/s. The coefficient of performance of small commercial turbines is typically between 0.25 and 0.45 based on manufacturers' rated capacities, speeds, and diameters. Turbine power is directly proportional to the swept area, so it is proportional to the square of the blade. The biggest factor affecting turbine output is wind speed. From the turbine cutting speed to the rated speed, the turbine power is proportional to the cube of the wind speed. This means that a 10 m/s wind produces eight times more force than a 5 m/s wind. This is why most turbines have very high wind speeds: this is also the easiest way to achieve high power output. In this article, wind energy devices and operating modes were studied, all electronic and written sources on the subject were studied. Alternative energy projects for climate conditions of the regions were considered by conducting a practical experiment with the heat of existing wind power plants operating at low wind speeds.

Small turbines have a limited variety of designs due to cost and performance limitations. The most common design is the variable speed, horizontal axis, fixed pitch 3-blade, direct drive permanent magnet machines with stall control. Blade pitch control would be difficult to justify economically, so blades are heavily pitched and optimized for power output at rated speed. This results in poorer performance at low speeds than a turbine with active pitch control. The maximum speed of the turbine is determined by the wind speed and the applied load. A power controller is usually required to prevent over-speeding of the turbine and over-charging of the batteries. This power controller may also include a power matching circuit that allows for optimized power output from the wind turbine at different wind speeds. Turbine overspeed is prevented by applying a low resistance load to the generator, increasing the load torque to the turbine, slowing the blades and resulting in aerodynamic stall.

There are significant differences between different manufacturers' specification of a turbine, but it is generally understood that a turbine produces rated power at rated wind speed. Based on a survey of published data for small wind turbines, we selected the following typical commercial turbine specifications:

Characteristics of small wind power plants

Table 1

The diameter of the turbine	m	1.6	2.7	5.5
Nominal wind speed	m/s	10	10	10

Rated power	w	300	1000	5000
Nominal turbine speed	rpm	400	300	200
Predicted power at 3m/s	w	8	27	135
Performance factor		0.25	0.30	0.36

When these turbines are installed in a low wind area, the actual power produced is significantly less than the rated power. For example, in most of Central Asia, the wind speed is only 3 m/s. This speed can be below cut turbines (the lowest speed at which it can produce power), if the power is proportional to the cube of the wind speed, we can calculate the theoretical power output at 3 m/s as listed in the table. It can be seen that the output power of these machines is much lower than the rated power, which highlights the need to optimize the turbine for low wind speed regions.

For most airfoils, lift is maximized at an angle of attack between 10 and 15 degrees. Obviously, the angle of attack depends on the wind speed and the speed of the turbine. A useful parameter in turbine performance analysis is the tip speed ratio (TSR), defined as the linear speed of the turbine blade tip divided by the prevailing wind speed. A lower yaw angle for wind speed results in a higher TSR at maximum lift. A TRS [tends] to give maximum lift at a lower 11 and therefore greater torque at a higher yaw angle. Ultimately, higher coefficients of performance are achieved by blades with lower pitch angles and higher TRS, but at the expense of lower speed torque, resulting in higher cutting speeds.

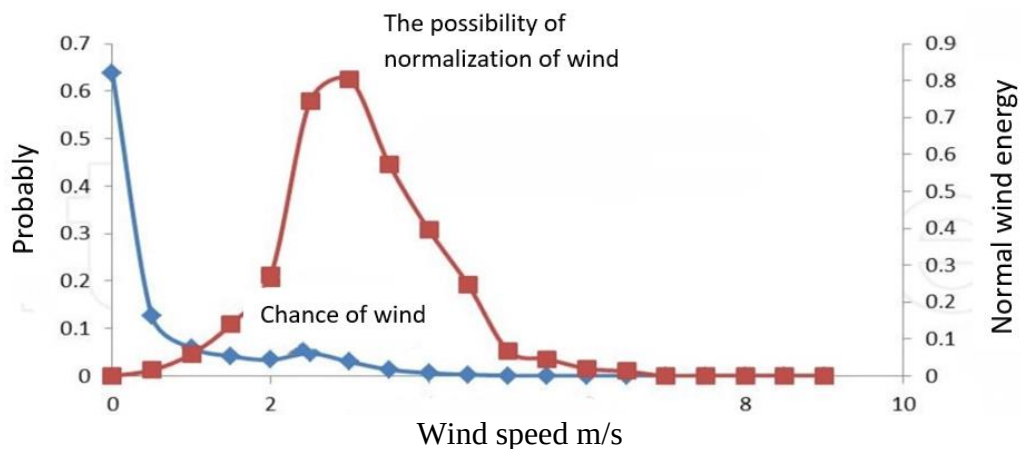


Figure 2. Normalized probability of wind energy from the test site of wind and low wind speed

At very low wind speeds, the turbine produces very little torque to overcome friction. When the wind speed is sufficient to keep the turbine spinning, the power output is roughly proportional to the cube of the wind speed. This corresponds to the nominal speed. Above this speed, the power output level decreases and stall-regulated turbines actually decrease as wind speed increases. Finally, at even higher wind speeds, fur speed, the turbine is shut down to prevent damage to the machine. A typical turbine power curve is shown in Figure 2.

In order to improve the production of electricity, the wind turbine requires a radical reconstruction. Equation 1 gives us the first clues as to how to proceed. it remains to change the area of the turbine for the wind speed and optimize the efficiency. Increasing the length of the blades, increasing the area of influence of the turbine, and increasing the power of the turbine. However, this increases the load on the turbine and causes the rotation speed to slow down. the electricity production from the generator is proportional to the square of the rotational speed, so it can be beneficial to adjust

the pitch angle to maximize TRS and thereby increase the generator speed. For low wind speeds, both the turbine hub and the generator will need to be reoptimized for larger blades to achieve an acceptable level of power production.

As a starting point for the design, we choose a system capable of supplying energy to a model rural house typical of the remote areas of SEA. Such residences typically use rechargeable lead-acid car batteries to power electric lights, radios, and televisions. These batteries are taken to a diesel powered generator station for weekly charging. Carrying batteries every week is a huge burden for the villagers, which can be alleviated by using a wind energy system. With the improvement of the use of electricity, the consumption of electricity will increase significantly. The extra power can be used for improved lighting, fans, and even accessories like refrigerators. a wind power system must have enough storage capacity that can be rented for a week without generating electricity, so we need at least 7 kWh of electricity storage. As with most small off-grid power applications, power is stored in 12V vehicle batteries. To minimize transmission losses, we choose the highest system voltage considered safe for such applications. An operating voltage of 48V can be achieved with 4 batteries in series, and with an energy storage limit of 7kWh, it translates into a battery capacity of about 150Ah, like normal truck batteries.

Features of the generator of wind power devices operating at low wind speeds

Table 2.

Wind speed	Lady	5
power	W	272
High length	m	2.25
Cp		0.29
Generator speed	rpm	340
Generator efficiency	%	80
Tension	W	48
Current	A	5.8
Poles		12
Phases		3
Rotor ID	mm	125
Rotor OD	mm	360

With a good turbine installation on top of a hill, winds near 5 m/s are likely in some coastal regions of SEA. From long-term measurements, we can determine that the wind can reach this target speed about 20% of the time, or 4.8 hours per day. Assuming this, the device would need to generate about 1/3 more than the saturated power requirement of the system to compensate for the loss or replacement in the system. we can produce about 1.3 kWh of electricity per day

At 4.8 hours of power generation per day, the system would need to produce approximately 270 W at 5 m/s wind. Assuming a generator efficiency of 80% and a Cp of 0.29, from equation 1 we can determine that the turbine area is 15.9 m.², giving a blade length of approximately 2.25 m. If we assume a conventional TSR of around 8, the turbine rotates at 170 rpm. Based on some preliminary measurements, it was determined that a conventional generator design would require a much higher RPM to achieve the desired power, so we double that speed, or 340 rpm. The operational TSR is optimized by fine-tuning the turbine blade height during system field testing, but we set the TSR to 16, which is twice the conventional ratio. At this point, the operating current of the generator is approximately 5.8A.

Conclusion

Most commercial turbines are designed for relatively high wind speeds, around 10 m/s, and produce negligible power below 5 m/s. As a starting point for a conventional axial flow, direct drive

horizontal axis 3-bladed wind turbine, we consider the turbine and generator we were able to optimize for lower wind speed operation and achieve significantly higher power output than available commercial turbines at lower wind speeds. The turbine can be further optimized and attention should be paid to airfoil shape, blade weight and construction. Using larger blades increases the cost and weight of the turbine and tower, but wind energy has proven to be a viable alternative in relatively low wind regions.

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Rezyume: *Shamol resurslarini O'rganish orqali global mommolarni yichimini tuzish yurtimiz va mamlakatimiz yoki mintaq bo'yicha ma'lum bir hudud uchun shamol energiyasi potentsialini baholash mumkin. Yurtimizdagi shamol resurslari potentsialining batafsilroq o'rganilib kichik tezlikli shamoldan elektr energiyani ishlab chiqaruvchi shamol elektr qurilmalari yuzasidan ehtiyot va imkoniyatlari o'rganilgan. Hozirgi kunda yaratilgan kichik shamol tezligida ham ishlovchi shamol elektr qurilmalari tahlil qilish va ularning yutuq hamda mavjud kamchiliklar yuzasidan izohlar keltirilgan. Shuning uchun maqolada kichik shamol tezligida ishlovchi shamol elektr qurilmalarini dizayni ustida ayrim loyihalar tavsiya etilgan. O'tkazilgan tajriba orqali past shamol tezligida ishlovchi qurilmalar xususiyatlarini o'rganilgan*

Резюме: *Изучая ветровые ресурсы, можно оценить потенциал ветроэнергетики для конкретного района нашей страны и страны или региона. Более детально изучен потенциал ветроэнергетических ресурсов нашей страны, изучены меры предосторожности и возможности ветроэнергетических устройств, вырабатывающих электроэнергию из малоскоростного ветра. Проведен анализ созданных сегодня ветроэнергетических устройств, работающих даже при малых скоростях ветра. Даны комментарии к их достижениям и имеющимся недостаткам. Рекомендованы некоторые проекты по созданию рабочих ветроэлектрических устройств. В ходе проведенного эксперимента изучены характеристики устройств, работающих при малой скорости ветра.*

Kalit so'zlar: *Shamol energetikasi, shamol, potentsiali, quvvat, kichik turbinalar, minoralar, quruqlik turbinalari, parrak uzunligi, ustunlar joylashuvi, kichik tezlikli shamoldan elektr energiyani ishlab chiqaruvchi shamol elektr qurilmalarini tahlil qilish.*

Ключевые слова: *Ветроэнергетика, ветер, потенциал, мощность, малые турбины, башни, наземные турбины, длина лопастей, расположение полюсов, анализ ветряных электростанций, вырабатывающих электроэнергию из тихоскоростного ветра*

STUDYING FACTORS AFFECTING SEEDS IN THE PROCESS OF ELECTRICAL STIMULATION OF VEGETABLE AND MELORONS SEEDS

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Summary: *This article discusses measures to prevent the shortage of vegetable production and greenhouse crops, increase their yield. In order to meet the demand of the population for these products, if necessary, to have an export potential, it is necessary to apply the achievements of modern science to the products grown. The use of new modern technologies will make a significant contribution to the development of the agricultural sector. When growing products in agriculture, traditional methods that require a lot of labor should be abandoned. The article presents materials on factors affecting seeds in the process of their electrical stimulation, which are significant in the cultivation of agricultural crops. Germination and good plant development indicate the need to use modern technologies in seed processing. At the same time, it is necessary to take into account the cultivation of seeds when they are affected by several factors affecting their growth. When treating seeds with ultraviolet radiation, the influence of the exposure dose of radiation and illumination has been studied.*

Key words: *seeds, radiation, plant seedlings, factors affecting seeds, radiation dose.*

Introduction.

In agriculture in the Republic of Uzbekistan, about 60 percent of vegetable crops are grown from seedlings. In our sunny country, it is possible to grow seedlings and effectively use protected soil structures for ultra-planting of vegetables 2-3 times a year.

In our Republic, such an opportunity is important to meet the population's demand for plant-based products and prevent food shortages that occur in the real world. In rural areas, to provide the population with affordable, high-quality food and increase production, the greenhouses created in the republic of Nafshalik and the use of modern methods for growing vegetable seedlings using electrotechnological methods are now relevant.

In vegetable growing, it is observed that plants grown from seedlings are faster in growth and development compared to similar plants not grown from seedlings. This promotion leads to faster ripening of the plant, sale of products on the market at good prices and a higher economic effect. Thus, many of our farmers benefit from growing vegetable crops from seedlings than when growing early crops in open ground and greenhouses. But for some farmers and residents, there is a lack of information and experience in preparing vegetable seedlings.

Intended for transplantation to a permanent place of growth, a young sprout is called a seedling, the organs of which have not yet been formed. Every day of growing plants with seedlings, it consists of light feeding, which provides enough nutrients and moisture during the first period of their life, it consists of growing them in field conditions, in an artificial climate, and then transplanting them to open or protected ground structures. Ego is grown in protected ground due to the fact that it is impossible to grow it in open ground in accordance with the temperature regime. More than half of the vegetable crops in open ground and about 90 percent of seedlings in protected ground are planted with seedlings. The seedling method is used in crops that require a large area of fertilizing during the growing season and are designed for early harvest.

Materials and methods. Currently, seedlings for open and protected ground are grown mainly in heated film greenhouses, and in private plots in film greenhouses. In the winter-spring garden for protected soil, seedlings are grown in a seedling compartment of heated winter glass or film greenhouses. For other crop rotations, seedlings are grown in structures specially adapted for this crop.

The method of growing seedlings has a number of advantages compared to conventional sowing of seeds directly into the ground. Seedlings are usually grown within 30-80 days. The progress achieved in plant development allows for an early harvest. Selling the early harvest at high prices provides additional income. Thanks to the preliminary planting of seedlings in the flooring, the growth period can be extended. This increases the yield of the plant and makes it possible to grow warm-weather crops and enrich them with various assortments of vegetables in the northern regions, where the growing season is considered long and there is a lack of sunlight.

It is impossible to correctly implement the technology of growing vegetable seedlings without taking into account environmental conditions and obtain a satisfactory harvest. In buildings where seedlings are grown, it is possible to create an artificial microclimate and an optimal soil environment, taking into account the characteristics of the plants, age, variety and cultivation conditions, as well as existing climatic conditions.

Microclimate is a physical change in the parameters of the environment in which air and root crops are found in the structures in which lullabina crops are grown. Solar radiation is the main process that creates climate, and is the main factor determining the type and variety of protected land structures in an existing place, the selected crops and the timing of their cultivation.

In Uzbekistan, at the end of spring there is a very high amount of sunlight. One way to eliminate this overheating is to cool the radiation, the light entering the room. Cooling is carried out in two ways:

- 1) painting the translucent surface of the structure or spraying white liquid and water onto it;
- 2) application of various cooling nets, curtains, screens similar to translucent covering materials.

There are the following environmentally friendly electrotechnological methods of exposing seeds to ultraviolet radiation. For example, V. Kharlamov influenced sprouted cucumber seeds with a root tip length of 0.5 mm, irradiating them with a mercury-quartz source and irradiating them with a wavelength of 400 nm. The illumination source was maintained at a constant voltage of 180 V. Irradiation times of 15, 30, 45, 60 and 75 minutes were irradiated at a distance of 25 cm from the source to the seeds. In each variant, 50 plants were observed. The author claims that plants grown from irradiated seeds for 75 minutes sprouted earlier than controlled ones: male plants - by 2 days, female plants - by 5 days; irradiated for 60 minutes, respectively - from 3 and 6 days, 60... With a 75-minute exposure, an increase in the number of lateral branches of seed buds and a decrease in the number of uncharged specimens are observed. In the variant with a 60-minute exposure, the number of fruits relative to the control increased by 55%, and their weight by 39.5%. It was also noted that the intensity of growth of green mass in the first ten days is directly proportional to the duration of irradiation of seeds at the stage of their germination.

Results

A comprehensive study of the effects of ultraviolet radiation on seeds was carried out by Nicotina Labakum and others. Under the influence of 5, 10 and 20 minutes of irradiation, they achieved the germination of experimental seeds with 79%, 91% and 46% of control seeds, respectively. Seeds irradiated for 10 minutes showed good results compared to the control. They sprouted in 5 days, the yield of the total mass of leaves increased by 78%, and seeds by 181%. Scientists also observed significant changes in plant growth due to several other morphological changes. Under the greater influence of irradiation, the plants ripened in a week, but gave a low grain yield and a mass of leaves.

In Europe, Huij and Bohle compared the effects of incandescent lamps and ultraviolet light, which provide regular daylight for the germination of pea seeds, noting the beneficial effects of ultraviolet light. Using the pea variety neigborxood, they conducted a study of the influence of the following methods of pre-sowing seed treatment on the yield: ultraviolet irradiation with a wavelength of $\lambda = 280..$ At irradiation doses in the range of 380 nm, 6 and 8 kJ/m² (lighting source DRT-400). Maximum illumination FL = 1200 lm (illumination source IKZK 220-250) infrared irradiator with a

wavelength of more than $\lambda = 780$ nm, experiments were carried out with exposure for 15 and 60 minutes.

Ultraviolet irradiation before sowing seeds significantly increases their germination energy and germination rate, accelerates plant maturation, increases yield and product quality, as a result of which a complex of other agrotechnical measures is increasingly being used. In addition, the UV method of seed irradiation is inexpensive, highly productive, energy efficient and economically justified.

At the same time, the most effective dose of UV irradiation for cucumbers, tomatoes, sweet peppers and other vegetable crops has not been established. Therefore, it is recommended to conduct a study of the effect of UV irradiation of sweet pepper seeds. Determining the best dose of UV radiation. Considering the positive effect of ultraviolet radiation on seeds, it is necessary to develop an appropriate technological process and propose methods for calculating the dose of UV radiation for this technological process, as well as develop a device that allows controlling the UV dose. The complete and perfect development of this technological process increases the efficiency of supplying seedlings for growing sweet pepper both in greenhouses and in open areas.

The process of irradiation of sweet pepper seeds and the parameters of the irradiation device should be taken as the main indicators assessing the process of germination of vegetable seeds. In their case, various electrical and technological factors influence. To study the factor-multiple effect, it is necessary to determine their functional relationship with the degree of germination and technological parameters.

The study is carried out using mathematical theory when planning experiments with mudflows, reducing and increasing the accuracy of the experiments, obtaining mathematical equations of the process, as well as determining the optimal operating parameters of the study. For mathematical and statistical processing of the results of a one-factor study, it is necessary to use several independent factors. In this case, it is necessary that the selected factors consist of influencing factors that change without interdependence on each other. We can test vegetable seeds using 2 or 3 complex variable factors when treated with electrical radiation. These are the following:

1. Height of suspension of the irradiator, meter;
2. Processing time, min;
3. Mains voltage, V.

An experiment obtained after processing the seeds of vegetable and garden crops with one-time ultraviolet irradiation, which allows the use of variations, the height of the irradiator suspension and the processing time when checking the results using the method of multifactorial experiments. Because during the irradiation process, seeds can be treated from 5 minutes to 15-20 minutes, during which time the change in network voltage may not differ much.

To construct an experiment planning matrix, the transition of factors from their real values to a coded (dimensionless) value was performed using the following expression:

$$x_i = \frac{X_i - X_{i0}}{\varepsilon} \quad (1)$$

where: X_i - control factor value i ; X_{i0} - Zero level controller value i ;
 ε - interval of change of this coefficient.

For each factor, we first code by setting the zero level and the change interval. We can select the type of mathematical model in the following view:

$$y = b_0 + \sum_{i=1}^n b_i x_i + \sum_{i < j}^n b_{ij} x_i x_j + \sum_{n=1}^n b_{ij} x_i^2 \quad (2)$$

The Box-Behnken type secondary experiment design method can be used.

Discussion

From the initial experiments, the main parameters were obtained that influence the process of seedling germination (days) when sweet pepper seeds are irradiated:

1. Height of suspension of the irradiating device, m;
2. Duration of irradiation of seeds of vegetable and melon crops, min;
3. Voltage of the network to which the irradiator is connected, V.

During the experiments, three experiments were conducted at each point on the spectrum of the Box-Behnken design. The order of the experiments was established in accordance with the table of numbers.

The specified factors, intervals and levels of their transformation are defined in
Intervals and levels of change in factors

Table 1

Factor designation		Levels	Intervals	factors		
Coded	Natural			-1	0	+1
X ₁	l	Illuminator hanging height, meter.	ε_{X1}	X _{1min}	X ₁	X _{1max}
X ₂	t	processing time, min.	ε_{X2}	X _{2min}	X ₂	X _{2max}
X ₃	U	Mains voltage, V.	ε_{X3}	X _{3min}	X ₃	X _{3max}

For this plan, the matrix of basic functions, the expression of the experiment, is verified according to the Cochran criterion.

By converting the encoded values into natural values and electrical irradiation after the appropriate changes, the expression of the mathematical model of vegetable and garden crop seeds is determined, representing the germination process:

$$\tau_{\text{всхожесть}} = A - Bl + Ct + Dlt + El^2 - \Phi t^2 \quad (3)$$

To find the optimal value of the mathematical model, it can be calculated in the desired computer program, for example: PassalABS. As a result of the research, the following optimal parameters for the process of irradiating seeds of agricultural crops were determined by irradiating seeds of sweet crops and monitoring seed germination: the height of hanging the irradiation device is X1 m, the duration of irradiation is X2 min. Using these parameters, it was determined how many days later the seeds of agricultural crops will germinate during treatment.

Conclusion

Thus, the use of ultraviolet irradiation of seeds in vegetable growing is very promising, and irradiation of agricultural seeds before planting has a beneficial effect.

We invite interested scientists and specialists to collaborate with us.

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Rezyume: Ushbu maqolada sabzavot va issiqxona ekinlari tanqisligini oldini olish va ularning hosildorligini oshirish chora-tadbirlari muhokama qilinadi. Aholining ushbu mahsulotlarga bo'lgan talabini qondirish, kerak bo'lsa eksport salohiyatiga ega bo'lishi uchun yetishtirilayotgan mahsulotlarga zamonaviy ilm-fan yutuqlarini tatbiq etish zarur. Yangi zamonaviy texnologiyalardan foydalanish qishloq xo'jaligi sanoatini rivojlantirishga katta hissa qo'shadi. Qishloq xo'jaligida oziq-ovqat etishtirishda ko'proq mehnat talab qiladigan an'anaviy usullardan voz kechish kerak. Maqolada qishloq xo'jaligi ekinlarini etishtirishda muhim ahamiyatga ega bo'lgan urug'larni elektr stimulyatsiyasi jarayonida ta'sir qiluvchi omillar haqida materiallar keltirilgan. O'simliklarning unib chiqishi va yaxshi rivojlanishi urug'larni qayta ishlashda zamonaviy texnologiyalardan foydalanish zarurligini ko'rsatadi. Shu bilan birga, urug'larning o'sishiga ta'sir qiluvchi bir qancha omillar ta'sirida etishtirishni hisobga olish kerak. Urug'larni ultrabinafsha nurlanishi bilan davolashda nurlanish va yorug'likning ta'sir qilish dozasining ta'siri o'rganildi.

Резюме: В данной статье рассматриваются меры по предотвращению дефицита продукции овощеводства и тепличных культур, повышению их урожайности. Для того чтобы удовлетворит спрос населения на эти продукты, при необходимости имеет экспортный потенциал, необходимо применять достижения современной науки к выращиваемой продукции. Использование новых современных технологий внесет значительный вклад в развитие сельскохозяйственной отрасли. При выращивании продуктов в сельском хозяйстве следует отказываться от традиционных методов, требующих больших трудозатрат. В статье приведены материалы по факторам, влияющих на семена в процессе их электрического стимулирования, значимые при выращивании сельскохозяйственных культур. Всхожесть и хорошее развитие растений указывают на необходимость использования современных технологий при обработке семян. В то же время необходимо учитывать выращивание семян при воздействии на них несколькими факторами, влияющих на их рост. При обработке семян ультрафиолетовым излучением изучены влияние экспозиционной дозы излучения и освещения.

Kalit so'zlar: urug'lar, radiatsiya, o'simlik ko'chatlari, urug'larga ta'sir qiluvchi omillar, nurlanish dozasi.

Ключевые слова: семена, излучения, проростки растений, факторы воздействующие на семена, доза излучения.

RENEWABLE ENERGY IS THE ENERGY OF THE FUTURE

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Summary: *Renewable energy is energy obtained from the Earth's unlimited or inexhaustible natural resources, such as wind and sunlight. Renewable energy is a type of energy that can replace traditional fossil fuel-based energy and is less harmful to the environment. Renewable energy sources are currently receiving the most attention. All developing countries are provided with opportunities such as subsidies and tax incentives to promote the transition to non-conventional forms of energy.*

Key words: *renewable energy, solar energy, wind energy, geothermal energy, bioenergy.*

Introduction. Renewable energy sources are one of the most relevant areas today. The reason is that the reserves of traditional types of energy known to everyone: oil and its products, natural gas, coal and other fuels are decreasing. According to the data of 2023, the values of natural gas reserves of the countries of the world can be seen in the diagram below.

Over time, natural energy reserves are decreasing. Therefore, the whole world is paying great attention to renewable energy resources. Examples of renewable energy resources include solar, wind, hydropower, geothermal, biomass, hydrogen, and ocean energy.

Today's world experience shows that due to the increase in the cost of the energy-carrying environment, on the other hand, with the development of the technology of using thermal energy, this energy source can become competitive, that is, it can be used in the same conditions as the traditional energy source.

Uzbekistan has a great potential of renewable energy sources. This is about 51 billion t.n.e. is estimated in the amount. Today, the existing equipment and technologies in the world are 179 million t.n.e. allows to use. This is more than three times the current annual amount of fossil fuel production in the country. Currently, the economic potential of renewable energy sources has not been assessed. Technical potential biomass resources were estimated without taking into account plant science, animal husbandry, industry and household waste. In fact, this potential should be evaluated in the near future. For example, 2 to 4 tons of cotton stalks can be harvested from one hectare of cotton, which means that only cotton stalk resources are 1-2 million t.n.e. can organize. The existence of a large potential of all renewable energy sources is an important basis for the successful development of renewable energy, and the creation of a favorable economic environment in Uzbekistan allows the utilization of a significant part of this technical potential.

Results

Solar energy is obtained by capturing radiant energy from sunlight and converting it into heat, electricity, or hot water. Photovoltaic systems can convert direct sunlight into electricity using solar cells. One of the advantages of solar energy is that the sun's rays are functionally unlimited. With its harvesting technology, there is an unlimited supply of solar energy. In the long term, solar energy can also eliminate energy costs and reduce energy bills in the short term. Many local governments are achieving widespread adoption by supporting solar investment through rebates or tax incentives. However, while solar energy can save you money in the long run, it does result in a significant upfront cost for most households. For private homes to install solar panels, they need to have an open space that can receive sunlight, which limits the individual application of this technology.

Wind energy devices capture the energy of the wind flow with the help of turbines and convert it into electricity. There are several forms of systems used to convert wind energy, and each one is

different. Commercial wind energy systems can power many different organizations, while single wind turbines are used to help supplement existing energy organizations. Another form is utility-scale wind farms, which are contracted or purchased wholesale. Technically, wind energy is a type of solar energy. The phenomenon we call "wind" is caused by temperature differences in the atmosphere combined with the rotation of the earth and the geography of the planet. Wind energy is a clean energy source that does not pollute the air like other forms of energy. Wind energy does not produce carbon dioxide or other harmful products that cause environmental degradation or harm human health, such as smog, acid rain, or other heat-trapping gases. Investing in wind energy technology can also open up new avenues for jobs and job training, as turbines on farms require maintenance and upkeep to keep running.

Geothermal energy is heat trapped under the Earth's crust as a result of Earth's formation and radioactive decay 4.5 billion years ago. Sometimes large amounts of this heat escape naturally, but all at once, leading to familiar phenomena such as volcanic eruptions and geysers. This heat can be captured and used to generate geothermal energy using steam from heated water pumped underground, which is then pumped up and used to run a turbine. Geothermal energy is not as widespread as other types of renewable energy sources, but it has significant potential for energy supply. It can be built underground. Geothermal energy is naturally replenished and therefore in no danger of running out (in the human time frame). When it comes to the disadvantages of geothermal energy, cost is a major factor. Infrastructure is not only expensive to build, but another major concern is its vulnerability to earthquakes in some regions of the world.

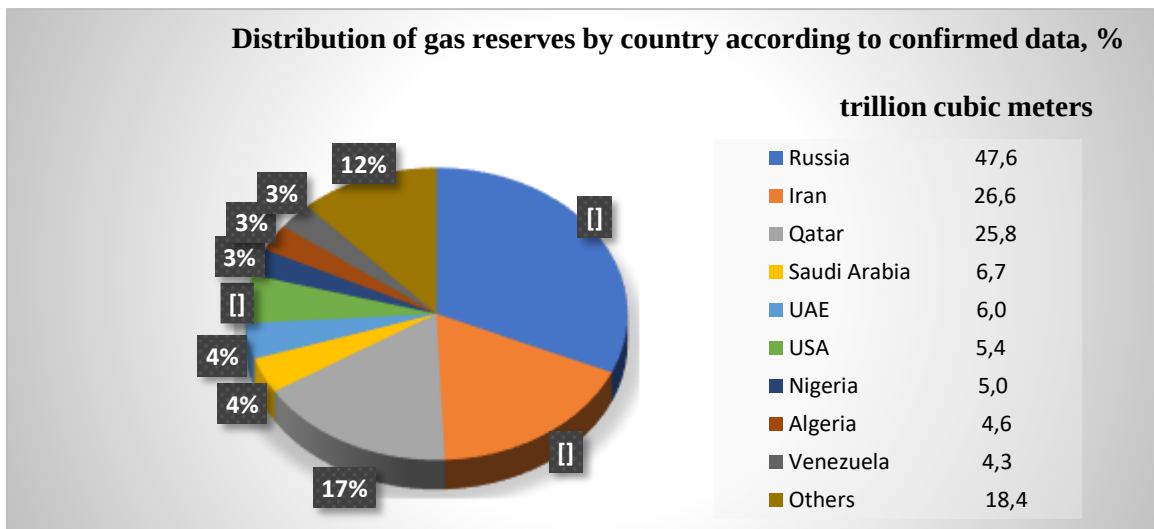


Figure 1. Dynamics of gas reserves of the countries of the world

The ocean can produce two types of energy: thermal and mechanical. Ocean thermal energy relies on warm water surface temperatures to generate energy through a variety of systems. Ocean mechanical energy uses tides and currents to generate energy from the Earth's rotation and gravity from the Moon. Unlike other forms of renewable energy, wave energy is predictable and the amount of energy produced is easy to calculate. Instead of relying on different factors like solar and wind, wave energy is more suitable. This type of renewable energy is also abundant, with the most populated cities located near oceans and ports, making it easy for local residents to use this energy. The potential of wave energy is an amazing, untapped energy source, with an annual generating capacity of 2,640 TW*h. Just 1 TW*h of energy per year could power 93,850 average US homes per year, or roughly twice the number of homes currently in the US. Those who live near the ocean will certainly benefit from wave energy, but those who live in landlocked states will not be ready to use it. Another

disadvantage of ocean energy is that it can disturb many of the ocean's delicate ecosystems. Although this is a very clean source of energy, large machinery must be built nearby to help capture this form of energy, which can wreak havoc on the ocean floor and the marine life that inhabits it. Another factor to consider is the weather, when rough weather occurs it changes the strength of the waves and thus a normal wave that is not stormy weather. produces less energy than waves.

To form water, hydrogen must combine with other elements, such as oxygen, because it does not exist as a gas by itself. When hydrogen is separated from another element, it can be used for both fuel and electricity. Hydrogen can be used as a clean burning fuel, resulting in less pollution and a cleaner environment. It can also be used for fuel cells, which are similar to batteries, and can be used to power an electric motor. Because hydrogen requires energy to produce, it is ineffective at preventing pollution.

Bioenergy is renewable energy derived from biomass. Biomass is organic matter from plants and organisms that lived recently. Using wood in your fireplace is a familiar example of biomass. Various methods are used to produce energy using biomass. This can be done by burning biomass or using methane gas produced by the natural decomposition of organic matter in water bodies or even landfills. Using biomass for energy production creates carbon dioxide that is put into the air, but plant regeneration consumes the same amount of carbon dioxide to create a balanced atmosphere. Biomass can be used in different ways in our daily life not only for personal use but also for business. In 2017, energy from biomass accounted for about 5% of the total energy used in the US. Although new plants need carbon dioxide to grow, plants need time to grow. We don't yet have a widespread technology that can use biomass instead of fossil fuels.

Conclusion. Renewable energy sources (electricity, natural gas, hot water) are crucial for people in remote desert, mountainous, waterless, seasonal jobs or expeditions that require electricity, heat and drinking water.

In Uzbekistan, more than 60 percent of the population lives in rural areas. About 1,500 hard-to-reach rural settlements cannot use traditional sources of electricity. That's why the attention to programs for the use of renewable energy sources has increased dramatically in the country.

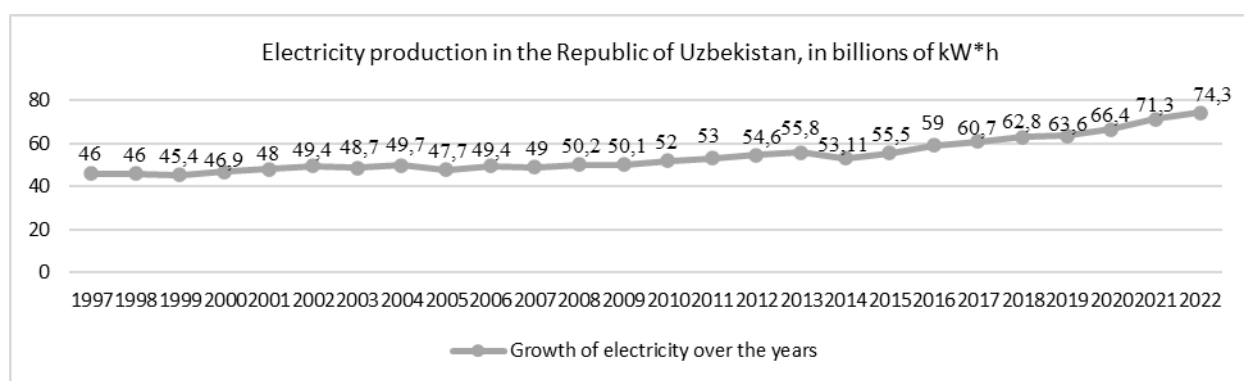


Figure 2. The annual volume of electricity production in the Republic of Uzbekistan

84-87% of the electricity produced in our country is produced in gas-based thermal power plants. Due to the introduction of new technologies in the energy system and gradual transition to alternative energy sources, it is predicted that by 2030, in addition to traditional energy reserves, the contribution of non-traditional resources as sources of electricity in our country will achieve significant results. According to the following statistics, we can see the share of energy resources in our Republic by 2025.

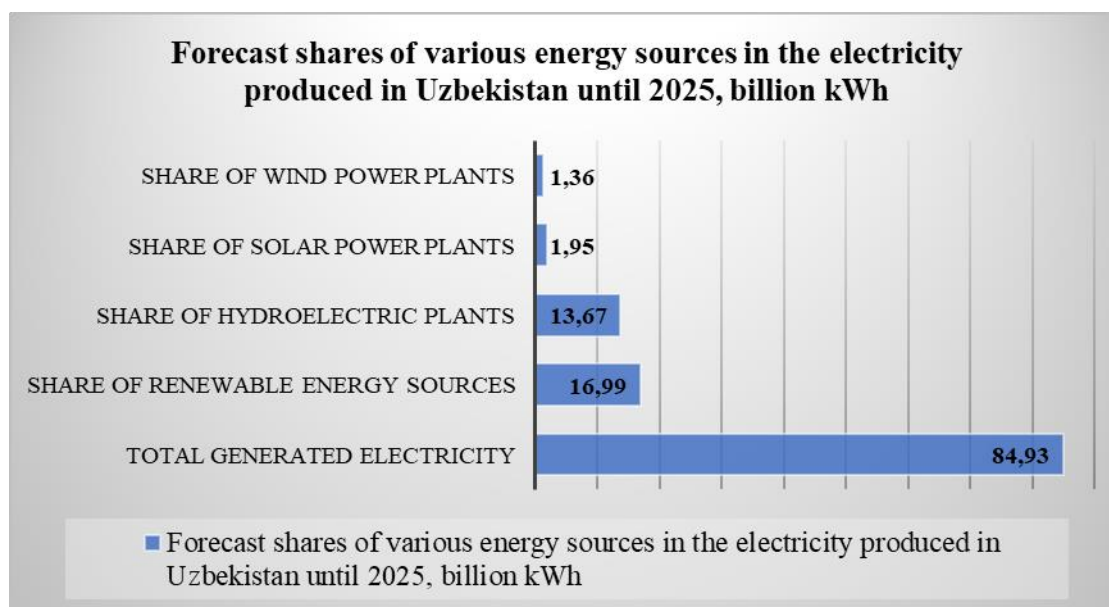


Figure 3. Forecast shares of electricity produced in Uzbekistan by different energy sources until 2025

According to the forecast, electricity production in Uzbekistan for 2019-2025 will increase by 40% by 2025 compared to 2018.

It is 84.93 billion kilowatt*hours. It is planned to increase the existing electricity production capacity by 2.5 times, which will allow to double the annual volume of electricity production by 2030.

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Rezyume: Qayta tiklanadigan energiya - bu shamol va quyosh nurlari kabi cheksiz yoki tugamaydigan yerning tabiiy resurslaridan olinadigan energiya. Qayta tiklanadigan energiya qazib

olinadigan yoqilg'iga tayanadigan an'anaviy energiya o'rnini bosa oladigan energiya turidir va u atrof-muhitga kamroq zarar keltiradi. Qayta tiklanuvchi energiya manbalariga hozirda eng katta urg'u berilmoqda. Rivojlanish bosqichida bo'lgan barcha davlatlar noan'anaviy energiya turlariga o'tishni ommalashtirish uchun aholiga subsidiyalar, soliqdan yengilliklar kabi imkoniyatlar berilmoqda.

Резюме: Возобновляемая энергия — это энергия, получаемая из неограниченных или неисчерпаемых природных ресурсов Земли, таких как ветер и солнечный свет. Возобновляемая энергия — это тип энергии, который может заменить традиционную энергию, основанную на ископаемом топливе и менее вредную для окружающей среды. Возобновляемым источникам энергии в настоящее время уделяется наибольшее внимание. Всем развивающимся странам предоставляются такие возможности, как субсидии и налоговые льготы для популяризации перехода на нетрадиционные виды энергии.

Kalit so'zlar: qayta tiklanuvchi energiya, quyosh energiyasi, shamol energiyasi, geotermal energiya, bioenergiya

Ключевые слова: возобновляемые источники энергии, солнечная энергетика, ветроэнергетика, геотермальная энергетика, биоэнергетика.

IMPROVING THE EFFICIENCY OF ELECTRICITY CONSUMPTION MODES IN THE ROLLING SHOP

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Summary: The purpose of this work is to describe the technological process of rolling mill equipment. Analysis of the optimal order of energy saving. Studying the factors affecting the relative consumption of electricity and electricity consumption patterns according to the rolling profile. It is the development of measures to improve the energy efficiency of the work of rolling mills.

Key words: Efficiency, improvement, rolling mills, rolling profile, metallurgical enterprises, steel melting, rolling shops, conclusion, proposal.

Introduction:

Relevance of the topic: Research aimed at increasing the efficiency of electricity consumption and creating energy- and resource-saving working modes in the world's production sectors is gaining importance. A sharp increase in the demand for products produced by steel production facilities of developed countries leads to a rapid increase in the consumption of electricity. Due to the fact that steel production in the world has increased by 10-12% in the last five years, increasing the efficiency of the use of electricity in metallurgical enterprises has become an urgent task. In metallurgical enterprises in the world, special attention is paid to the standardization and forecasting of electricity indicators and the development of scientifically based values of these indicators in electric steel production.

Purpose of the topic:

- description of technological equipment and technological process of rolling mills;
- electricity consumption of rolling production;
- methods of improving the working order of rolling mills.

The main part

Rolling stock is a finished product made of metals in a rolling mill to certain sizes and shapes by hot or cold processing.

Rolled metal is divided into the following types based on the type of metal used:

- 1) Black metal rolled product
- 2) Color rolled product
- 3) Steel rolled product

A rolling mill is a set of equipment used for the production of a certain rolling stock with all the main and auxiliary equipment related to it.

The main part of rolling mills consists of one or several working cells, in which rolling shafts are located. The shafts are driven by an electric motor.

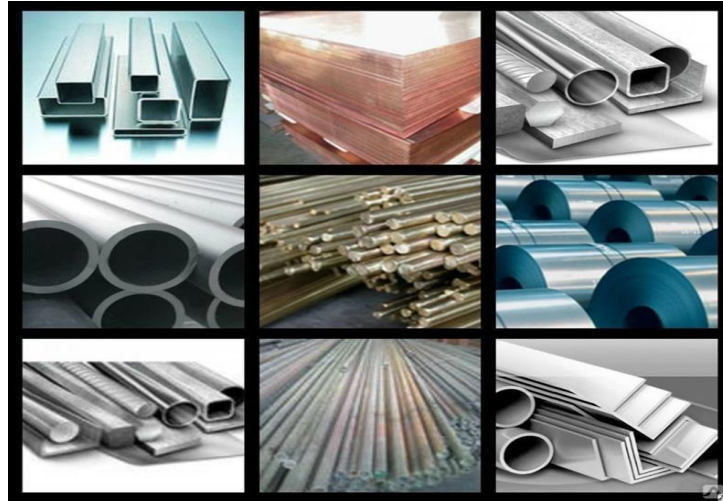


Figure 1.

Main devices, equipment used directly for deformation of metal (rolling rollers, driving motors, reducers, pinion gears). All other equipment necessary for the rolling process is auxiliary equipment (pressure screws, rollers, rollers, shears, saws, hammers, pumping stations, etc.).

It is possible to distinguish three types of electric drives of stans: reversible adjustable, non-reversible adjustable, non-reversible non-adjustable.



Figure 2.

Modern rolling mills consist of a technological complex of machines installed in a row, which require high-quality electricity supply for the production of rolled products according to the established standards.

Due to the high demand for rolled products, it is necessary to study the electrical energy and other effects that affect the production of steel.

The productivity of rolling mills is determined by the throughput of individual units that ensure the execution of technological operations, but mainly, the productivity of the mill is determined by the throughput of the main working units.

The profile of the grooves of rolling mills is different. Example: the surface of the saw is flat for obtaining copper, and the surface of the saw is different in shape to obtain a special profile.

The furrows on the face are called furrows. The space formed by two beams is called a caliber. Workpiece passes through the caliber, forms and takes the shape of the caliber. Calipers are open and closed. In open calibers, the axis of symmetry is parallel, and in closed calibers, it is not symmetrically parallel.

According to the tasks of calibrating shafts:

- a) Compactor
- b) Closer to the shape, profile
- c) To get a clean surface

Two-row looms, in turn, are divided into reversible and non-reversible looms. In reversible looms, the workpiece rotates in both directions. In non-reversible machines, the workpiece rotates only in one direction. Rolling speed is 7-15 m/sec when producing sheets, 35 m/sec when spreading tunics.

Two- and four-jaw machines are mainly used for hot rolling of metal. In three-groove looms, the average shaft becomes frictional. In six-, eight-, twelve-, and twenty-groove multi-groove looms, there are two working grousers, which serve for cold spreading of sheet tapes.

In universal stans, the grooves are located vertically and horizontally, in which the workpiece is spread both lengthwise and crosswise.

Wires with diameter $d=5-9$ and larger diameters are taken in wire rolling mills. Wires of small diameter are obtained by stretching. Wire rolling mills work non-stop and the speed is 20-30 m/sec. Wires are wrapped in a 200 kg bundle.

The process of obtaining a profile is a very complex operation, in which, depending on the strength of the cross-section of the profile of the rolling stock, the workpiece passes through the gauges one after the other up to 7-14 times. They are form-fitting, coarse and clean caliber. The process of calibrating the chute is shown and consists of several shape-approximation gauges.

In steel mills, ingots enter the heating section of the rolling shop at a temperature of 800-8500 C and are heated in furnaces with a temperature of 1300-13500 C. The heated ingots are placed on the roll with the help of cranes. The roller consists of rollers that convey the casting to the blooming or slabbing for spreading. Blooming and slabbing, in turn, are transferred to a sheet rolling mill or a non-stop preparation mill after the ingot sizes are reduced from 350x350 to 150x150 mm. In this case, the size (50X50) is brought, cut to the given length and delivered to the warehouse.



Figure 3.

Thus, the current production of rolling stock consists of two cycles: ingot workpiece and finished product.

Rolling of sheets. Currently, the demand for sheets is growing, and to meet this demand, there are non-stop and semi-stop mills, one mill can produce up to 1 million tons of sheets per year.

There are looms that work continuously to produce thin sheets, the grain is clean and coarse in the cleat, and the surface of the sheets is clean when passing through the clean cleat.

The cleanliness of the surface of the sheets plays a big role in spreading. When the workpiece is heated, oxides are formed on its surface. Therefore, it is necessary to clean his face. For cleaning, leaf surfaces are washed with 15-20% H_2SO_4 , washed and dried.

Laying pipes

Pipes are a widely used material in various sectors of the economy. Depending on the function, pipes are made of carbon, alloy construction steels and non-ferrous metal alloys by rolling, welding and pressing methods. Depending on the production method, there can be welded and seamless pipes. The starting material for welded pipes is a workpiece cut on the basis of a pipe spread made of steel sheets. There are two methods of welding the seams, in the first method, the edges of the pipe welder are heated to 1300-1350⁰ C in special devices and the edges are connected by supplying air or oxygen. With this method, pipes with a diameter of 75-165 mm can be obtained. By the second method, gas and water pipes with a diameter of 540-1620 mm and a thickness of 5-20 mm are obtained by electric arc

welding. With this method, you can get strong welded pipes. Extraction of welded pipes consists of three stages:

1. Cutting the pipe workpiece in the shearing machines and bending the workpiece in the sheet bending machines, turning it into a pipe;
2. Welding of pipe edges;
3. After calibrating the welded pipe, the pipe workpiece is passed through the machines one after the other in the sheet bending machines.

Pipe edge welding is done with electric arc or gas welding.

When joining pipe edges by hot welding, the workpiece is heated to 1300-1350°C in special furnaces and joined by spraying air or oxygen. Sometimes heat welding can be done in special conveyor-type installations.

In this case, the pipe workpiece is passed through the cone hole and brought into the form of a pipe. The workpiece is directed into the furnace chamber, oxygen or air is passed through the chamber, the tube seam is welded and then calibrated

In addition, it is possible to weld groove edges with electro contact electro induction methods. In these methods, welding is performed under a flux. In the future, pipes with a spiral seam are also removed. In this case, the pipe workpiece is made of cut steel sheet strips, the strips are twisted in a spiral shape, brought into the shape of a pipe, and the seam is welded by automatic electric arc welding under the flux. In this case, since the seam is not in one plane, its strength is high.

Summary

1. The analysis of the technological process and the classification of the technological equipment of rolling production were carried out.
2. The electrical supply of rolling mills of the metallurgical industry was studied and the most optimal scheme was selected.
3. An analysis of optimal operating modes and power consumption of Prokat-300 main and auxiliary electric motors was carried out:
 - a) reduction of overheating and overloading of main electric motors; indoor use with forced ventilation;
 - b) reduction of energy loss in resistance during start-up.
4. Factors affecting the relative power consumption and the amount of power consumption according to the rolling profiles have been determined:
 - mathematical models of comparative power consumption for rolled profiles were built;
 - the assessment of changes in the comparative consumption of electricity should be carried out taking into account the structure of the products;
 - the planning of comparative energy consumption should be carried out taking into account the composition of the products planned for production and should be revised when it changes.

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Rezyume: *Ushbu ishning maqsadi prokat uskunasining texnologik jarayonini tavsiflashdir. energiya tejashning optimal tartibini tahlil qilish. elektr energiyasining nisbiy iste'moliga ta'sir etuvchi*

omillarni va toymasin profil bo'yicha elektr energiyasini iste'mol qilish strukturasini o'rganish. bu prokat tegirmonlarining energiya samaradorligini oshirish chora-tadbirlarini ishlab chiqishdir.

Резюме: Целью данной работы является описание технологического процесса прокатного оборудования. Анализ оптимального порядка энергосбережения. Изучение факторов, влияющих на относительное потребление электроэнергии и структуру потребления электроэнергии по скользящему профилю. Это разработка мероприятий по повышению энергоэффективности работы прокатных станов.

Ключевые слова: Эффективность, совершенствование, прокатные станы, прокатный профиль, металлургические предприятия, сталеплавильное производство, прокатные цеха, заключение, предложение.

Kalit so'zlar: Samaradorlikni takomillashtirish, prokat stanoklari, prokat profillari, metallurgiya korxonalari, po'lat quyish, prokat sexlari, xulosa, taklif.

THE EFFECT OF ULTRASOUND ON THE HEALTH OF WORKERS

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Summary: The most common sources of ultrasound are piezoelectric and magnetic transducers. In addition, in industrial conditions, low-frequency ultrasound is often generated during aerodynamic processes: the operation of jet engines, gas turbines, powerful air engines, etc. Ultrasound is a mechanical vibration of an elastic medium, propagating in the form of alternating compression and rarefaction; Frequencies above 16-20 kHz are not perceived by the human ear. As the frequency of ultrasonic vibrations increases, their absorption by the environment increases and the depth of penetration into human tissue decreases. Absorption of ultrasound is accompanied by heating of the environment. The passage of ultrasound in a liquid is accompanied by the effect of cavitation.

Key words: ultrasound, piezoelectric and magnetic transducers, airway exposure

Introduction. Recently, technological processes based on the use of ultrasound energy have become increasingly widespread in production. In industry, ultrasound is used to assess the quality of welds in aircraft and rocketry.

Ultrasound has also found its use in medicine in the diagnosis and treatment of various diseases. Due to the increase in the unit power and speed of various units and machines, the noise level is increasing, including in the ultrasonic frequency range..

Ultrasound-20kHz is a mechanical vibration of an elastic medium with a frequency exceeding the upper limit of hearing. There are two types of ultrasonic vibrations - contact and air.

Contact ultrasound has a local effect on the body, as it is transmitted through direct contact with the ultrasound device, workpieces, or the environment in which ultrasound vibrations are generated.

Under the influence of local (contact) ultrasound examination, autonomic polyneuritis of the hands (less often in the legs) of varying severity appears, up to the development of paresis of the hands and wrists and autonomic vascular dysfunction.

Airway exposure to ultrasonic vibrations generated by low-frequency ultrasound of industrial equipment has a negative effect on the human body. Long-term systemic effects of air ultrasound cause diseases of the nervous and cardiovascular systems, reduce metabolic processes in the body, and cause hearing loss.

The severity of the changes depends on the intensity and duration of the ultrasound exposure to the person through the air, and increases in the presence of high-frequency noise in the spectrum, while adding a clear hearing loss.

If contact with ultrasound continues, these disorders will become more stable.

The nature of the changes that occur in the body under the influence of ultrasound depends on the exposure dose.

Small doses have a stimulating effect - micro-massage accelerates metabolic processes, which is successfully used in medicine to treat various diseases.

Larger doses and longer exposure time of ultrasound to the body lead to disruption of various body systems.

Results

Measures to prevent the negative effects of ultrasound on the body of operators of technological devices and employees of treatment and diagnostic rooms consist, first of all, of carrying out activities of a technical nature:

- creation of automated ultrasound equipment with remote control;

- use of low-power equipment as much as possible, which helps to reduce noise and ultrasound intensity in the workplace by 20-40 dB;
- placing the equipment in soundproof rooms or remote controlled rooms;
- steel or duralumin sound-proofing devices, enclosures, equipment for screens covered with rubber, anti-noise mastics and other materials;
- Automatic shutdown of ultrasound transducers that can be contacted by ultrasound (loading and unloading materials);
- The use of ultrasound devices with the longest frequency from the audible range - not less than 22kHz;
- it is recommended to use a special working tool with a vibration-isolating handle to protect the hands from contact effects of ultrasound;

If it is not possible to reduce the noise and ultrasound intensity to acceptable values due to production reasons, personal protective equipment should be used - noise protection, rubber gloves with cotton lining, etc.

Table 1

Infrasound source	Characteristic frequency infrasound range	Infrasound levels
Car transport	The entire spectrum of the infrasonic range	70-90 dB outside, up to 120 dB inside
Railway transport and trams	10-16 Hz	85 to 120 dB indoors and outdoors
Industrial devices of aerodynamic and shock effects	8-12 Hz	90-105 dB up to
Ventilation of industrial facilities and buildings, the same in the subway	3-20 Hz	75-95 dB up to
Reactive plane	Approx 20 Hz	Up to 130 dB outside

Prevention of harmful effects of ultrasound

Technological measures are at the heart of preventing the harmful effects of ultrasound: creation of automatic ultrasound equipment (for washing dishes, cleaning parts), remote-controlled devices; transition to the use of low-power equipment. In this case, the intensity of ultrasound and noise is reduced by 20-40 dB (for example, ultrasonic cleaning of parts, soldering, drilling, etc.).

When designing ultrasonic devices, it is recommended to choose operating frequencies that are as much as possible in the audible frequency range (not less than 22 kHz) in order to avoid the effect of obvious HF noise. Ultrasonic devices that exceed the standards of noise and ultrasound must be equipped with soundproof devices: cases, screens made of steel or duralumin. Covered with sound-absorbing materials: ruberoid, technical rubber, plastic, anti-vibration, anti-noise mastic. Soundproof shelters of ultrasonic devices should be separated from the floor with rubber gaskets and should not have holes or holes. The Department of Labor Protection continues a series of articles on the negative effects of harmful factors on the human body and the fight against it. Today we will talk about ultrasound. Ultrasounds are mechanical vibrations of an elastic medium, which have the same physical properties as sounds, but exceed the upper limit of audible frequency (more than 20 kHz). Low-frequency ultrasounds (frequency - tens of kilohertz) have the ability to spread in the air, high-frequency

(frequency - hundreds of kilohertz) - fade away quickly. In elastic media - water, metal, etc. - ultrasound propagates well, and the temperature of these media has a significant effect on the propagation speed.

According to the method of propagation of vibrations, ultrasound is divided into contact (when hands or other parts of the human body come into contact with the source of ultrasound) and air (acoustic).

Sources of ultrasound in the workplace.

Artificial sources of ultrasound include all types of ultrasonic technological equipment, ultrasonic devices and equipment for industrial, medical and household purposes that generate ultrasonic vibrations in the frequency range from 20 kHz to 100 MHz and higher. The source of ultrasound can also be equipment that causes ultrasonic vibrations during operation as an accompanying factor. The main elements of ultrasonic technology are ultrasonic transducers and generators. At present, ultrasound is widely used in mechanical engineering, metallurgy, chemistry, radio electronics, construction, geology, light and food industry, fishery, medicine, etc. In production conditions, short-term and periodic contact effects of ultrasound occur when holding the tool, workpiece, loading products into baths, unloading them and performing other operations. The analysis of the prevalence and prospects of the use of various ultrasound sources showed that 60-70 percent of those working in conditions of negative effects of ultrasound are defect detectors, operators of cleaning, welding, cutting machines, ultrasound doctors (ultrasound), physiotherapists, surgeons, etc.

Effects of ultrasound on the human body. The changes that occur under the influence of ultrasound (air and contact) occur according to the general scheme: low intensity stimulates and activates, and medium and large ones weaken, inhibit and completely suppress functions. possible. The most studied biological effect of ultrasound is its contact behavior. Experience has shown that ultrasonic vibrations can penetrate deep into the body and cause serious local tissue damage: inflammatory reaction, bleeding, and at high intensity - necrosis.

Due to the short wavelength, high-frequency contact ultrasound is almost invisible in the air and affects workers only when the ultrasound source is in contact with the surface of the body. Changes caused by contact ultrasound are usually more pronounced in the contact zone, most often these are fingers, hands. Long-term work with ultrasound during contact with the hands causes damage to the peripheral neurovascular apparatus, and the severity of the changes depends on the ultrasound intensity, sound time and contact area, i.e. can increase in the presence of ultrasound effects and additional factors of the production environment that increase its effect (air ultrasound, local and general cooling, contact lubricants - various types of oils, static muscle tension, etc.).

Among those working with contact ultrasound sources, there was a high percentage of complaints about the presence of paresthesia, sensitivity of the hands to cold, a feeling of weakness and pain in the hands at night, decreased tactile sensitivity, sweating. There are also complaints of headache, dizziness, noise in the ears and head, general weakness, palpitations, pain in the heart region.

In people who are engaged in experimental work on ultrasound devices for a long time, sometimes diencephalic diseases (weight loss, sudden increase in blood sugar, slow decrease to the initial level, hyperthyroidism, mechanical muscle excitability, itching, paroxysmal attacks) occur. such as visceral crises).

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to the initial level, hyperthyroidism, mechanical muscle excitability, itching, paroxysmal attacks) occur. such as visceral crises).

Measures to protect and prevent the impact of ultrasound on workers should be aimed at limiting the impact of sound and ultrasound vibrations transmitted through air and communication. The main measure to reduce noise and ultrasound is to reduce their intensity at the source, but this way is not always technically possible. Industrial enterprises often use excessive intensity of ultrasonic vibrations, so first of all, attention should be paid to the rational selection of the power of the equipment. In cases where intensity reduction is not in the interest of technology, the most effective measure to reduce noise and ultrasound is to soundproof the equipment. Prevention of ultrasonic impact of the contact is achieved by shutting off vibrations during loading and unloading of parts, for which it is recommended to use automatic blocking.

To a large extent, it is possible to weaken the intensity of the contact effect using special devices for loading parts (grids, plexiglass containers, etc., handles with an elastic coating). If necessary, it is recommended to use short-term contact clamps, clamps, rubber and cotton gloves from time to time.

Walls and welding machines must have special devices for fixing parts during processing. Ultrasound - elastic vibrations with a frequency higher than the range of human hearing (20 kHz), propagates in the form of waves in gases, liquids and solids, or creates standing waves in limited areas of this medium.

Ultrasound sources - all types of ultrasonic technological equipment, ultrasound devices and equipment for industrial and medical purposes. Normalized parameters of contact ultrasound according to CH 9-87 PE 98, sound pressure levels in a third octave with geometric mean frequencies equal to 12.5; 16.0; 20.0; 25.0; 31.5; 40.0; 50.0; 63.0; 80.0; 100.0 kHz. Harmful effects of ultrasound are manifested in the functional disorders of the nervous system, changes in blood pressure, composition and properties of the human body. Workers complain of headaches, fatigue and hearing loss.

The main documents regulating safety when working with ultrasound GOST 12.1.001-89 SSBT "Ultrasound. General safety requirements" and GOST 12.2.051-80 SSBT "Technological ultrasound equipment. Safety Requirements", also SI 9-87 RB 98 "Airborne Ultrasound. Maximum permissible levels in workplaces", SI 9- 88 RB 98 "Ultrasound transmitted by contact. Maximum levels allowed in workplaces".

It is forbidden for a person to have direct contact with the working surface of the ultrasound source and the communication device during the ultrasound excitation. It is recommended to use a remote control; interlocks that ensure automatic shutdown when sound-proofing devices are opened. High-frequency ultrasound is almost invisible in air and can affect workers mainly when the ultrasound source comes into contact with the exposed surface of the body. Low-frequency ultrasound, on the other hand, has a general effect on workers through the air, and a local effect due to the contact of the hands with the workpieces, where the ultrasonic vibrations are excited.

Ultrasonic vibrations propagate in the direction directly at the source of formation, but at a small distance from the source (25-50 cm) they turn into concentric waves and fill the entire working room with ultrasound and high-frequency noise.

Ultrasound has a significant effect on the human body. As mentioned above, ultrasound can propagate in all media: gaseous, liquid and solid. Therefore, in the human body, it affects not only the actual organs and tissues, but also cells and other fluids. When

propagating in a liquid medium, ultrasound causes cavitation of this liquid, i.e. it is the appearance of the smallest empty bubbles filled with vapors of this liquid and substances dissolved in it and their compression (collapse). This process is accompanied by the formation of noise.

When working on powerful ultrasonic devices, operators complain of headaches, which, as a rule, disappear when work is stopped; quick fatigue; night sleep disorder; feeling of unbearable sleepiness during the day; weakening of vision, feeling of pressure on the eyelids; poor appetite; constant dryness in the mouth and stiffness of the tongue; abdominal pain, etc.

infrasound - the field of acoustic vibrations in the frequency range below 20 Hz. In production conditions, infrasound, as a rule, is combined with low-frequency noise, and in some cases with low-frequency vibration. Infrasound is absorbed very little in air and therefore can travel long distances.

Many natural phenomena (earthquakes, volcanic eruptions, sea storms) are accompanied by the emission of infrasonic vibrations.

In industrial conditions, infrasound is mainly generated during the operation of large-sized machines and mechanisms (compressors, diesel engines, electric locomotives, fans, turbines, jet engines, etc.) that perform rotation or rotational movement with cycle repetition, and operate at low speeds. Infrasonics of aerodynamic origin occur in turbulent processes in gas or liquid flows. According to SanPiN 2.2.412.1.8.10-35-2002 normalized parameters of continuous infrasound sound pressure levels in the octave frequency range with geometric mean frequencies of 2, 4, 8, 16 Hz.

The total sound pressure level is the value calculated by the energy sum of the sound pressure levels in the octave frequency bands, measured when the "linear" (from 2 Hz) frequency response is turned on in the sound level meter, or without corrective corrections; It is measured in dB (decibels) and denoted by dB Lin.

Infrasound has a negative effect on the entire human body, including the hearing organ, and reduces hearing sensitivity at all frequencies. The long-term impact of infrasound vibrations on the human body is considered a physical burden and causes fatigue, headaches, vestibular disorders, sleep disorders, mental disorders, central nervous system dysfunction, etc. Low-frequency vibrations with an infrasonic pressure level above 150 dB are absolutely unbearable for people.

Conclusion

Compressors are the most characteristic and common source of low acoustic vibrations. It is noted that the noise of compressor shops is low-frequency and infrasound dominates, and in the operators' cabins, infrasound is more evident due to the attenuation of high-frequency noise. Powerful ventilation systems and air conditioning systems are also sources of infrasonic vibration. Their maximum sound pressure levels reach 106 dB at 20 Hz, 98 dB at 4 Hz, and 85 dB at 2 and 8 Hz, respectively.

In the frequency range of 16-30 Hz, the threshold of perception of infrasonic vibrations for a hearing analyzer is 80-120 dBA, and the threshold of pain is 130-140 dBA. The impact of infrasound on a person is considered a physical burden: spatial orientation is disturbed, seasickness, indigestion, visual disturbances, dizziness and changes in peripheral blood circulation. The degree of exposure depends on the frequency range, sound pressure level and duration of exposure. Vibrations with a frequency of 7 Hz interfere with concentration and cause fatigue, headaches and nausea. The most dangerous vibrations with a frequency of 8

Hz. They can cause the phenomenon of resonance of the circulatory system, which leads to an overload of the heart muscle, a heart attack, or even the rupture of some blood vessels. Low-intensity infrasound increases nervousness, can cause depression. Ultrasonic equipment and technologies are widely used in various fields of human activity for active exposure to substances (welding, tinning, processing, degreasing of parts, etc.); systematic analysis and control of physical and mechanical properties of substances and materials (defectoscopy); for processing and transmission of radar and computer signals; in medicine, sound images for the diagnosis and treatment of various diseases, cutting and combining biological tissues, sterilization instruments, hands, etc.

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Rezyume: *Ultratovushning eng keng tarqalgan manbalari piezoelektrik va magnit transduserlardir. Bundan tashqari, ishlab chiqarish sharoitida past chastotali ultratovush ko'pincha aerodinamik jarayonlarda hosil bo'ladi: reaktiv dvigatellarning ishlashi, gaz turbinalari, kuchli pnevmatik motorlar va boshqalar. Ultratovush- bu elastik muhitning mexanik tebranishlari, unda o'zgaruvchan siqilishlar va siyraklanishlar shaklida tarqaladi; 16-20 kHz dan yuqori chastotalisi inson qulog'i bilan sezmaydi. Ultrasonik tebranishlar chastotasining oshishi bilan ularning muhit tomonidan so'rilishi oshadi va inson to'qimalariga kirish chuqurligi pasayadi. Ultratovushning yutilishi muhitni isitish bilan birga keladi. Ultratovushning suyuqlikdagi o'tishi kavitatsiya ta'siri bilan birga keladi.*

Резюме: *Наиболее распространенными источниками ультразвука являются пьезоэлектрические и магнитные преобразователи. Кроме того, в производственных условиях низкочастотный ультразвук часто генерируется при аэродинамических процессах: работе реактивных двигателей, газовых турбин, мощных пневмодвигателей и т.п. Ультразвук — механическая вибрация упругой среды, распространяющаяся в виде попеременных сжатий и разрежений; Частота выше 16-20 кГц не воспринимается человеческим ухом. По мере увеличения частоты ультразвуковых колебаний увеличивается их поглощение окружающей средой и уменьшается глубина проникновения в ткани человека. Поглощение ультразвука сопровождается нагревом окружающей среды. Прохождение ультразвука в жидкости сопровождается эффектом кавитации.*

Ключевые слова: *ультразвук, пьезоэлектрические и магнитные преобразователи, воздействие на дыхательные пути.*

Kalit so'zlar: *ultratovush, pyezoelektrik va magnit transduserlar, havo yo'llarining ta'siri*

УДК 621.313

RESEARCH OF AN AUTONOMOUS WATER SUPPLY SYSTEM THAT NEUTRALIZES UNDERGROUND WATER USING ULTRAVIOLET RADIATION

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Summary: *This scientific article is dedicated to the provision of clean drinking water to agricultural facilities and the population, and is aimed at offering an optimal scientific and technical solution. An autonomous water supply system using solar energy, purifying and disinfecting water with ultraviolet rays is offered.*

Key words: *Drinking water, artisanal well, ultraviolet light, water purification, disinfection.*

Introduction.

A disadvantageous situation has arisen in rural areas, where only one-third of the rural population has access to safe centralized water supply systems and it is not economically feasible to build new ones. In this regard, ensuring the epidemiological safety of drinking water for residents of rural districts is one of the main tasks of the state and scientific communities of the Republic of Uzbekistan.

In most regions, the rural population uses underground drinking water. These waters have higher organoleptic, chemical and bacteriological indicators than surface waters. However, their quality cannot fully meet the requirements of the sanitary-epidemiological service for microbiological disinfection.

At present, the issues of development of UV source control systems devices, which allow to provide water neutralization and purification with wide possibilities of practical use, high efficiency and reliability, have not been sufficiently studied. In addition, the possibility of using solar energy as a power source for ultraviolet lamps is of great scientific and practical interest.

In this regard, the urgent task of the public economy is to study the possibility of large-scale practical use of single spatial ultraviolet radiation control devices and systems, which allow water to be disinfected with high efficiency, effectiveness and high reliability.

Another important problem in rural areas is the frequent outages of the centralized power supply and voltage asymmetry, which forces people to look for alternative sources of electricity.

Methods.

One of the methods of providing epidemiologically safe drinking water to remote rural areas is the use of water purification systems based on ultraviolet radiation with autonomous power sources from solar cells.

The use of solar energy in the energy supply system seems to be relevant. However, the daily, monthly and annual unevenness of solar radiation forces us to look for ways to use it wisely. In particular, the use of batteries, regulation of energy using controllers, and the use of efficient energy converters in the power circuits of ultraviolet lamps ensure high reliability and efficiency of the autonomous ultraviolet disinfection system. In this regard, theoretical research and the development of systems for ultraviolet disinfection of groundwater with a technologically simple and high-efficiency solar photovoltaic power supply system are urgent tasks.

The purpose of the research is to develop the principles of improving the technology of disinfection of underground drinking water with ultraviolet radiation and to justify the autonomous system of providing energy to the sources of ultraviolet radiation.

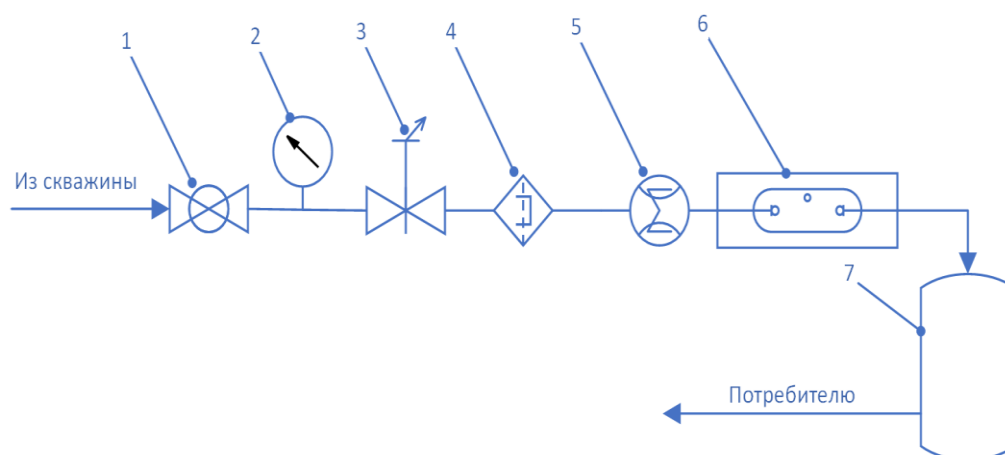


Figure 1. Technological scheme of the autonomus device for decontamination of groundwater
1-water inlet valve, 2-pressure sensor, 3-solenoid valve, 4-electromagnetic water purifier, 5-water consumption meter, 6-ultraviolet lamp camera, 7-purified water storage tank

A water purifier equipped with an ultraviolet (UV) disinfection system is designed for connection to artesian wells. The principle of operation of the system is described as follows:

1. Pumps located in an artesian well deliver water to the inlet valve;
2. A special sensor always shows the water pressure;
3. The water supply is remotely controlled using a solenoid valve;
4. Water is cleaned of suspended particles using an electro-magnetic cleaner;
5. Purified water meter;
6. A chamber that contains ultraviolet lamps and cleans water from bacteria;
7. Purified water storage tank.

Results and Discussion

Based on the simulation model, the first version of the autonomous UV disinfection system using solar panels was developed.



Figure 2. A device for disinfecting water based on ultraviolet lamps is shown.

The system components included the following elements:

- 30 W and 12 V UV lamp manufactured by "Phillips" company;
- Four UV solar panels are connected in parallel and provide a total of 400 W peak power;
- Three lithium-ion batteries are connected in parallel, with a total capacity of 160 Ah and a voltage of 12 V;

- K-200 control controller;

- RP-500-3m inverter model

The following indicators of the system were recorded:

Jsc - Short circuit current;

U_{so} - salt operating voltage;

f - filling coefficient of solar cells (SC) volt-ampere characteristic (VACH);

η - SC efficiency;

W_{max} – maximum power of SC;

W_{opt} - optimal loading point power at SC.

Measurements of these photovoltaic parameters, as well as the temperature characteristics of solar cells, were carried out under the influence of sunlight. The procedure for determining the parameters includes monitoring the operating temperature of the panel, for which special thermosensitive film sensors placed on the back of the panel were used. Also, the parameters of the solar panels in 3 different modes are determined in relation to the air temperature on the solar day and the direction of the sun:

- Mode I: precise orientation of the sun in azimuth and zenith (the SC surface is strictly perpendicular to the incoming solar flux);

- Mode II: Azimuth direction on the Sun, but the SC surface is at an angle of 42° to the horizon

- Mode III: south along the azimuth and the SC surface is placed at an angle of 42° relative to the horizon.

The characteristics of the solar cells were measured at 14:00 on July 13, 2021, during the second mode regulation (Table 1).

Experimental parameters of the solar panel in mode 2

Table 1

Parameters	Measurement value
E _o is the flux density of solar radiation, BT/M ²	848
Panel temperature SC work, °C	54,6
Air temperature: T _x , °C	44
Air temperature behind the panel T', °C	38
Short circuit current J _{sc} , A	1,84
U _{opr} only operating voltage,	18,7
VACH filling factor, f	0,67
Efficiency. solar cell, % η	10,4
Maximum power SC W _{max} , W	34,4
At the optimal load point SC power W _{opt} , W	23,1
The average operating temperature of the panel is SC _w , °C	54,6

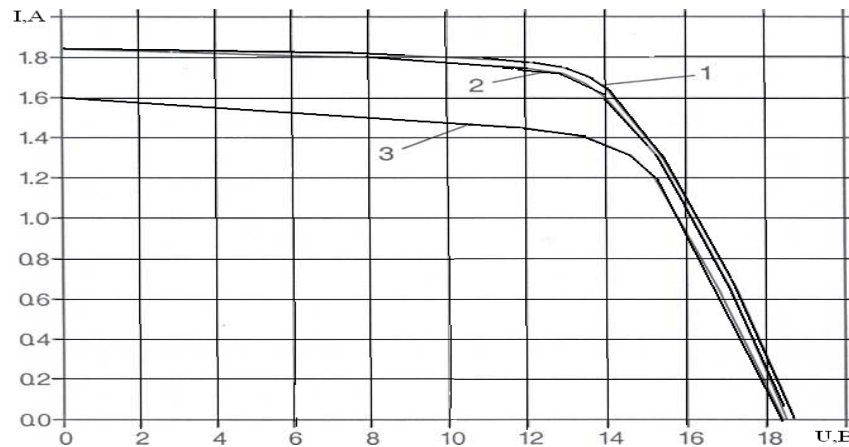


Figure 3. Comparison of SC load VACHes in modes I, II and III

Figure 3 shows a comparative analysis of load characteristics in three SC positions. it can be clearly seen that load curves 1 and 2 are almost indistinguishable from each other, which shows the effectiveness of using uniaxial (azimuthal) observation when installing solar panels at an angle to the earth's surface. A comparison of these curves highlights the positive effect of azimuth tracking, which helps to increase the power of the SC and therefore the entire solar power plant.

In addition, experiments were conducted in order to evaluate the changes in the properties of solar cells during the day in the SC (azimuth to the South; angle of inclination to the horizon 42°) direction.

The conducted experiments confirmed the high energy properties of solar cells (SCs) and the verification of the simulation model was successfully carried out. In conclusion, these SBs represent a suitable option for integration into an integrated system.

Different bacteria and viruses require different doses of ultraviolet (UV) radiation to inactivate them. In this regard, two sample samples were selected at different time intervals to adjust the intensity of UV radiation.

The obtained water samples were sent to the laboratory of the Kibray district department of the Tashkent regional department of the sanitary-epidemiological welfare and public health committee under the Ministry of Health of the Republic of Uzbekistan. The analysis showed that the dominant microorganism is coliphage

MS-2.

Then, in the laboratory of the National Research University "TIAME" to determine the minimum dose of ultraviolet radiation, water samples were exposed to ultraviolet radiation at different doses (Table 2)

MS-2 Log Inactivation	Sample 1 (MW*s/sm ²)	Sample 2 (MW*s/sm ²)
1	3.9	15.3
2	25.3	39.3
3	46.7	63.3
4	68	87.4
5	89.5	111.4
6	111.0	135.5

Table 2 Doses required for MS 2 inactivation

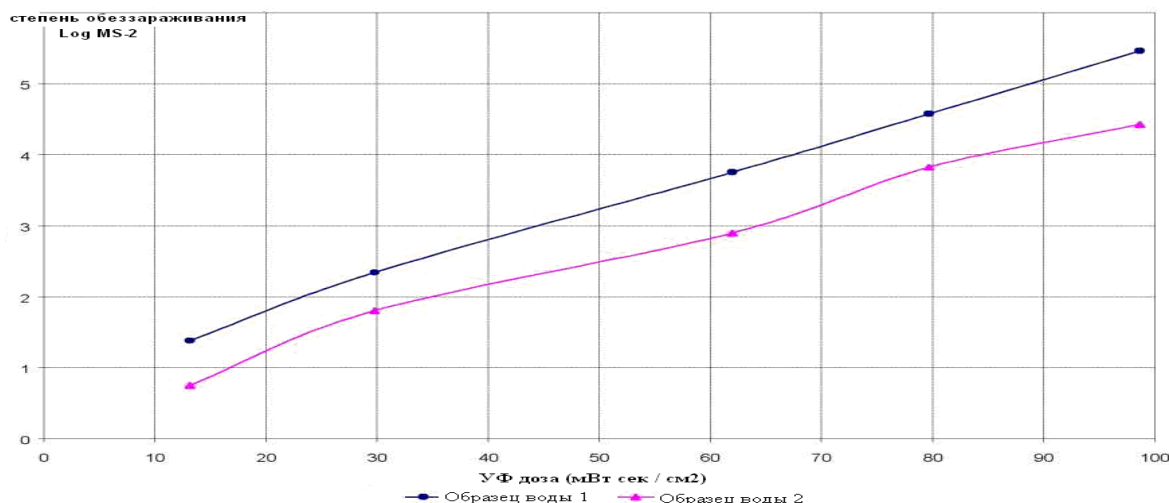


Figure 4. Shows the minimum doses of ultraviolet (UV) radiation required for inactivation

The data presented in Photo 4 show the minimum doses of ultraviolet (UV) radiation required for inactivation. Of particular interest is the second water sample, which requires an increased dose of UV radiation. This situation is explained by an increase in iron concentration exceeding the recommended value (in this sample, iron (0.45-0.65) mg/l). Nevertheless, the bacteriological parameters of the water remained within the established standards.

After the introduction of the model device for UV disinfection, subsequent periodic studies of water samples confirmed the efficiency and reliability of this autonomous system for groundwater treatment.

Conclusion

1. A special autonomous ultraviolet irradiator device was created to neutralize underground water. Its main elements are an electro-magnetic cleaner, an ultraviolet lamp and a soldering panel.
2. In order to effectively use solar energy, 3 different modes of the solar panel have been tested according to the azimuth of the sun and the angle of its position relative to the horizon. In this case, it was confirmed that the highest power is obtained in this azimuthal direction.
3. In order to choose the optimal dose of ultraviolet radiation, MS-2 coliphage, one of the most resistant microorganisms to water disinfection, was activated. The minimum dose of 100% neutralization of water from the initial suspended particles treatment with an electro-magnetic cleaner is 111 MBt*s/cm². The dose of UV disinfection of raw water is 135 MW *s/sm².

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Rezyume: *Mazkur ilmiy maqola qishloq xo'jaligi ob'yektlari va aholini toza ichimlik suvi bilan ta'minlashga bag'ishlangan bo'lib, optimal ilmiy-texnik yechim taklif etishga qaratilgan. Quyosh energiyasidan foydalanadigan, suvni ultrabinafsha nurlar bilan tozalaydigan va zararsizlantiradigan avtonom suv ta'minoti tizimi taklif etiladi.*

Резюме: *Данная научная статья посвящена обеспечению чистой питьевой водой сельскохозяйственных объектов и населения и направлена на предложение оптимального научно-технического решения. Предлагается автономная система водоснабжения, использующая солнечную энергию, очищающую и обеззараживающую воду ультрафиолетовыми лучами.*

Kalit so'zlar: *Ichimlik suvi, artisanal quduq, ultrabinafsha nurlar, suvni tozalash, dezinfeksiya qilish.*

Ключевые слова: *Питьевая вода, кустарный колодец, ультрафиолет, очистка воды, дезинфекция.*

ANALYSIS THE MAIN PROBLEMS OF ELECTRODES IN ELECTRIC ARC FURNACES (EAF)

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Summary: *This article describes what types of electrodes are used in electric arc furnaces and their technical characteristics. As well as, the factors that cause the increase in the consumption of electrodes are analyzed and solutions are given. In addition, cases of electrode breakage and damage, which negatively affect the continuity and quality of the melting process, were analyzed, and suggestions were made to solve these causes.*

Key words: *Graphite electrode, EAF, consumption of electrodes, energy efficiency, breakage electrodes.*

The production of steel by Electric Arc Furnaces (EAF) has steadily expanded during the past few decades. Whether in the AC or the DC type, the electric arcs are struck from one or more electrodes to metallic charges [1]. Electrodes are the main element in the operation of steel melting furnaces. Not only electrodes directly affect the timely and high-quality melting of the slag but also, reducing the consumption of electricity in metal melting is one of the most important tasks. Because of the process of metal melting is 40-70% of the whole process and the consumption of electricity is 60-80%. Acceleration of the metal melting as much as possible, the electric arc between the electrodes and the metal plays a very important role for the quality continuation of the technological process [2].

Maximizing the speed of steel melting is crucial, with the electric arc formed between the electrodes and the metal playing a vital role in ensuring the continuous quality of the technological process. Furthermore, the high quality melting of metal within a designated timeframe is directly contingent upon the performance of the electrodes. So that nowadays one of the most significant challenges in contemporary metal melting processes is the issue of electrode damage and breakage.

After all, when melting steel, electrodes are damaged, broken, and as a result, the arc goes out and the melting process is disturbed. So that depending on the mechanical and thermal tolerance of electrodes and their use in melting processes, the selection of their production process, materials, selection of electrode types in accordance with the process is one of the urgent problems. As well as, high quality melting of metal in a specified period time directly depends on the electrodes. Today, the use of furnaces is increasing, and the demand for electrodes is increasing directly after the increase in power. One of the biggest problems in the process of metal melting today is damage (breakage) of electrodes. In this article, these problems are analyzed and solutions are given with a scientific and practical approach [3-4].

The first part of this article begins with an analysis of the most common types of electrodes used in EAFs and their characteristics. **The second part** addresses the most important problems in the use of electrodes in melting technologies and provides science-based suggestions for overcoming these problems. As well as, in **the third part** of the main part, how many electrodes are used to melt a given amount of steel in the technological process, and the factors that cause this amount to increase are analyzed, and suggestions for solutions to these problems are given.

The most commonly used electrodes in EAF are presented in fig. 1.

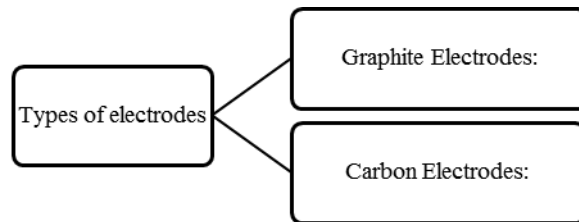


Figure 1. Types of electrodes most commonly used in EAF.

Graphite electrodes are used in electric arc furnaces for several reasons. For example, the mentioned electrodes are selected based on the power and technological process of EAF. Currently, graphite electrodes are widely used for their high thermal stability and durability in the most powerful furnaces. The table below shows the characteristics of graphite electrodes selected according to the points [8].

Table 1.

Types of graphite electrodes and their characteristics.

Types of Graphite Electrodes	Characteristics
Regular Power (RP)	- Suitable for applications with current density $< 17 \text{ A/cm}^2$.
	- Mainly used in ordinary power electric furnaces.
	- Moderate performance and cost.
High Power (HP)	- Designed for applications with current density $< 22 \text{ A/cm}^2$.
	- Suitable for EAF and ladle furnaces.
	- Better performance than RP electrodes.
Ultrahigh Power (UHP)	- Suited for applications requiring current density $> 25 \text{ A/cm}^2$.
	- Ideal for ultra-high power steelmaking EAFs.
	- Utilizes high-quality needle coke.
Super High Power (SHP)	- Engineered for extremely demanding conditions.
	- Current density $> 25 \text{ A/cm}^2$.
	- Exceptional performance and durability.
	- Utilizes premium needle coke.

Above are the types and classifications of electrodes, of which the most widely used in the steel melting process are UHP and SHP graphite electrodes.

Electrodes stand out as the pivotal element in the steel melting process, exerting a profound influence on the quality and efficiency of metal melting within a specified timeframe. The effectiveness of electrodes is crucial for achieving high-quality metal melting within the desired time parameters. Therefore, this article is dedicate to determining the quantity of electrodes consumed in electric arc furnaces. The electrode consumption for 1 t. of produced steel is an important technical economical factor of EAF operation. We can say that the consumption of electrodes in EAF steelmaking depends not only on the quality of the electrodes, but also on the level of operation and management of steelmaking.

Low specific consumption of electrodes - moves within a wide range – between 2 to 6 kg/t of produced steel and depends on various factors including:

Firstly, the time of melting - shortening the melting period by 10 minutes brings a decrease in electrode consumption by approximately $0,3 \text{ kg.t}^{-1}$.

That is why the operational practice of electric arc steelmaking furnaces demonstrated that the total electrode consumption correlates well with the overall electricity consumption [4]. Maintain a good power supply state and supply electricity within the allowable current intensity range of the

electrode according to the design requirements of the electric furnace. As well as, it is necessary to identify energy waste in steel melting furnaces to reduce energy consumption. It is clear from electrical engineering that the value of useful energy is directly related to energy waste.

We will examine the energy balance of the (EAF), which is expressed as follows [5]:

$$W_e + W_s + W_{ch} + W_b = W_m + W_{e,l} + W_{th,l} \pm W_{en} \quad (1)$$

where - W_e – is the electricity consumed by the electric furnace installation from the energy system; W_s – is the enthalpy of the charge and gases entering the EAF workspace; W_{ch} – is the chemical energy of exo– and endothermic oxidation, reduction and slag formation reactions; W_b – is the amount of thermal energy introduced into the EAF workspace using fuel and oxygen burners; W_m – enthalpy of the drained liquid metal and slag (useful energy consumption); $W_{e,l}$ – electrical losses in the power source and secondary current supply (up to the working space of the furnace); $W_{th,l}$ – thermal losses from the working space of the furnace; W_{en} – represents the change in enthalpy of the lining (positive for heating and negative for cooling) [11].

The portion of electricity consumption in the balance can be expressed as follows:

$$W_e = W_m + W_{e,l} + W_{th,l} - (W_s + W_{ch} + W_b) \quad (2)$$

From the analysis in equation (2) that a reduction in electricity consumption can be obtained both by reducing electrical and thermal losses, and by using other types of energy, that is, using integrated heating.

Secondly, the consumption of electrodes the choice of electrode material, quality, and coating can also play a significant role in electrode consumption management. According to the above points, take a graphite electrodes as an example, the production technology of high-quality graphite electrodes for heavy-duty arc furnaces is quite complex. The consumption of graphite electrodes fluctuates within a significant range, which during normal operation of furnaces is 4–8 kg/t (in a well-functioning heavy-duty steel-smelting furnace, the total consumption of electrodes was 4 kg/t of steel). The following measures to reduce the consumption of graphite electrodes in electric steel making process are presented in the fig.2.

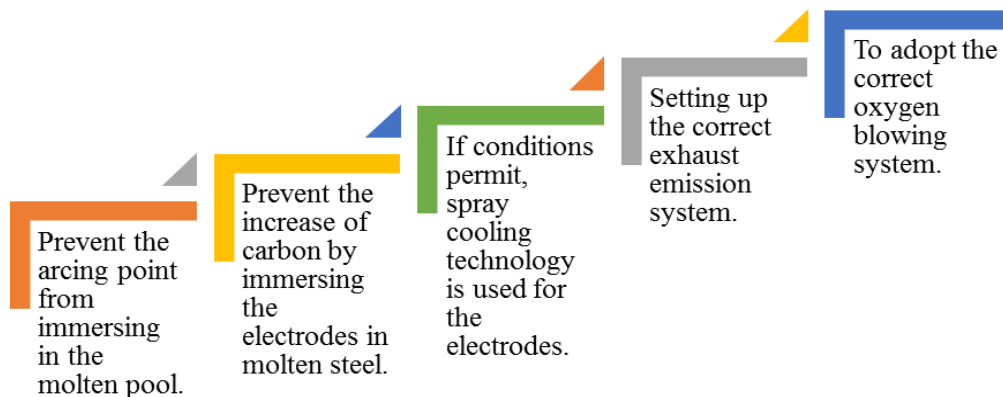


Figure 2. Measures to reduce the consumption of graphite electrodes in electric steel making process.

Based on the points mentioned above, it can be concluded that the consumption of graphite electrodes in EAF steelmaking is influenced not only by the quality of the electrodes but also by the efficiency of the steelmaking operation and management. Various factors such as operational practices, maintenance, and overall management of the steelmaking process play a crucial role in determining the lifespan and consumption rate of graphite electrodes in EAFs.

One of the next major problems in electric steel melting is electrode breakage and damage. In the operation of electric arc steel melting furnaces, these problems not only increase the consumption

of electrodes, but also seriously damage the energy efficiency due to replacing broken electrodes or working with the remaining two electrodes. We will consider these issues below in fig.3.

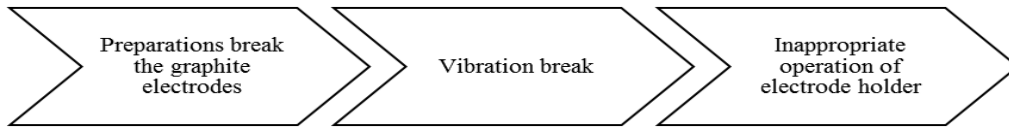


Figure 3. Factors causing breakage and damage of graphite electrodes.

That is, in the figure 3 presented above, we briefly mentioned 3 main reasons for the breaking and damage of electrodes in the technological process. These reasons can be explained as follows:

1. When smelting, after the bottom of preparations gradually melt, it is like a main shaft, the space under it is empty, the un-melted scrap steel on furnace wall will fall down to the electrodes, causing cracks. Generally, the broken part is the electrode holder.

2. The electrode is subjected to electromagnetic force during smelting, and it will definitely vibrate, which will easily cause the electrode to fatigue and break. These breaks have no disciplines, mostly occurs near the middle of the electrode nipples and nipples.

3. It is not allowed to have foreign matter between the electrode and holder, both should be always vertical, holder cannot be held out of the safety line of the electrode. These irregular operations will cause the electrode to break.

Above, we present the solutions for preventing electrode breakage in the figure 4 below.

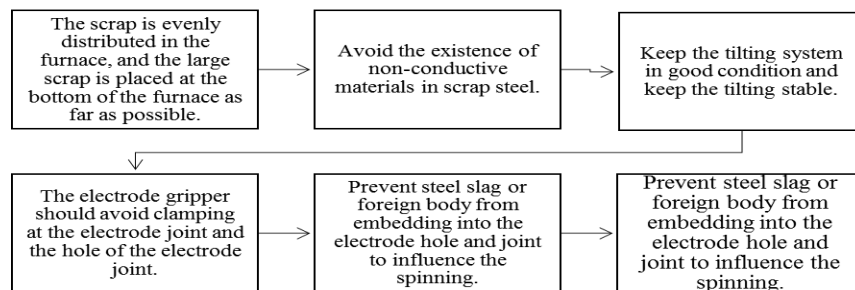


Figure 4. Strategies to prevent electrode breakage in steel smelting.

The above measures can be explained as follows:

Preventing graphite electrodes from damage can not only reduce the cost of semi-finished products by reducing the consumption of electrodes, but also ensure the efficiency of electrical energy. In general, two factors affect the breakage and damage of electrodes: These are external and internal factors.

1. Internal factors are caused by the quality of graphite electrode products.

Reasons for breaking of electrode nipples: Nipples play a key role in the connection of electrodes in steelmaking. The quality of Nipples is directly related to the use of electrodes in electric furnace steelmaking.

Causes of malfunctions during installation and use due to external factors.

These include: Collapse breaks down the electrode: If the steel scrap in the furnace has formed a bridge structure in the smelting process, especially near the melting point, the long time and short arc operation will produce a larger lateral impact force, which will cause the collapse of the material. An important feature of this kind of accident is that the action moment of the electrode clamping point is the largest, and the probability of breaking near the electrode clamping point is the greatest. As well as, resonance action breaking electrode: Graphite electrodes are bound to vibrate when they are subjected to electromagnetic force in the process of smelting. If the mechanical vibration frequency of the pole is close to or synchronized with that of the electromagnetic force, the electrodes will resonate and lead to fatigue fracture of the pole.

To conclude, electrodes ensure high-quality melting of scrap in the technological process. For this, it is important to have accurate information about the types and classification of electrodes and to choose special electrodes. This is mainly because of complexity of the production technology of graphite electrodes and their production according to the requirements of steel melting furnaces, their price increases. So, that is why in this article, the consumption of graphite electrodes in the process of steel smelting is given, and if the electrodes are damaged or broken, the condition of the consumption of the electrodes and what problems they cause are considered. Also, the technical specifications of graphite electrodes, which are the main element of the steel melting process, are given, the problems that may arise in their use in the technological process are given, and the suggestions for solving these problems are presented in figures 2 and 4.

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Rezyume. *Ushbu maqolada elektrda po'lat eritish pechlarida qanday turdagi elektrodlar qo'llanilishi va ularning texnik xarakteristikalari keltirilgan. Shuningdek, elektrodlar sarfini ortishiga olib keladigan omillar tahlil qilinib, bu sabablarga yechimlar taqdim etilgan. Bundan tashqari, eritish jarayonining uzluksizligi va sifatiga salbiy ta'sir ko'rsatuvchi elektrodning sinishi va shikastlanishi holatlari tahlil qilinib, ushbu sabablarni bartaraf etish yuzasidan takliflar berilgan.*

Резюме. *В данной статье описано, какие типы электродов используются в электродуговых печах и их технические характеристики. А также проанализированы факторы, вызывающие увеличение расхода электродов и даны пути решения. Кроме того, проанализированы случаи поломки и повреждения электродов, отрицательно влияющие на непрерывность и качество процесса плавки, и даны предложения по устранению этих причин.*

Kalit so'zlar. *Grafit elektrod, EAF, elektrodlar iste'moli, energiya samaradorligi, elektrodlar sinishi.*

Ключевые слова. *Графитовый электрод, ЭДП, расход электродов, энергоэффективность, поломка электродов.*

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DETERMINATION OF THE LAWS OF CHANGE OF ELECTRICITY CONSUMPTION PARAMETERS

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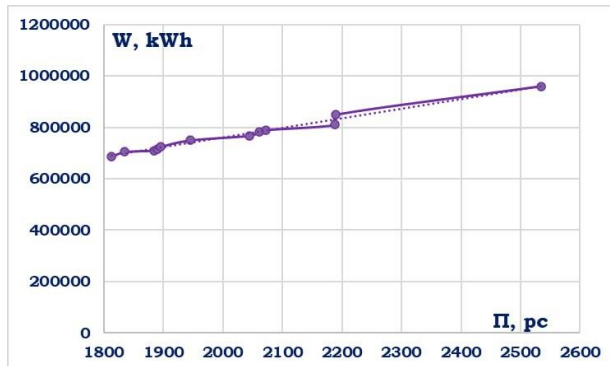
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Summary: The article deals with the issues of determining the patterns of changes in the parameters of electrical energy on the example of the enterprise "Uz Truck & Bus Motors". And also on the basis of relationships $W=f(P)$ and $d=f(P)$ using the least squares method, mathematical models were developed by constructing energy characteristics that characterize the relationship of products produced at the enterprise to the total electricity consumption and specific electricity consumption per unit of production, according to the company's data for 2018, 2019, 2020 and the correlation coefficients were determined.

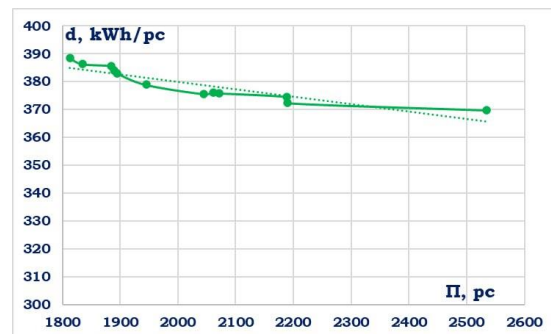
Key words: Electricity consumption, patterns of change, relative energy consumption per unit of production, correlation coefficient.

The study of the laws of changes in the parameters of the electrical energy consumption of the machine-building enterprise is carried out on the basis of the enterprise's three-year data of 2018, 2019, 2020, by constructing energy characteristics characterizing the relationship between the electricity produced in the enterprise and the comparative consumption of electricity per unit of product.

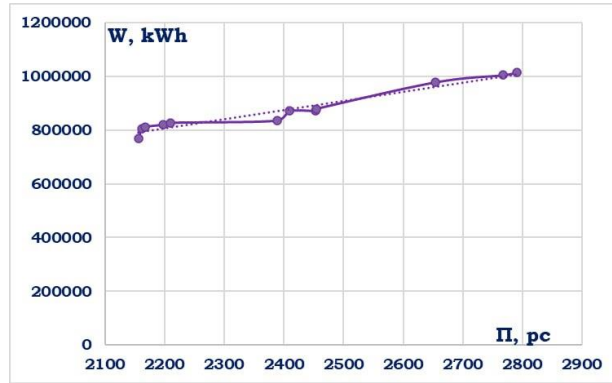
The method of least squares was used in this, and the purpose of determining the laws of changes in electricity is to determine the degree of connection between the parameters of electricity in the production process of the manufactured products (seater car, chassis, bus and dump truck) [1, 2, 4, 6].



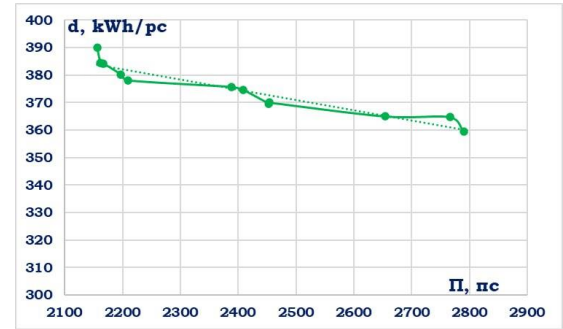
Picture 1. $W=f(\Pi)$ energy characteristic of the research object (2018)



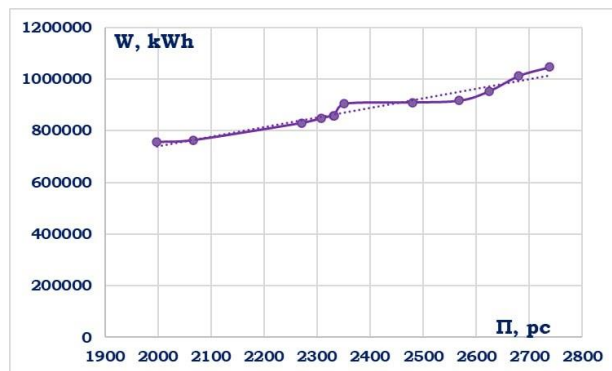
Picture 2 Energy characteristic $d=f(\Pi)$ of the research object (2018)



Picture 3. Energy characteristic of the research object $W=f(\Pi)$ (2019)



Picture 4. Energy characteristic $d=f(\Pi)$ of the research object (2019)



Picture 5. Energy characteristic of the research object $W=f(\Pi)$ (2020)



Picture 6. Energy characteristic $d=f(\Pi)$ of the research object (2020)

Determining the laws of change of energy parameters is researched based on the analysis of energy characteristics $W=f(\Pi)$, $d=f(\Pi)$ in the period 2018-2020. Based on the initial data provided by the enterprise, energy characteristics are built.

The analysis of the energy characteristics $W=f(\Pi)$, $d=f(\Pi)$ presented in Pictures 1-6 shows that it is possible to see the proportionality of the indicators between the electricity consumed during the years 2018-2020 and the values of its comparative consumption indicator, respectively, of the produced product. This indicates the existence of a connection between these parameters. This is based on the results of the following mathematical models [3, 5, 4, 7].

As a result of the statistical processing of the initial data for 2018-2020, the connection of the total electricity consumption and the relative consumption indicator to the manufactured product can be seen in the following mathematical models for 2018:

$$W = 373,31\Pi + 13275 \quad (1)$$

$$d = -0,0268 \Pi + 433,52 \quad (2)$$

where, Π is the quantity of the product produced for the considered period, units.

In the same way, the following mathematical expressions were created for the energy characteristics $W=f(\Pi)$, $d=f(\Pi)$ built for 2019-2020 [8, 9, 4, 10]:

$$W = 339,53\Pi + 58245 \quad (3)$$

$$d = -0,0366 \Pi + 451,86 \quad (4)$$

$$W = 371,92 \Pi - 2936,4 \quad (5)$$

$$d = -0,0459 \Pi + 481,84 \quad (6)$$

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}} \quad (7)$$

Expression (7) defines the correlation coefficient for energy characteristics $W=f(\Pi)$ and $d=f(\Pi)$,

where, x_i – in the sample x the value of the variable; $\bar{x}$ – x mean value of the variable; y_i – the value of the variable y in the sample; $\bar{y}$ – y mean value of the variable.

The value of the correlation coefficients determined on the basis of the developed mathematical models was determined by expression (7). In 2018, $r=0.9132$ for $W=f(\Pi)$ energy characteristic, $r=0.9107$ for $d=f(\Pi)$ energy characteristic; In 2019, $r=0.9220$ for $W=f(\Pi)$ energy characteristic, $r=0.8994$ for $d=f(\Pi)$ energy characteristic; In 2020, $r=0.8871$ for energy characteristic $W=f(\Pi)$ and $r=0.9141$ for energy characteristic $d=f(\Pi)$ in 2020, the high value of correlation coefficients is the consumption of manufactured products and electricity and comparative consumption indicators characterizes the existence of a connection between This characterizes the expediency of developing electricity forecasting models taking into account the factors affecting electricity based on the primary data provided by the company when forecasting the electricity consumption and the relative consumption of electricity per product unit.

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Rezyume. Мақолада электр энергияси параметрларининг ўзгариши қонуниятларини аниқлаш "Uz Truck & Bus Motors" қўшма корхонаси мисолида кўриб чиқилган. Бунда корхонанинг 2018, 2019, 2020 йиллардаги маълумотлари асосида корхонада ишлаб чиқарилган маҳсулотнинг умумий электр энергияси истеъмолига ва маҳсулот бирлигига тўғри келадиган электр энергиясининг солиштирма сарфига боғланишини характерловчи энергетик характеристикаларни қуриши орқали энг кичик квадратлар усулидан фойдаланган ҳолда $W=f(\Pi)$

ва $d=f(P)$ bog'laniшlari asosida matematik modelлар ишлаб чиқилган ва корреляция коэффициентлари қиймати аниқланган.

Резюме. В статье рассматриваются вопросы определения закономерностей изменения параметров электрической энергии на примере предприятия " Uz Truck & Bus Motors". А также разработаны математические модели на основе связей $W=f(P)$ и $d=f(P)$ с использованием метода наименьших квадратов, путем построения энергетических характеристик, характеризующих связь продукции, произведенной на предприятии и общего и удельного расходов электроэнергии на единицу продукции; по данным предприятия за 2018, 2019, 2020 годы и определены коэффициенты корреляции.

Kalit so'zlar. Elektr energiyasi iste'moli, o'zgarish qonuniyatlari, maxsulot birligiga to'g'ri keladigan elektr energiyasining solishtirma sarfi, korrelyatsiya koeffitsiyenti.

Ключевые слова. Потребление электроэнергии, закономерностей изменения, относительный расход электроэнергии на единицу продукции, коэффициент корреляции.

**PROBLEMS OF POWER SUPPLY TO RESIDENTIAL AND PUBLIC
CONSUMERS IN CITIES OF UZBEKISTAN**

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²*Karakalpak State University*

Summary: *The article discusses the main problems associated with improving the quality and reliability of power supply to public utility consumers in the cities of Uzbekistan. Five main problems of power supply of cities are presented: 1. In connection with the reconstruction and modernization of all power supply systems of cities, the possibility of building complex electrical networks in the republic. 2. Investigation of power consumption modes of public utility consumers for the purpose of energy saving. 3. Based on field measurements, patented methods have been developed for calculating electrical loads of the same type of household consumers and total electrical loads at transformer substations (TS), distribution points (DP), main regional substations (MRS) of power supply of cities. 4. The necessity of calculating and applying reactive power compensation in urban electric networks has been substantiated. 5. Recommended measures to reduce electricity losses in utility power networks.*

Thus, as a result of solving the tasks, based on the reconstruction and modernization of electrical networks in all cities of Uzbekistan. the quality of electricity and the reliability of electricity supply to urban consumers are increasing, and electricity losses are decreasing, which meets the energy saving policy in the republic.

Keywords: *closed networks, graphic design load, power quality, power reliability, power factor correction, the total electrical load, energy saving, reduction of energy losses.*

1. Introduction

At the present stage, the problems of quality and reliability of power supply to cities come to the fore. Due to the widespread use of new digital electronics in all industries and in the utilities of the residential and public sectors in cities, the problems of electricity quality and reliability of power supply are relevant and in demand.

The main directions for improving the quality of electricity and the reliability of electricity supply to consumers in the residential and public sectors are as follows:

1. On the basis of complex electrical networks, the construction of the most optimal power supply schemes for micro districts and improvement of the quality of voltage and electricity.

2. Development of methods for determining electrical loads and calculating urban networks according to the theory of probability.

3. Research and recommendations on the regime of electricity consumption in residential and public buildings.

4. Recommendations for the use of reactive power compensation in electrical networks of the residential and public sectors.

5. Measures to reduce electricity losses in electrical networks of residential and public sectors in micro districts.

1. On the basis of the new legislative framework, Presidential Decrees and normative materials, entire blocks of 5, 7, 9, 16-storey buildings in the Zangiotinsky and Sergeli districts of the city of Tashkent are being built in a short time, at the same time, all more than 340 objects of the residential and public sectors, as well as in the city of Andijan and other cities. After the commissioning of turnkey objects, there will be no new construction in this micro district. This requires an integrated approach to solving the problem of quality and reliability of power supply, using the latest innovative technologies, automated digital energy, the latest electrical equipment. As a result, in the future it will be possible to

choose an optimal, complexly closed power supply scheme for these arrays. All these energy-saving measures help to improve the quality of electricity and the reliability of power supply to the neighborhoods.

In the practice of power supply to foreign cities, there is a significant spread of closed networks up to 1000 V, which have a number of indisputable advantages over other types of networks. Closed networks have high technical and economic indicators and proved to be the best in operation. The latter is confirmed by more than 30 years of experience in the operation of the closed circuit network in New York and the widespread use of such networks in other cities in the United States. Currently 230 cities in the United States have closed circuit distribution networks. These networks have resulted in savings of \$ 37.5 billion. The first closed networks in Europe appeared in the early 30s in Berlin, Malta. Currently closed networks up to 1000 V are used in the cities of Denmark, Switzerland, Germany. Norway. Despite the fact that the first experience of introducing closed networks in Moscow was not entirely successful, work in this direction continues to this day in a number of city networks and organizations. Thus, closed circuits were created in Moscow, St.Petersburg, Vyborg. Urban closed networks with voltage up to 1000 V provide almost uninterrupted power supply to consumers. In this case, the level of uninterruptible power supply is determined by the type of protection used in the network. Redundancy of individual network elements in case of their damage is carried out automatically through the network up to 1000 Volts through the use of appropriate protection and automation equipment. This provides for the parallel operation of transformers through a network up to 1000 V. The use of the principle of network closure up to 1000 V is the main difference between the considered type of urban networks, which determines the technical and economic indicators and operational characteristics of such networks. Closed networks differ in the number of distribution lines above 1000 V and according to the network execution scheme up to 1000 V. Depending on this, they are called cross-closed, three or four trunk and complex-closed. From the experience of using closed circuits, it was concluded that the widespread implementation of these circuits in the CIS is advisable, as they ensure economic and reliable operation and a good operating mode.[]

2. A fundamental step in the design, planning and operation of a rational city power supply system is to determine the calculated electrical loads. The procedure for calculating electrical loads of the proposed integrated method based on a complete set of typical (standard) daily graphs of electrical loads of consumers in the residential and public sectors and the theory of probability is as follows:

- first, on the basis of numerous experimental studies of urban electric consumers, using the mathematical apparatus of the theory of probability, typical (standard) daily graphs of electrical loads (almost a complete set) of the same type of urban electric consumers were constructed.

- further, on the basis of these characteristic daily graphs, the equations of the curve of the function of changing the modes of the typical (standard) daily consumption of electricity with a 30-minute maximum (interval) of each individual type of electrical consumer are determined.

The daily graph of the electrical load shows the change in the mode of electricity consumption at a given object during the day and can be represented as a function curve on the plane, where the load is given - along the ordinate, and the time of changing the operating mode - along the abscissa. This means that this curve can be expressed for each consumer in the form of an equation, a formula, on the load plane.

The essence of the proposed patented method is that, considering the calculated load as the maximum load in the time interval of half an hour, it is necessary to determine the equation of the function of the curve of the daily schedule of the same type of consumer and, knowing the installed (nominal) power, with a probability of 0.7 - 0.9 we determine the half-hour the maximum of the equation of the curve of the daily schedule of this consumer, which will be the calculated power of this consumer. It follows from this that the main task is to correctly and accurately determine the analytical formula expressing in the form of a curve the function of the daily schedule of each type of electrical consumers, based on the typical (standard) daily graphs of electrical loads.

Thus, a formula is determined that describes the curve of the daily load schedule, which closely coincides with the typical (standard) schedule. For each type of consumer, its own curve equation and its own calculation formula are used.

In connection with the above, various methods of determining the function of the curve of the daily schedule of these consumers are considered, which most closely coincide with the typical (standard) schedule. Accordingly, the methods of Lagrange, Newton, Chebyshev, Bessel, Stirling, the interval method, spline functions of 2, 3, 4 orders were considered to find the equation (calculation formula) of the function of the curve of the daily load schedule.

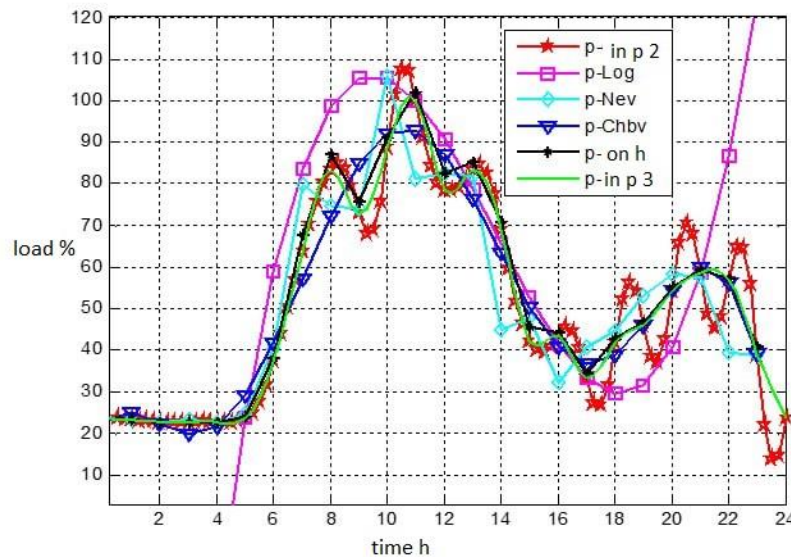


Fig. 1. Daily graphs of the hospital electrical loads, calculated by the interpolation formulas of Lagrange, Newton, Chebyshev, by the interpolation formula of the 2nd order spline function, 3 orders, and typical (standard) daily schedule

Figure1. presents daily graphs of electrical loads calculated by the interpolation method of Lagrange (equation of 3 degrees) - orange line, by Newton method (equation of 5 degrees) - blue line, by the method of Chebyshev (equation of 8 degrees) - blue line, by the interpolation formula of spline function 2 order - red line, according to the interpolation formula of the spline function, 3rd order - green line and typical (standard) daily graph - black line.

Table 1.

Relative error in calculating daily graphs of electrical loads (in percent) by various methods

Time	Typical	Lagrange	Newton	Chebyshev	Spline 2	Spline 3
0.00-1.00	23.9800	106.519	1.7827	4.1477	11.7827	1.7827
1.00-2.00	23.9800	109.131	0.6413	6.9465	10.3859	0.3859
2.00-3.00	22.7700	113.976	0.9647	2.6956	10.1319	0.1319
3.00-4.00	22.7700	126.463	2.8322	14.9726	10.1319	0.1319
4.00-5.00	22.7700	193.513	0.9780	4.8789	10.1319	0.1319
5.00-6.00	24.1000	2.2920	1.9720	17.6099	32.2920	2.2920
6.00-7.00	38.1900	35.3657	5.9033	8.5481	32.3312	2.3312
7.00-8.00	67.9500	18.7494	14.8898	18.9761	36.4380	4.4380

8.00-9.00	87.0100	11.7479	16.3898	20.1164	34.3536	4.3536
9.00-10.00	75.8200	28.0470	2.3727	10.6330	24.0340	4.0340
10.00-11.00	91.2300	13.4247	13.7488	0.8698	22.9452	2.9452
11.00-12.00	101.950	1.9500	25.3803	9.8856	21.9500	1.9500
12.00-13.00	82.6500	8.8208	0.0433	5.1709	25.3940	4.3940
13.00-14.00	85.3000	8.3662	4.3238	11.4608	12.3027	2.3027
14.00-15.00	71.0600	8.3108	58.2433	12.2649	23.2699	3.2699
15.00-16.00	45.6300	13.4573	3.8932	9.5213	27.9489	4.9489
16.00-17.00	44.1300	6.4161	36.1976	8.0262	41.5884	1.5884
17.00-18.00	34.3800	3.4296	15.8806	6.3574	33.4296	3.4296
18.00-19.00	42.9400	45.8634	3.4896	10.8078	22.2868	2.2868
19.00-20.00	46.4900	47.7481	12.5094	1.5798	20.8460	0.8460
20.00-21.00	55.3400	35.8951	4.8644	1.6105	32.0468	2.0468
21.00-22.00	59.3900	1.3308	3.0173	0.6750	21.3308	1.3308
22.00-23.00	57.3600	33.7100	44.9742	2.3374	20.8971	0.8971
23.00-24.00	40.7900	67.5962	5.1831	4.7950	15.1831	3.1831

Table 1 shows the relative errors in calculating the daily graphs of the hospital electrical loads (in percent) by various methods. Calculation of daily graphs of electrical loads for all consumers of the same type in the residential and public sectors using the method of Lagrange, Newton, Chebyshev, Spline function of the 2nd order when visualizing daily graphs using these methods, the sharp peaks of the extreme points of the daily graph curve are cut off. As a result, the calculated curve differs from the typical (standard) one and has maximum relative errors according to the Lagrange method - an error of more than 100%, according to Newton method - an error of 58.2%, according to the Chebyshev method - an error of 20.1%., According to the spline function method. 2nd order - 41.5%, etc., except for the spline function method of 3rd order, where the maximum relative calculation error is an error of up to 5%. Thus, a third-order spline function formula is adopted, which almost completely coincides with the typical (standard) daily schedule of electrical loads.

The third-order spline function method uses piecewise approximation of the daily schedule at half-hour intervals, as a result, a high accuracy of the calculated function of the daily schedule curve was obtained, which almost closely coincides with the typical (standard) daily schedule of the same type of residential and public sector consumers. [6.p.16, 8 p. 831].

The generalized formula for the spline function of the curve of the 3rd order of the daily graph of electrical loads of electric consumers in the residential and public sectors is presented as follows:

$$\begin{aligned}
 S(x) = & \frac{(x - x_2) \cdot (x - x_3) \cdot \dots \cdot (x - x_{24})}{(x_1 - x_2) \cdot (x_1 - x_3) \cdot \dots \cdot (x_1 - x_{24})} \cdot S_1(x) + \\
 & + \frac{(x - x_1) \cdot (x - x_3) \cdot \dots \cdot (x - x_{24})}{(x_2 - x_1) \cdot (x_2 - x_3) \cdot \dots \cdot (x_2 - x_{24})} \cdot S_2(x) + \\
 & + \dots \dots \dots + \\
 & \frac{(x - x_1) \cdot (x - x_2) \cdot \dots \cdot (x - x_{23})}{(x_{24} - x_1) \cdot (x_{24} - x_2) \cdot \dots \cdot (x_{24} - x_{23})} \cdot S_{48}(x)
 \end{aligned} \quad (1)$$

In general terms, this expression looks like this:

$$S(x) = \bigcup_{i=1, \dots, 48} S_i(x). \quad (2)$$

Substituting the data from the daily schedule into these equations, the segments of the curve are obtained and, having laid all 48 segments, as a result, the curve of the daily schedule is obtained, which almost completely coincides with the typical (standard) daily schedule of electrical loads of

consumers, this allows, based on the analytically found daily schedule, with 0.7-0.9 and the rated power of the object, determine the maximum (calculated) electrical load of this consumer, choosing a half-hour maximum load. Figure 2. the combined daily schedule of the hospital's electrical load is presented.

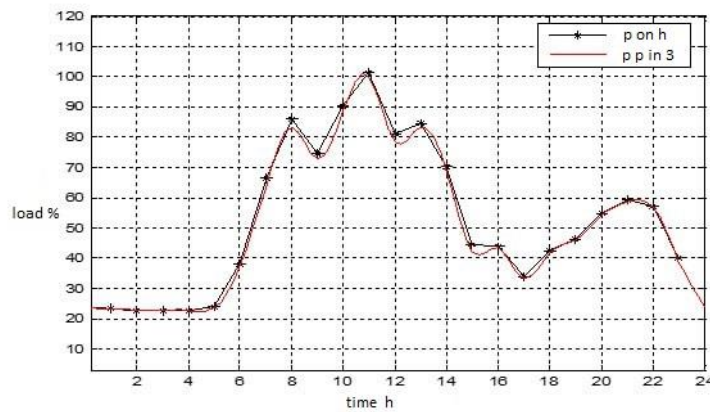


Fig. 2. Daily graphs of electrical loads calculated using the interpolation formula of the 3rd order spline function (red line) and a typical (standard) daily graph (black line)
Accuracy + -5%.

Knowing the design load of each consumer outgoing from TS, DP, hydraulic fracturing (any number of consumers), on the basis of typical (standard) daily schedules, we add up the loads for each half hour of 48 options and the maximum amount of these 48 options will be the total calculated load of TS, DP. Hydraulic fracturing at any time interval of the daily schedule, without any coefficients, without errors. First, the calculation of loads, after which the calculation of the electrical network and electricity losses is carried out.

The calculated total load of consumers of residential and public buildings at a voltage of 0.38 kV is a single calculated load on a transformer substation or a substation at a voltage of 6-10 kV, and the calculated total load of urban networks of 6-10 kV is the initial design load for the city's power supply system with a voltage of 35 -110 kV. The addition of active powers must be carried out according to the probabilistic-statistical method for calculating electrical loads according to the formulas:

$$\overline{P}_{\Sigma i} = C_{i1} \overline{P}_1 + C_{i2} \overline{P}_2 + C_{i3} \overline{P}_3 + \dots + C_{in} \overline{P}_n = \sum_{i=1}^n C_i \overline{P}_i, \quad (3)$$

$$\sigma_{\overline{P}_i} = \sqrt{C_{i1}^2 \sigma_{P_1}^2 + C_{i2}^2 \sigma_{P_2}^2 + \dots + C_{in}^2 \sigma_{P_n}^2}$$

C_i – distribution coefficients of the schemes;

$\overline{P}_i$ – mathematical expectation of the load of the i-th consumer;

$\sigma_{\overline{P}_i}$ – standard deviation of the load of the i-th consumer.

The numerical characteristics of the apparent power will be equal:

a) mathematical expectation

$$\overline{S} = \sqrt{\overline{P}^2 + \overline{Q}^2} \quad (4)$$

b) standard deviation

$$\sigma_{\overline{S}} = \sqrt{\cos^2 \varphi \sigma_P^2 + \sin^2 \varphi \sigma_Q^2}.$$

When determining the total load of heterogeneous consumers, the following expressions are used for each calculated hour:

a) mathematical expectation

$$\overline{S_{\Sigma}} = \sqrt{\left(\sum_{i=1}^n \overline{P_i}\right)^2 + \left(\sum_{i=1}^n \overline{Q_i}\right)^2} \quad (5)$$

b) standard deviation

$$\sigma_{\overline{S_{\Sigma}}} = \sqrt{\cos^2 \varphi \sum_{i=1}^n \sigma_{\overline{P_i}}^2 + \sin^2 \varphi \sum_{i=1}^n \sigma_{\overline{Q_i}}^2} \quad (6)$$

The advantage of the proposed method is that when determining the calculated loads, it more accurately and reliably reflects the actual total loads in electrical networks, since the calculation is carried out in 48 options (for half-hour intervals of the maximum electrical load) and takes into account the own maximum load of each individual consumer entering to this network with the help of the developed 3 computer software products and using the automatic system of commercial energy metering (AEM).

3. Research has shown that the load in any element of the urban network is a function of a large number of factors and their numerous random combinations and changes over time. Consequently, all quantities calculated on the basis of electrical loads will be probabilistic quantities - functions of random variable electrical loads.

This circumstance makes it expedient to calculate urban networks by a probabilistic method based on typical daily graphs of electrical loads of consumers, given by stochastic values, for each half hour of a day of one of 48 options. Such a calculation allows you to have a real picture of the electrical network mode for each half hour and to optimize the power supply system by level and by year, taking into account the development prospects, the probabilistic values of electrical loads can be considered as numerical characteristics of statistical distributions. The well-known formulas for calculating urban networks have been improved, by converting them into a probabilistic form, in the form of mathematical expectation and standard deviation, as a result, the calculation of the city electrical network is more accurate and reliable.

Below we consider the methods of determination necessary for network calculations of quantities in the probabilistic setting of consumer loads using the elements of analysis of multidimensional random functions.

Improving the methodology for calculating electrical loads, we will determine all the calculated electrical quantities in the form of mathematical expectation and standard deviation.

$$P_p = \overline{P_p} + t_{\alpha} \cdot \sigma_{\overline{P_p}} \quad (7)$$

Using the expansion of the function of random arguments in a multidimensional Taylor series in accordance with the definition of its numerical characteristics for the function of independent random arguments, in the most general form, they have the form:

a) mathematical expectation

Taking into account the functional dependence of the total load S on active P and reactive Q, which makes up its first and second partial derivatives, are determined by the formulas:

$$\begin{aligned} \frac{\partial S}{\partial P} &= \frac{P}{\sqrt{P^2 + Q^2}} = \cos \varphi; \\ \frac{\partial S}{\partial Q} &= \frac{Q}{\sqrt{P^2 + Q^2}} = \sin \varphi \end{aligned} \quad (8)$$

$$\begin{aligned}\frac{\partial^2 S}{\partial P^2} &= \frac{Q^2}{\sqrt{(P^2 + Q^2)^3}} = \frac{\sin^2 \varphi}{S}; \\ \frac{\partial^2 S}{\partial Q^2} &= \frac{P^2}{\sqrt{(P^2 + Q^2)^3}} = \frac{\cos^2 \varphi}{S}.\end{aligned}\quad (9)$$

When determining the total load of consumers, they are found as the first and second partial derivatives of this function and have the form:

$$\frac{\partial S_{\Sigma}}{\partial P_i} = \frac{\sum_{i=1}^n P_i}{\sqrt{\left(\sum_{i=1}^n P_i\right)^2 + \left(\sum_{i=1}^n Q_i\right)^2}} = \cos_{\Sigma} \varphi; \quad (10)$$

$$\frac{\partial S_{\Sigma}}{\partial Q_i} = \frac{\sum_{i=1}^n Q_i}{\sqrt{\left(\sum_{i=1}^n P_i\right)^2 + \left(\sum_{i=1}^n Q_i\right)^2}} = \sin_{\Sigma} \varphi;$$

$$\frac{\partial^2 S}{\partial P_i^2} = \frac{\sum_{i=1}^n P_i}{\sqrt{\left(\left(\sum_{i=1}^n P_i\right)^2 + \left(\sum_{i=1}^n Q_i\right)^2\right)^{3/2}}} = \frac{\cos^2_{\Sigma} \varphi}{S}; \quad (11)$$

$$\frac{\partial^2 S_{\Sigma}}{\partial Q_i} = \frac{\sum_{i=1}^n Q_i}{\sqrt{\left(\left(\sum_{i=1}^n P_i\right)^2 + \left(\sum_{i=1}^n Q_i\right)^2\right)^{3/2}}} = \frac{\sin^2_{\Sigma} \varphi}{S}.$$

Hence, the numerical characteristics of the total total load of consumers are equal:

a) mathematical expectation

$$S_{\Sigma} = \sqrt{\left(\sum_{i=1}^n P_i\right)^2 + \left(\sum_{i=1}^n Q_i\right)^2} \quad (12)$$

б) standard deviation

$$\sigma_{S_{\Sigma}} = \sqrt{\cos^2_{\Sigma} \varphi \sum_{i=1}^n \sigma_{P_i}^2 + \sin^2_{\Sigma} \varphi \sum_{i=1}^n \sigma_{Q_i}^2} \quad (13)$$

According to the conservative position of P.L. Chebyshev for any distribution law at least (1 - 1 / t²) 100 are distributed in the interval $X \pm t\sigma$. At $t = 3$, this is 95%, which fully satisfies the required accuracy of engineering calculations. The practical use of the obtained calculation formulas requires a preliminary determination of the mathematical expectations and standard deviations of consumer loads.

The application of the above method for calculating electrical quantities for stochastic assignment of loads significantly increases the complexity of the calculations, however, this circumstance in the presence of a computer is not an insurmountable obstacle.

For an example, the calculation of power supply for a residential area of the city of Tashkent is considered. As the initial data, we used experimental measurements carried out over the past three years on objects of public and residential buildings in cities of Uzbekistan, including this microdistrict. Based on the results of experimental measurements, computer programs were developed for calculating characteristic daily schedules and power supply networks of urban consumers and implemented on a computer in the MATLAB programming language

4. Recommendations for the use of reactive power compensation in electrical networks of the residential and public sectors. As the measurements carried out in urban networks have shown, due to the widespread use of small motor loads (motors of refrigerators, washing machines, fans, vacuum cleaners, lighting from LED lamps) in residential and public buildings, the active power factor became equal to $\cos\varphi = 0.78-0.89$. Therefore, the task is to apply reactive power compensation in urban electrical networks. To do this, it is necessary to pre-inspect each transformer substation and calculate the required amount of reactive power and select standard capacitor banks.

5. Optimization of installation devices of electrical networks in terms of reactive power, optimal power and stimulation of the installation of compensating devices at consumers, optimization of operating voltages. in power centers and radial power grids, equalization of phase loads in 0.38 kV power grids, installation and commissioning of reactive power compensation devices in urban networks, replacement of wires on overloaded lines, replacement of underloaded power transformers, transfer of power grids to a higher voltage Unom, elimination of underload and overload in secondary current and voltage circuits, etc.

Conclusions:

1. On the basis of the reconstruction and modernization of all city power supply systems, it is possible to build complex electrical networks that are more economical and reliable.

2. A new way of determining the calculated loads of municipal consumers, more accurate and economical.

3. The electrical load of the power supply systems of cities changes every minute, therefore, the calculation of the electrical network must be carried out by a probabilistic-statistical method.

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Rezyume: Maqolada O'zbekiston shaharlaridagi kommunal xizmatlar iste'molchilarini elektr energiyasi bilan ta'minlash sifati va ishonchliligini oshirish bilan bog'liq asosiy muammolar ko'rib chiqiladi. Shaharlarni elektr energiyasi bilan ta'minlashning beshta asosiy muammosi keltirilgan: 1. Shaharlarning barcha elektr ta'minoti tizimlarini rekonstruksiya qilish va modernizatsiya qilish munosabati bilan respublikada kompleks elektr tarmoqlarini qurish imkoniyati. 2. Energiyani tejash maqsadida kommunal iste'molchilarning energiya iste'moli rejimlarini o'rganish. 3. Dala o'lchovlari asosida bir xil turdagi maishiy iste'molchilarning elektr yuklarini va transformator nimstansiyalarida (TS), taqsimlash punktlarida (DP), elektr ta'minotining asosiy mintaqaviy podstansiyalarida (MRS) umumiy elektr yuklarini hisoblash uchun patentlangan usullar ishlab chiqilgan. shaharlar. 4. Shahar elektr tarmoqlarida reaktiv quvvat kompensatsiyasini hisoblash va qo'llash zarurati asoslandi. 5. Kommunal elektr tarmoqlarida elektr energiyasi yo'qotishlarini kamaytirish bo'yicha tavsiya etilgan chora-tadbirlar.

Shunday qilib, vazifalarni hal etish natijasida O'zbekistonning barcha shaharlarida elektr tarmoqlarini rekonstruksiya va modernizatsiya qilish asosida amalga oshirilmoqda. elektr energiyasining sifati va shahar iste'molchilarini elektr energiyasi bilan ta'minlash ishonchliligi ortib bormoqda, elektr energiyasi yo'qotishlari kamaymoqda, bu esa respublikada energiya tejash siyosatiga javob beradi.

Резюме: В статье рассмотрены основные проблемы, связанные с повышением качества и надежности электроснабжения потребителей коммунальных услуг в городах Узбекистана. Представлены пять основных проблем электроснабжения городов: 1. В связи с реконструкцией и модернизацией всех систем электроснабжения городов, возможность построения сложных электрических сетей в республике. 2. Исследование режимов энергопотребления потребителей коммунальных услуг с целью энергосбережения. 3. На основе натурных измерений разработаны запатентованные методы расчета электрических нагрузок однотипных бытовых потребителей и полных электрических нагрузок на трансформаторных подстанциях (ТП), распределительных пунктах (РП), магистральных районных подстанциях (МРП) электроснабжения г. города. 4. Обоснована необходимость расчета и применения компенсации реактивной мощности в городских электрических сетях. 5. Рекомендуемые мероприятия по снижению потерь электроэнергии в коммунальных электросетях.

Таким образом, в результате решения поставленных задач по реконструкции и модернизации электрических сетей во всех городах Узбекистана. Повышается качество электроэнергии и надежность электроснабжения городских потребителей, снижаются потери электроэнергии, что соответствует политике энергосбережения в республике.

Kalit so'zlar: yopiq tarmoqlar, loyihalangan yuklamalar grafigi, quvvat sifati, quvvat ishonchliligi, quvvat koeffitsientini tuzatish, umumiy elektr yuklamasi energiya tejash, energiya yo'qotishlarini kamaytirish.

Ключевые слова: закрытые сети, графическое проектирование нагрузки, качество электроэнергии, надежность электроснабжения, коррекция коэффициента мощности, полная электрическая нагрузка, энергосбережение, снижение потерь энергии.

UDC 677.024

APPLICATION OF BAMBOO FIBER IN THE TEXTILE INDUSTRY

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Summary: Natural and chemical raw material compositions for Kostyumbop tissues were introduced, physical and mechanical and hygienic properties were identified, and an alternative fiber content was proposed for the production of clothespin toq'ima.

Keywords: fiber, bamboo, wool, polyester, cotton, linen, moisture, strength, stretch, stretch

In this article, we will talk about how to make your business more competitive. Bamboo tolasing is an ecological tosalig of important importance for the ego. In this article, we will tell you how to do it yourself, and how to do it yourself. Despite the fact that all types of bamboo have strong characteristics, they can have a positive impact on the environment (1-2-figure).

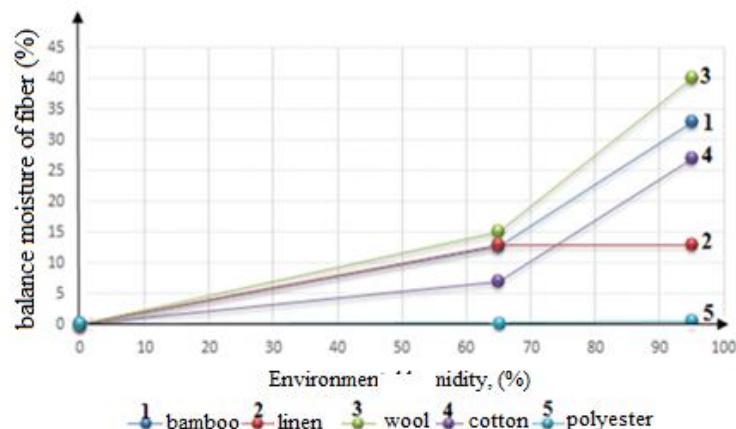


Figure 1. Graph of the effect of environmental moisture on the balance moisture of fiber

2.1.-according to figure analysis, environmental humidity is 0.5% at 65% polyester fiber balance moisture and 0.7% at 95% ambient humidity. Environmental humidity for cotton fibers is 8% equilibrium moisture at 65%, 27% at 95%, linen fiber equilibrium moisture at 13%, bamboo fiber at 13.4% and 95% humidity at 33%, and wool fiber equilibrium moisture at 17% and 40%.

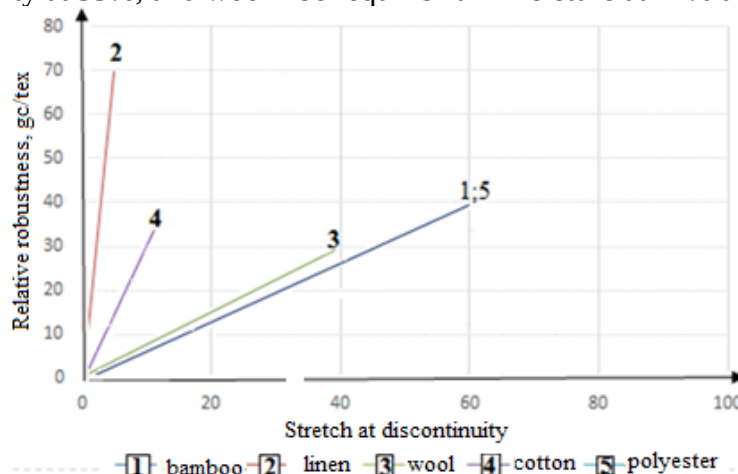


Figure 2. Relative robustness effect graph of fiber stretch at discontinuity

The 60% relative strength of stretch for polyester fiber in Figure 2 is 40gs/Tex, for bamboo fiber stretch 60% relative strength is 40gs/Tex, for wool fiber stretch 40% relative strength is 30gs/Tex, for linen fiber stretch is 2.5% relative strength is 70gs/Tex.

Positive properties of bamboo fiber: high ecology of raw materials; excellent hygienic and wellness properties; hypoallergenic; high-strength and at the same time soft, elastic and air-permeable (20% higher than natural cotton); environmentally friendly bamboo fiber has been proven to kill up to 70% of the bacteria that come into contact with it in the milk, and this effect lasts up to helps give; it has a high absorption capacity of water and unpleasant odors; practically does not wrinkle, washes well and is attractive blind

From the analysis of the properties of raw materials, it is advisable to use mixtures of wool and bamboo, cotton, linen and polyester fibers presented in the manufacture of costume tissues.

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Резюме: Выявлены физико-механические и гигиенические свойства натурального и химического сырья для костюмных тканей, предложен альтернативный состав волокон для производства костюмных тканей.

Ключевые слова: волокно, бамбук, шерсть, полиэстер, хлопок, лен, влага, прочность, разрыв, растяжение

Rezyume: Kostyumbop to'qimalar uchun tabiiy va kimyoviy xomashyo tarkiblari keltirilib, fizik-mexanik hamda gigenik xususiyatlari aniqlandi va kiyimbop toq'ima ishlab chiqarish uchun muqobil tolaviy tarkib taklif etildi.

Kalit so'zlar: tola, bambuk, jun, polestr, paxta, zig'ir, namlik, mustahkamlik, uzilish, cho'zilish.

UDK 621.311.12

"SMART GRID" IN COMPLEX CLOSED SYSTEMS CITY ELECTRIC SUPPLY

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Summary: *Smart grids are modernized power supply networks that use information and communication networks and technologies to collect information about energy production and consumption, allowing them to automatically improve the efficiency, reliability, economic benefits, and sustainability of electricity production and distribution. . The development of smart grid technology also means a fundamental reorganization of the electricity services market, despite the fact that the terminology at first glance suggests only the development of technical infrastructure. However, smart power grids have disadvantages: dependence on constant power supply, the presence of outsiders - network developers, legal uncertainty of liability.*

Key words: *smart networks, modernized communication networks, digital automation, control, reliability, power quality, complex networks.*

Since the beginning of the 21st century, opportunities have arisen to take advantage of innovations in electronic technology to eliminate shortcomings and reduce the cost of the electrical network. For example, technological restrictions on consumption around peak power affect all consumers equally. In parallel, growing concerns about the environmental damage of fossil fuel power plants have led to a desire to use more renewable energy sources. Sources such as wind and solar power are highly intermittent, and therefore there is a need for more complex control systems to facilitate their connection to the controlled network. Power from solar panels (and to a lesser extent wind turbines) calls into question the need for large, centralized power plants. The rapid reduction in costs indicates a transition from a centralized network topology to a highly distributed one, where electricity production and consumption occur within the local network. Finally, growing concerns about terrorism in some countries have led to calls for a more reliable energy system that is less dependent on centralized power plants - potential targets of attack. The term "smart grid" has been around since 2003, when it appeared in an article "The demand for reliability will drive investments" Michael T. Burr. This work lists several functional and technological definitions of the smart grid, as well as some of the benefits. The common element across most definitions is the application of digital data processing and communications to the electrical grid, making data flow and information management key smart grid technologies. Various possibilities for the broad integration of digital technologies, as well as the integration of a new network of information flows to control processes and systems, are key technologies in the development of smart grids. At the moment, the power industry is being transformed in three classes: improving infrastructure ("strong grid in China"), adding a digital layer, which is the essence of the smart grid, and transforming business processes that make smart grids cost-effective. Much of the work is being invested in modernizing the power grid, especially this concerns the distribution and automation of substations, which will now be included in the overall smart grid concept, but other additional capabilities are also being developed.

The core smart grid technologies emerged from early attempts to use electronic control, metering and monitoring. In 1980, automatic meter reading was used to monitor the energy consumption of large customers, and evolved into the Smart Meter of the 1990s, which stores information about how electricity was used at different times of the day. The smart meter is in continuous communication with the energy producer, meaning it is monitored in real time, and can be

used as an interface for demand response devices and smart plugs. Early forms of demand response were devices that passively sensed the load on the power grid by monitoring changes in the frequency of the power supply. Devices such as industrial and domestic air conditioners, refrigerators and heaters could adjust their operating cycles to avoid running during network peaks. Since 2000, the Italian Telegestore project has been the first to use a large network (27,000,000) of homes using smart meters, connected via a digital network using the power line itself. In some cases, broadband access technologies were used over power lines, in others, wireless technologies such as mesh topology were used for more reliable connections to various devices in the home, as well as support for metering of other utilities such as gas and water.

The global grid monitoring and synchronization revolution occurred in the early 1990s, when the US agency Bonneville Power Administration expanded smart grid research with sensors capable of very rapid analysis of power quality anomalies over very large geographic scales. This work culminated in the first Wide Area Measurement System (WAMS) in 2000. Many countries instantly adopted this technology, such as China.

What is Smart Grid?

From the point of view of the US Department of Energy, smart grids have the following attributes:

1. The ability to self-heal after power failures;
2. Possibility of active participation in the work of the consumer network;
3. Network resistance to physical and cyber interference by attackers;
4. Ensuring the required quality of transmitted electricity;
5. Ensuring synchronous operation of generation sources and electricity storage units;
6. Emergence of new high-tech products and markets;
7. Increasing the efficiency of the energy system as a whole.

According to the European Commission, which deals with the development of a technology platform in the field of energy, Smart Grid can be described by the following aspects of operation:

1. Flexibility. The network must adapt to the needs of electricity consumers.
2. Availability. The network must be accessible to new users, and new connections to the global network can be user generating sources, including renewable energy sources with zero or reduced CO₂ emissions.
3. Reliability. The network must guarantee the security and quality of electricity supply in accordance with the requirements of the digital age.
4. Cost-effective. Innovative technologies in building a Smart Grid together with effective management and regulation of the functioning of the network should be of greatest value.

In Russia, the idea of Smart Grid currently acts as the concept of an intelligent active-adaptive network, which can be described by the following features:

1. Saturation of the network with active elements that allow changing the topological parameters of the network;
2. A large number of sensors that measure current operating parameters to assess the state of the network in various operating modes of the power system;
3. System for collecting and processing data (software and hardware systems), as well as means for controlling active network elements and electrical installations of consumers;
4. Availability of the necessary executive bodies and mechanisms that allow changing the topological parameters of the network in real time, as well as interacting with adjacent energy facilities;
5. Tools for automatically assessing the current situation and making network operation forecasts;
6. High performance of the control system and information exchange.

In this regard, the task is set to develop new optimal, reliable, high-quality power supply systems for residential complexes, neighborhoods, microdistricts, built under one cadastre, based on

complex urban smart networks. The use of digital automation in these electrical networks makes it possible to increase the reliability of power supply and the quality of electricity for consumers.

In Uzbekistan, this became possible thanks to the Presidential Decrees on the integrated construction of massifs and facilities under one cadastre, where there will be no new construction. As a result, wide opportunities have been opened for the construction of various types of optimal complex-closed urban electrical networks using the latest digital automation and information communication technology.

Based on the Decree of the President of the Republic of Uzbekistan No. PF - 60 dated January 28, 2022 “On the Development Strategy of New Uzbekistan for 2022-2026,” as well as the Decree of the President of the Republic of Uzbekistan dated March 27, 2019 No. PP-4249 “On the strategy for further development and reform electric power industry of the Republic of Uzbekistan”, a program has been developed for the reconstruction and modernization of the entire energy complex of Uzbekistan. Taking into account the investments of the WORLD DEVELOPMENT BANK, a feasibility study has been prepared and the reconstruction and modernization of electrical networks and substations of 0.38-6-10 kV and above has begun in all cities of the republic.

In connection with the reconstruction and modernization of existing and planned new urban electrical networks that meet the requirements of new times, the task is to develop new approaches, methods and ways to build the most optimal, economical, reliable and high-quality power supply system, since the issues of energy saving and rational consumption of electricity are in the foreground in cities.. To solve these problems, we have developed for the first time standard daily schedules of urban consumers and new specific norms for the design loads of the residential and public sectors in cities. New formulas have been developed for calculating the electrical loads of each type of consumer and the total electrical loads at transformer substations, distribution centers, and gas distribution stations. Choosing the most optimal scheme of a complex closed-loop network will make it possible to provide electricity to consumers from 2-3 sides, as well as create the same voltage in all power supply nodes and improve the quality of electricity supplied to the consumer.

For the first time, the use of Smart Grid in complex urban power supply systems will make it possible to fully automate the electrical networks of residential and public sectors in cities, as well as obtain high savings and energy efficiency of the power supply system.

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Rezyume: *Aqlli tarmoqlar - bu energiya ishlab chiqarish va iste'mol qilish to'g'risida ma'lumot to'plash uchun axborot-kommunikatsiya tarmoqlari va texnologiyalaridan foydalanadigan modernizatsiya qilingan elektr ta'minoti tarmoqlari bo'lib, ular elektr energiyasini ishlab chiqarish va taqsimlashning samaradorligi, ishonchliligi, iqtisodiy foydalari va barqarorligini avtomatik ravishda oshirish imkonini beradi. . Aqlli tarmoq texnologiyasining rivojlanishi, shuningdek, terminologiya birinchi qarashda faqat texnik infratuzilmani rivojlantirishni nazarda tutishiga qaramay, elektr*

energiyasi xizmatlari bozorini tubdan qayta tashkil etishni anglatadi. Biroq, aqlli elektr tarmoqlarining kamchiliklari bor: doimiy elektr ta'minotiga bog'liqlik, begonalar - tarmoq ishlab chiqaruvchilarining mavjudligi, javobgarlikning huquqiy noaniqligi.

Резюме: Интеллектуальные сети — это модернизированные сети электроснабжения, которые используют информационно-коммуникационные сети и технологии для сбора информации о производстве и потреблении энергии, что позволяет им автоматически повышать эффективность, надежность, экономическую выгоду и устойчивость производства и распределения электроэнергии. . Развитие технологий интеллектуальных сетей также означает фундаментальную реорганизацию рынка электроснабжения, несмотря на то, что терминология на первый взгляд предполагает лишь развитие технической инфраструктуры. Однако у интеллектуальных электросетей есть недостатки: зависимость от постоянного электроснабжения, присутствие посторонних лиц – разработчиков сетей, юридическая неопределенность ответственности..

Kalit so'zlar: aqlli tarmoqlar, modernizatsiya qilingan aloqa tarmoqlari, raqamli avtomatlashtirish, boshqaruv, ishonchlilik, quvvat sifati, murakkab tarmoqlar.

Ключевые слова: интеллектуальные сети, модернизированные сети связи, цифровая автоматизация, управление, надежность, качество электроэнергии, сложные сети.

SCOPE AND SPECIFICITY OF TECHNOLOGICAL EXPRESSION TOOLS IN THE ART OF MULTIPLICATION

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Summary: *The importance of technology in animation is great. Without them, cartoons are unimaginable. As we focus on the gradual stages of development of animation, we see that from year to year the techniques and technologies in it change, one being replaced by another. To date, the number of technologies in the art of animation is very large.*

Keywords: *Animation, computer graphics, technology, 3 dimensions 2 dimensions, cartoon.*

INTRODUCTION

Today, we are witnessing that every positive discovery that has been made has a great impact on the development and perfection of the spirituality of the next generation. In particular, the development of technology is so deeply ingrained in the minds of children that technical means are used effectively in the educational process. We can see this in the art of animation. Currently, the United States, Japan, China, Russia, Canada and a number of European countries are in the lead in the production of cartoons. Given that the stage of production of cartoons in our country is now developing, we can say that the created cartoons have their own achievements. In our own, relatively simple cartoons, the chosen theme and idea are imbued with national values.

MATERIALS AND METHODS

If we look at them one by one and analyze them. "Review" technology. The technology of "Translation" is one of the first multitechnologies, in which each detail in the background, each part of the protagonist is created and colored separately. Before shooting each frame, the details are pushed. This technique, which is one of the most complex technological processes in animation, also served as the basis for the creation of the first cartoons. This technology was initially complex, ie each frame was drawn from head to toe on a separate piece of paper. switched to reconstruction technology in order to create. "Work with a doll" technology. This technology is the first in Russia Created in 1906 by multiplier Alexander Shiryaev. It depicts 12 dancing figures on a motionless background. Cartoon Photographed on a 17.5 mm film for 3 months. According to this technology, dolls of a certain size, ie multi-heroes, are made directly by hand. The background also consists of paper, fabric, sticks, and other products accordingly. Each movement of the puppets is imaged, and thus a sequence of events occurs. Around the world, this technology has been used to make animated films in many different genres. Many cartoons based on this technology have been created in Uzbekistan. For example, "6x6 square", "Turtle", "In the yard" and others.

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"Working with plasticine" technology. In English, the term "claymation" was patented by Wynn Wintom in Oregon. Alexander Tatarsky, Harry Bardin, Nick Papk and others worked on this technology. It is led by plasticine, clay, animal fat, beeswax and other similar products. These products are used to make multi-characters, backgrounds and props. One of the important features is the ability to change their movements, position and move at the right time.

“Working with sand” technology. "Sand animation" ("Powder animation"), this technology was later improved and updated, and was developed with dry tea, coffee, powder, salt, sugar, flour and other similar products. The founder of this technology is a Canadian director and animator Carolyn Leaf. It is difficult to animate any powder product, to create scenes and cartoons in it, because the artist does not move boldly while painting on the powder with his hand or any equipment, and only if he pays great attention to accuracy, a perfect image is created. Each movement is photographed individually. At the end of the work, the animated film is created by placing the shots on the computer in sequence.

“Painting on glass” technology. The author of the technology “Working in the style of glass painting” is a Canadian animator Caroline Leaf. He introduced new technology to the animated film, creating backgrounds, multi-characters, using watercolors and gouache, which are special colored paints on the glass surface. This technology is not that advanced. That is why there are no cartoons based on this technology in our country. Therefore, we will not dwell on the analysis of this technology and cartoons of this style.

“LEGO animation” technology. In this technology, the main object of "Lego" toys known to us. In this technology, which consists of Lego toys, the role of heroes is played by cars, planes, buildings, streets, robots and more. The interesting thing is that they they all consist of a variety of details, are directly constructively handmade, and have the convenience of assembling, spreading, or reshaping them at the same time. This allows you to change objects directly in a transformation way. LEGO animation technology. In this technology, the main object of "Lego" toys known to us. In this technology, which consists of Lego toys, the role of heroes is played by cars, planes, buildings, streets, robots and more. The interesting thing is that they they all consist of a variety of details, are directly constructively handmade, and have the convenience of assembling, spreading, or reshaping them at the same time. This allows you to change objects directly in a transformation way. “Straw work” technology. The technology of "working with straw" is a multicultural technology that is not developed at all in the world, and this technology is still a source of untouched experiments. According to the data, only one or two cartoons were shot in this technology, which was created in the last century, and it has not risen to the level of popularity. While this technology is somewhat similar to “reconstruction” technology, there are a number of differences. Straw is a natural environmentally friendly product with a textured surface layer and a color that combines scales of gold and yellow. Therefore, there is no doubt that the restoration, improvement, development and production of animated films on this technology can give effective results.

“Computer animation” technology. This technology is implemented directly using computer capabilities. Many computer graphics programs such as Toon Boom, Flash, and After Cad come in handy. Multi-heroes, backgrounds, grass, trees, environment, etc. are developed from head to toe in this very program. Cartoon images are made in the following ways: vector graphics, raster graphics, fractal graphics, and three-dimensional (3D) graphics. Computer technology also includes Squigglevision. Squigglevision is a computer technology that moves the contours of images. This technology was created by Tom Snyder. As we have witnessed, each technology has its own expression and attracts the attention of children. While the main audience of cartoons is children, the above-mentioned technologies and their means of expression are likely to be the basis for them to grow up mentally healthy, mentally deep, observant, polite and inquisitive in various fields. Therefore, it is important that the screening of cartoons in different technologies maintains its continuity and the creation of new technologies.

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Rezyume: Animatsiyada texnologiyaning ahamiyati katta. Ularsiz multfilmlarni tasavvur qilib bo'lmaydi. Animatsiya taraqqiyotining bosqichma-bosqich bosqichlariga e'tibor qaratar ekanmiz, yildan-yilga undagi texnika va texnologiyalar o'zgarib, biri ikkinchisi bilan almashtirilayotganini ko'ramiz. Bugungi kunga kelib, animatsiya san'atida texnologiyalar soni juda ko'p.

Резюме: Технологии очень важны в анимации. Без них невозможно представить мультфильмы. Если мы обратим внимание на поэтапные этапы развития анимации, то увидим, что из года в год приемы и технологии в ней меняются, одна сменяется другой. Сегодня количество технологий в искусстве анимации огромно.

Kalit so'zlar: Animatsiya, kompyuter grafikasi, texnologiya, 3 o'lchovli 2 o'lchovli, multfilm.

Ключевые слова: Анимация, компьютерная графика, технологии 3D 2D, мультфильм.

**DESIGNING ENERGY-EFFICIENT BUILDINGS IN THE UNIQUE CONDITIONS OF
KARAKALPAKSTAN**

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Summary: *This article delves into the challenges and opportunities of designing energy-efficient buildings in the arid region of Karakalpakstan, Central Asia. It elucidates the importance of sustainable design principles in addressing the unique climatic conditions and resource constraints of the region. By exploring the significance of energy-efficient design, the specific challenges of the local climate, and potential strategies for sustainable building practices, the article provides valuable insights for architects, engineers, and planners working in similar arid environments. The comprehensive approach to sustainable building design presented in the article serves as a model for addressing the complexities of energy efficiency, environmental stewardship, and community resilience in arid regions worldwide.*

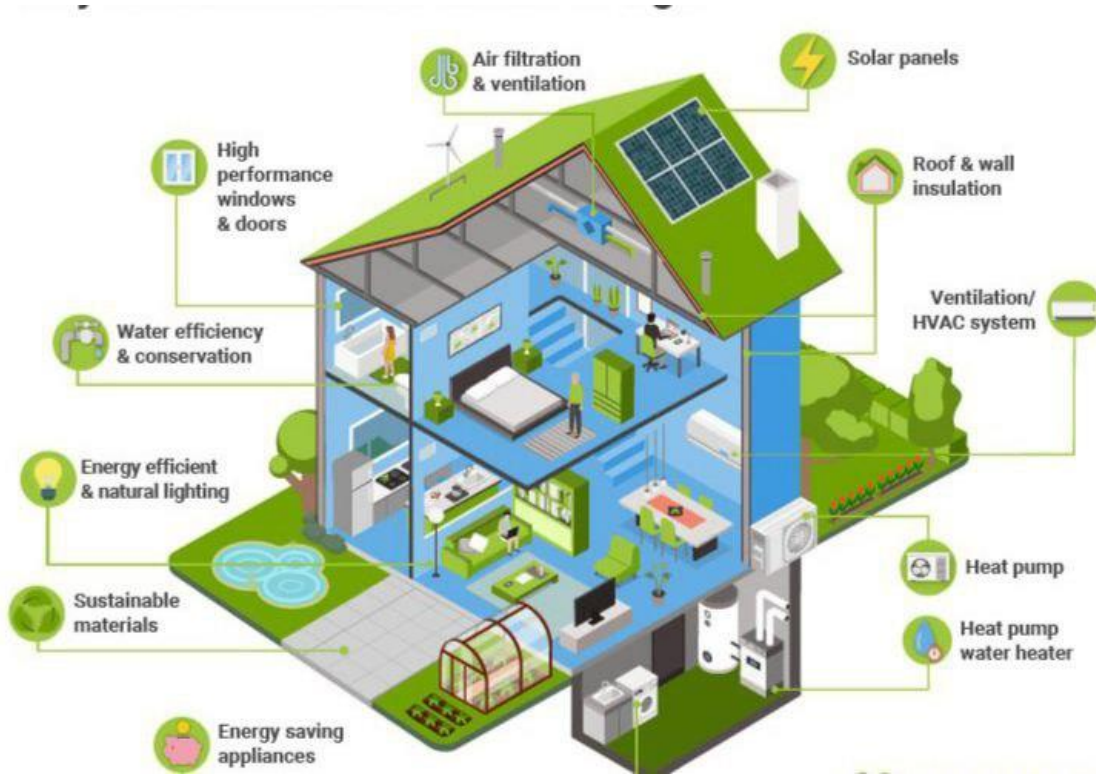
Key words: *Energy-efficient design, sustainable building practices, arid climate challenges, passive solar techniques, renewable energy sources, water-efficient measures, resilient architecture, environmental stewardship in architecture*

Karakalpakstan, located in the arid region of Central Asia, faces unique challenges when it comes to designing energy-efficient buildings. The extreme climate, characterized by hot summers and cold winters, requires innovative solutions to ensure comfortable living conditions while reducing energy consumption. This article explores the importance of energy-efficient design in Karakalpakstan, the challenges specific to the region, and potential strategies for sustainable building practices.

In a region where energy resources may be scarce and costly, the significance of energy-efficient buildings cannot be overstated. By incorporating sustainable design principles, such as optimizing insulation, utilizing passive solar techniques, and implementing efficient Heating, Ventilation, and Air Conditioning systems, buildings can minimize their energy demands and environmental impact. Additionally, energy-efficient buildings offer long-term cost savings for occupants and contribute to the overall resilience of the community against energy shortages and price fluctuations.

The unique climatic conditions of Karakalpakstan present specific challenges for energy-efficient building design. High temperatures during the summer months necessitate effective cooling strategies, while harsh winters require robust insulation and heating solutions. Moreover, the scarcity of water resources in the region adds complexity to the design process, as water-efficient measures must also be integrated into building systems. Balancing these factors while maintaining architectural aesthetics and functionality requires a comprehensive understanding of the local context and a multidisciplinary approach to design.

To address the challenges of designing energy-efficient buildings in Karakalpakstan, architects, engineers, and planners can employ several strategies tailored to the region's needs. Incorporating traditional building techniques and materials that respond to the local climate, such as adobe construction or shading devices, can enhance thermal performance and reduce reliance on mechanical systems. Furthermore, the integration of renewable energy sources, such as solar panels or wind turbines, can provide clean and reliable power for buildings, particularly in remote areas with limited access to the grid. Water-saving fixtures, rainwater harvesting, and wastewater treatment systems can contribute to overall sustainability and resilience.



Basic energy systems of home design

In the face of climate change and increasing energy demands, the design of energy-efficient buildings in Karakalpakstan is crucial for environmental stewardship and the well-being of its inhabitants. By embracing sustainable design practices that account for the region's unique climate and resource constraints, architects and builders can create resilient and comfortable living spaces that minimize energy consumption and environmental impact. Through collaboration, innovation, and a deep understanding of local conditions, the development of energy-efficient buildings in Karakalpakstan can serve as a model for sustainable architecture in arid regions worldwide.

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Rezyume: Ushbu maqola Qoraqalpog'iston Markaziy Osiyo quruq iqlim mintaqasida energiya tejamkor binolarni loyihalash muammolari va imkoniyatlarini o'rganadi. Bu mintaqaning o'ziga xos iqlim sharoitlari va resurs cheklovlarini hal qilishda barqaror konstruksiya tamoyillarining ahamiyatini yoritadi. Energiyani tejaydigan konstruksiyaning ahamiyatini, mahalliy iqlimning o'ziga xos muammolarini va barqaror qurilish amaliyotlari uchun potentsial strategiyalarni o'rganib, maqola xuddi shunday quruq iqlim muhitda ishlaydigan me'morlar, muhandislar va rejalashtiruvchilar uchun qimmatli tushunchalar beradi. Maqolada taqdim etilgan barqaror binolarni loyihalash bo'yicha kompleks yondashuv butun dunyo bo'ylab quruq iqlim hududlarda energiya samaradorligi, atrof-muhitni muhofaza qilish va jamiyatning barqarorligi bilan bog'liq chidamliliklarni hal qilish uchun namuna bo'lib xizmat qiladi.

Резюме: В данной статье рассматриваются проблемы и возможности проектирования энергоэффективных зданий в засушливом регионе Каракалпакстана, Центральная Азия. В нем поясняется важность принципов устойчивого проектирования в решении уникальных климатических условий и ограниченности ресурсов региона. Исследуя значение энергоэффективного проектирования, конкретные проблемы местного климата и потенциальные стратегии устойчивого строительства, статья предоставляет ценную информацию для архитекторов, инженеров и проектировщиков, работающих в аналогичных засушливых средах. Комплексный подход к проектированию экологически чистых зданий, представленный в статье, служит моделью для решения проблем энергоэффективности, охраны окружающей среды и устойчивости сообществ в засушливых регионах по всему миру.

Kalit so'zlar: Energiyani tejaydigan konstruksiyalar, barqaror qurilish amaliyotlari, quruq iqlim muammolari, passiv quyosh texnikasi, qayta tiklanadigan energiya manbalari, suvni tejaydigan choralar, bardoshli arxitektura, arxitekturada atrof-muhitni boshqarish

Ключевые слова: Энергоэффективное проектирование, устойчивые методы строительства, проблемы засушливого климата, пассивные солнечные технологии, возобновляемые источники энергии, водосберегающие меры, устойчивая архитектура, экологическое управление в архитектуре.

SOCIAL SCIENCES

**TECHNOLOGIES FOR DEVELOPMENT OF SPEECH CULTURE OF STUDENTS
THROUGH TEACHING TYPES OF TRANSFER OF MEANING**

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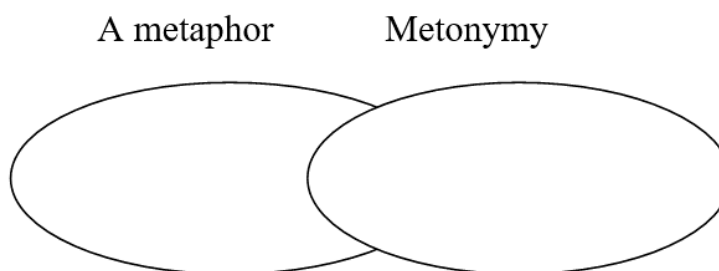
Summary: *The article describes the methodological basis of using innovative educational technologies through figurative words in the process of modern education. This topic is of great importance in developing students' speech, enriching their active vocabulary, forming their speech culture, and forming grammatical concepts.*

Key words: *educational-educational competence, innovative educational technologies, innovation, education, innovative activity, problem-based teaching, role-playing lesson, educational games, "Venn diagram", "Comparative analysis" method, "Fill in the blanks" method, "Newspaper article" method, "Askiya Payrovi" method, creative text.*

Introduction. Based on the main goal of teaching the mother tongue, teachers of the mother tongue and literature today pay special attention to the issue of improving the quality of oral and written speech of the student. On this basis, teachers of the native language today organize their lessons using a number of modern interactive methods to improve the speech culture of students, to create creative thinking, and to increase the effectiveness and attractiveness of speech. It is better to develop students' oral and written speech as part of the development of speech culture. This work is organized in order to encourage them to be creative, to teach them the aspects of words and word forms in creating artistic value. Even when studying the subject of the types of meaning transfer, the teacher should look at these tools as a means of increasing the student's speech culture and effectiveness.

The main part. A student who clearly perceives the role and effect of these tools in oral and written speech understands the role and importance of the ways of transferring meaning in literary texts and acquires the skills to use them in his speech. Below, we would like to recommend several methods to achieve this goal. Usually, in exercises aimed at increasing vocabulary and developing speech, the main focus is on enriching students' vocabulary with new words and developing the ability to use these words appropriately in their speech. But in the teaching of the mother tongue, while enriching the students' vocabulary with new words, how to use these words, to form the skills of using figurative words that increase the effectiveness of speech. requires a special approach. Even when discussing the types of meaning transfer, the teacher should focus students' attention mainly on the role of these tools in increasing the effectiveness of speech. Because it is very important to learn the ways of transferring the meaning of words and to develop the skill of being able to use it in one's own speech in order for the student's speech to be attractive and impressive. In addition, the expressiveness of the speech has an impact on the communicativeness of the speech and is also important in the formation and development of all basic competencies. It is desirable that these methods be given in order of increasing difficulty.

"Venn diagram" method. Based on the "Venn diagram" method, it is possible to compare the similar and different aspects of the types of meaning transfer. For example:



"Comparative analysis" method. After mastering the theoretical information about the types of meaning transfer, it is recommended to use the "Comparative analysis" method in order to determine to what extent this knowledge has been mastered. Two types of artistic texts are presented to the students and they are asked which of the given types of transfer of meaning such as metaphor, metonymy, synecdoche, and simile are involved in this text. For example:

Have mercy on the cloud
He cried his tears.
Birds fly away, willows
He raises his head.
Through the cloud
The sun smiles
Washed willow
He combs his hair. (E. Vahidov)
Our village is old, on the outskirts
It was a plain next to the sky.
Build a roof and spend the night on the roof
Counting the stars was a strange thing. (A. Mukhtar)

The first passage is taken from the poem of E. Vahidov, and the second passage is taken from the poem "Yulduzim" by Asqad Mukhtar. After reading these passages expressively, the teacher asks the students the following questions.

1. What are the ways of transferring meaning in the first four?
2. What about the second one? After the students read the quatrain, they will learn from the metaphorical method of meaning transfer in the first quatrain. to raise one's head, the rising of the sun from among the dark clouds after a quick rain, the smiling face of the sun, the shining of the branches of the washed willow after the rain in the sunlight is likened to the sun combing the washed hair of the willow), and in the second four, they give information about the non-use of meaning transfer types.

The interview process continues with the following questions:

1. What emotions did E.Vahidov want to express in his poem, what kind of scene comes to your mind after reading this poem and how does your mood change?
2. What kind of scene will appear before your eyes when you read this excerpt from the poem "Yulduzim" by Asqad Mukhtar. How will your mood change after reading this poem?
3. Count how many words are used in the passage from E. Vahidov's poem, how many of them are used figuratively? In the first four, 20 words are given, of which only 7 words are said to be used in their meaning. With the help of the remaining words, it can be seen that E.Vahidov has revealed 4 metaphorical events in this poetic passage.

After the analysis, the teacher asks the students the following questions:

1. Which of these poetic passages do you think is more impressive?
2. Explain what this effectivity is due to.

Fill in the blanks method. In order to complete this task, students were given incomplete sentences and poetic fragments. Instead of points, there are several options that the reader can put. The

reader chooses from these options the exact word that creates the phenomenon of meaning transfer and analyzes this sentence. For example:

1. A sad melody makes the heart... was (tinjar, ortar, kirinar) 2. Each person's... season - the period of youth will be unforgettable. (blooming, beautiful, wonderful) 3. The boy ran to his mother... (falling, passing, coming) 4. He needed a ... for our group to unite. (manager, leader, chief) 5. Studentship - my time. (the best, gold, good) 6. This loom we are working on is no one can break its laws. (unwritten, embedded, iron)

"Creative teacher" method. In this method, students are given incomplete sentences. Students are asked to fill in the blanks in these sentences with phrases and explain what type of meaning transfer phenomenon is involved in these phrases. 1. Speak more slowly, go around, ... (so that no one hears) Answer: the wall also has ears. 2. Sometimes you are afraid that you will die... (you don't believe, you are afraid) Answer: your eyes are not enough, your heart is pulling you back. 3. In yesterday's football match, Uzbekistan ... (won) Answer: the hand was raised. 4. To deliver the good news to Salijan's mother... (ran quickly). Answer: I ran on my feet.

"**Askiya Payrovi**" method. For this, the teacher divides the students in the class into two groups and calls two of them to the blackboard and asks them to create a word game in the form of "I named you...". One of the members of the 1st group looks at a student from the 2nd group and says: "I made you look like a lion with a lion head, that's why I called you Arslan Khan." This "newly named" student, in turn, gives a metaphorical name to any student in group 1. Askiya's game is then conducted between groups, and the group that named it incorrectly or failed to name it metaphorically is excluded from the game. The winning group will receive an incentive card.

"**Explanatory dictionary**" method. Students are divided into two or more groups. Then, using the "Annotated Dictionary of the Uzbek Language", the groups were asked to find the correct (own) and transitive words of the words generation, eyebrow, sink, gold, heat, iron, step, root. a task is given to determine the meanings and explain the connection between them. Students can complete this assignment by:

Words	Notes
A generation	1. Descendants from ancestors; people belonging to a certain period of time; syllable 2. Portable. An updated, improved series of modern electronic calculators and other technical equipment.
Eyebrow	1. An arcuate hairy layer on top of the skull. 2. The front part of some things, the place where they are pushed out. Avon's brow. 3. An arc-shaped flower carved into a ring, necklace, etc. is an ornament.
Drowning	1. Drowned, submerged. 2. Portable. Buried in something; covered, immersed (in a state).
Gold	1. Chemical element belonging to group I of Mendeleev's periodic system; rare precious metal of yellow-red color; dice: gold. 2. Portable. About anything precious or dear.
Hot	1. Kinetic energy that heats up and heats up bodies, which occurs as a result of the movement of molecules in the composition of the body; heat, temperature. 2. Mobile Pleasant to the person, pleasant.
Iron	1. A chemical element belonging to group VIII of Mendeleev's periodic system, a heavy metal with a dark silvery luster, which flattens when bonded, can be formed into any shape, and when combined with carbon, forms steel and cast iron.

	2. Portable. A notebook whose entries have the force of law.
Step	1. Each foot throw, foot step in the process of walking; man 2. Portable. Activity, development.
Root	1. The underground part of the plant that takes water and fertilizers from the ground; vein. 2. Mobile Base, base, source. ...we must return to the roots of our ancient heritage and apply the rich traditions of our past to the construction of a new society.

Assignment. Compare the transference phenomena associated with animals. These similes are based on the similarity between animal and human character. Make up sentences yourself using words like snake, swallow, and eagle in figurative sense.

Locust - Locusts are arable land, uncultivated, free land. (Proverb) "The locusts have come," Haidar said, looking in that direction. They all looked in that direction. Twenty-five horsemen were dusting the road. (S. Ainiy) Lion - A good hunter shoots a lion, a good farmer clears the ground. (Proverb) - Bally, lion, who took the letter from you? - An old man. (A. Qadiri)

Elephant - The largest land animal is the elephant. Is it necessary to argue with Khalilov, Khalilov is an elephant, you are a ram. (I. Rahim)

Fox - This horseman with a fox cap on his head looked familiar to him. (H. Ghulam) I don't believe it, but I know that the old fox hides a lot from her husband. (O. Umarbekov)

Deer - For example, deer in the mountains, parrots in the forest, and nightingales in the meadow live in pairs, not alone, Anvar said. (A. Qadiri) Goodbye now... there is only one goodbye left in my heart, Goodbye now you are gone innocent boy. (A. Oripov)

"Logical observation" method. In this method, small creative texts with figurative meanings are assigned to students. Then, based on this text, several questions and tasks are given for students to make logical observations. It is advisable to implement these practical works at the stage of strengthening and applying the acquired knowledge in practice. For example:

Four categories.

A friend who doesn't leave your side when the sun is shining on your head is just a friend.

It's not a friend who doesn't leave your side when the sun is shining on your head, and disappears when a cloud comes over your head.

A "friend" who does not leave your trail when the sun is shining on your head, and betrays you when a cloud comes over your head is an enemy.

A true friend who doesn't chase you when the sun is shining on your head and doesn't leave you when a cloud comes over your head.

1. What types of meaning transfer are there in this text?

2. Explain this simile in your own words. Sunshine on your head -

3. Explain this simile in your own words. A cloud over your head -

4. What is the relationship between these migrations and natural phenomena. Share your thoughts.

5. Create a creative text on the topic "True friend" with the participation of meaning transfer types.

"Creative approach" method. We offer the following step-by-step method of creating an artistic text in order to prove that the educational subject "Mother tongue" is important in improving speech, enriching it, giving it artistic color, bringing sophistication to the student in the beautiful world of our language.

Assignment. Enrich the given artistic text in an emotional and affective way using figurative words and phrases, figurative expressions.

Spring has come to our country. The whole nature came to life and turned green. The smell of trees and flowers hits the nose, and the gentle breeze makes one's heart happy. Especially the white flowers of the apricot tree make everyone happy. Children's joy is endless, beautiful leaves are flying around. Grandfather farmers enjoyed the wonderful freshness of spring and began planting crops. Birds fly in the gardens, especially the swallows, who have fallen into the nesting season.

The teacher can enrich this text in an emotional and affective way using the following steps: The teacher shows the students a colorful picture that shows the nature of spring, and tells them about spring and its beautiful nature. urges to cry. Then the students perform the following tasks in sequence.

Task 1. *"Spring has come to our country."* Analyze the parts of this sentence. Complete the sentence with a qualifier. Students can give examples of such combinations as "A beautiful spring has come to our country", "Emerald spring has come to our country", "A beautiful spring has come to our country". The teacher asks the students to analyze these sentences and why we call the spring season beautiful, beautiful, emerald. Students express their opinions. The teacher presents his version by saying, "Spring has come to our country as the bride of the seasons." Students write down the option that suits them in their notebooks. If this option is said by a student, or a more effective sentence is made, the teacher encourages this student and tells him to write down the same sentence in the notebook.

Task 2: *"All nature came to life and became green."* In the sentence, try to replace the combination "green color went" with another word. If the 5th graders are struggling to find a more effective, artistic combination instead of this combination, the teacher can provide them with the following options: "started to turn green", "started to turn green", "started to turn green ". The teacher asks to choose the most appropriate and unique option from the given word combinations, and then write it down in a notebook.

Task 3. *"The smell of trees and flowers hits the nose, and the gentle breeze makes one's heart happy."* He asks the students to suggest what other verb can be used instead of the verb "pleases" in this sentence. After listening to the opinion of the students, he recommends using the verb "tickles" instead of the verb "pleases".

Task 4. *"Especially the white blossoms of the apricot tree make everyone happy."* The teacher offers to find the quality in this sentence and to try to support this quality. Also, he recommends replacing the compound "pleases the eyes" with such compounds as "makes the heart happy".

Task 5. *"Children's joy is boundless, beautiful leaves are flying from each other."* Students will think about what phrase can be used to replace the phrase "happy endlessly" in this sentence and what other word can be chosen instead of the verb "flying".

Task 6. *"Birds are flying in the gardens, especially the swallows who have fallen into the nest-building period."* Choose a word related to music instead of the word "glide" in this sentence. How can the word "swallows" be represented by a figurative expression? Every new sentence formed is recorded in a notebook. After completing all the tasks, the students will be able to find out the differences between the previous and newly created texts, compare and differentiate the meanings of words, and clearly see what elements are responsible for the expressiveness and artistry of the artistic text. it is appropriate to display these texts side by side on the screen. In this table, the positions made by students should be marked with black italics.

Spring has come to our country. The whole nature came to life and turned green. The smell of trees and flowers hits the nose, and the gentle breeze makes one's heart happy. Especially the white flowers of the apricot tree make everyone happy. Children's joy is endless, beautiful leaves are flying around. Grandfather farmers enjoyed the wonderful	Spring, the bride of the seasons, has come to our country. The whole nature came to life and turned green. The smell of trees and flowers hits the nose, the gentle breeze tickles the heart. Especially, the white blossoming branches of the apricot tree please everyone's eyes and bring peace to the hearts. The joy of the children cannot be contained, and beautiful

freshness of spring and began planting crops. Birds fly in the gardens, especially the swallows, who have fallen into the nesting season.	leaves start flying around. The grandfather farmers enjoyed the wonderful freshness of spring and started planting crops. Birds are buzzing in the gardens, especially the spring harbingers of swallows, who have fallen into the nesting season.

In the process of creating this text, the teacher should listen carefully to the opinions expressed by the students, guide them, remind them of the best options, and explain why they chose this option. After creating a creative text, the teacher gives the task of finding lexical tools familiar to students from the newly created text and filling in the following table. He tells about their importance.

Figurative expression	Bride of the seasons, harbingers of spring
Premium quality	White
Adjectives	Green, soft, white, beautiful
A figurative word	To tickle the heart, please the eyes
The phrase	It doesn't fit inside, tie a belt

Step-by-step implementation of the process of creating a creative text is definitely recommended for students of the age who are just learning to create an artistic text. Students who have learned the skills of creating an artistic text at a certain level can later enrich the given text with artistic visual tools using independent, somewhat general tasks.

"Article to the newspaper" method. It is recommended that the teacher use this method after providing theoretical information about the types of transfer of meaning, and after this information is consolidated and controlled. This method encourages students to explore creatively. Tasks related to research help to develop the student's creative thinking, to independently search for multi-meaning words and to develop the ability to use them in the right place. For this, the groups are presented with 6 color pictures depicting some event, nature, or some holiday or event. Then, based on these pictures, a publicist writes an article for the newspaper. The group that can use the most and most relevant transfer phenomena in their article will get an incentive card. The other group will have to find the picture based on which this article was written.

"Mindful reader" method. In this method, students are asked to find texts in which types of transfer of meaning are involved, to provide information about the types of transfer of meaning used in the text, to give information about what makes the text artistic. In the process of completing these tasks, students come to the conclusion that it is difficult to search for texts that involve the types of meaning transfer, to search for words with a transfer meaning in the text. This, in turn, helps writers learn what skills are required to create a particular work. Using the above methods, after the subjects have been strengthened, at the last stage, the students will be given the task of writing a creative text or an essay involving the transfer of meaning.

Conclusion. As you can see, each topic in the mother tongue lesson can be conducted by organizing exercises and tasks, various games that help the student's speech culture, emotional and affective enrichment. This requires great creativity and skill from the teacher. Above, we described the lessons aimed at developing students' speech culture and increasing vocabulary by teaching the types of transfer of meaning: "Venn diagram", "Comparative analysis", "Fill in the blanks", "We gave recommendations on how to enrich with methods such as "Logical observation", "Explanatory dictionary", "Creative reader", "Askiya payrovi", "Creative reader", "Article to the newspaper" and "Thinking reader"..

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Rezyume: *Maqolada zamonaviy ta'lim berish jarayonida ko'chma ma'noli so'zlar orqali innovatsion ta'lim texnologiyalaridan foydalanishning metodik asosi yoritilgan. O'quvchilarning nutqini o'stirishda, ularning faol lug'atini boyitishda, ularda nutq madaniyatini shakllantirishda, grammatik tushunchalarni hosil qilishda mazkur mavzu katta ahamiyatga ega.*

Резюме: *В статье описаны методологические основы использования инновационных образовательных технологий через образное слово в процессе современного образования. Данная тема имеет большое значение в развитии речи учащихся, обогащении их активного словарного запаса, формировании культуры речи, формировании грамматических понятий.*

Kalit so'zlar: *o'quv-ta'limiy kompetensiya, innovatsion ta'lim texnologiyalari, innovatsiya, tarbiya, innovatsion faoliyat, muammoli o'qitish, rolli dars, ta'limiy o'yinlar, "Venn diagrammasi", "Qiyosiy tahlil" usuli, "Bo'sh o'rinlarni to'ldir" usuli, "Gazetaga maqola" metodi, "Askiya payrovi" metodi, ijodiy matn.*

Ключевые слова: *учебно-воспитательная компетентность, инновационные образовательные технологии, инновации, образование, инновационная деятельность, проблемное обучение, ролевой урок, развивающие игры, «диаграмма Венна», метод «Сравнительный анализ», метод «Заполните пробелы», метод «Газетная статья», метод «Аския Пайрови», творческий текст.*

**TECHNOLOGY OF DEVELOPMENT OF COMPETENCE OF MUSIC CULTURE
TEACHERS OF GENERAL SECONDARY SCHOOLS IN WORKING WITH "ANVIL
STUDIO" MUSICAL COMPUTER PROGRAMS**

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Summary: *This article describes the methods of working with "Anvil Studio" musical computer programs in order to develop the competences of using computer programs in the organization of a modern lesson using good pedagogical technologies in music lessons of a general secondary school.*

Key words: *Music lesson, music methodology, new technologies, music theory, computer technology, musical programs.*

Introduction. By the end of the last century, it became clear that the quality of education depends not on the amount of real knowledge of a person, but on his acquisition of basic competencies. This is recognized by the world pedagogical community. Therefore, the way to modernize modern education is the way to transition to quality education both in the general school and in the system of additional education for children. Competent education implies the formation of an integrated system of "general knowledge, abilities, skills, as well as experience of independent activity and personal responsibility of students."

In the last decades of the last century, the rapid development of new information technologies began, which led to the process of computerization of school education. Today, the level of development of computer technologies in educational institutions, including additional educational institutions - children's art school, children's music school, creates technological conditions for their active use in solving certain pedagogical problems of the educational process.

The main part. Most of the music computer programs are professional music editors, and at the same time, there are no obstacles for students to master the main functions of the new direction of music pedagogy within the discipline of "Computer Music Studio". The above-mentioned programs comply with the principles of music-computer training, are excellent, reliable and belong to the products of the best software manufacturers in the world.

Summarizing the experience of introducing computer technologies into the educational process of educational institutions of Uzbekistan, we highlight the main ways of introducing information and music-computer technologies into music education:

- introduction of computer music programs (educational, developmental, simulation, presentation, etc.) to lectures and practical sessions;
- Use of musical programs (reference-informational, educational and game) in the student's independent works;
- application of monitoring (diagnostic) programs to control the acquisition of knowledge and the development of student skills;
- introduction of new electronic music equipment (keyboard synthesizer, music computer, etc.) into the pedagogical process;
- students and teachers turn to the Internet in preparation for teaching and learning practice in educational institutions.

Thus, we see that the computer is a versatile tool. The unusual charm of the computer is that working with it stimulates creative research and is infinitely useful for the development of thinking, analysis and generalization, formation and composition, and the search for appropriate solutions.

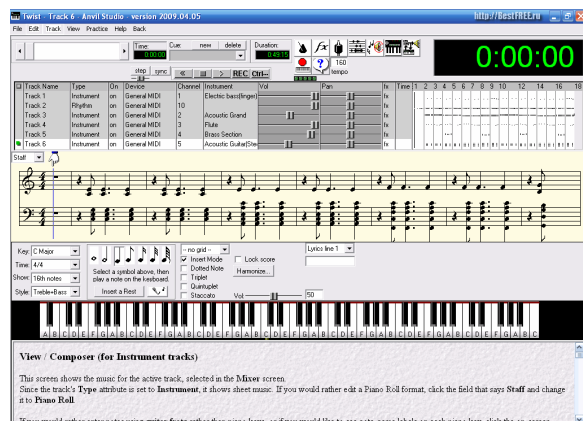
Currently, computer literacy is necessary in all areas of human activity. A musician cannot be technologically illiterate. After all, it is clear that the next path of the art of music, like its entire history, is connected with the gradual renewal of musical instruments. Music pedagogy cannot stand aside from

this process. No matter how complicated the organizational problems in the implementation of computer music pedagogy may seem, the success and feasibility of using music-computer technologies in music pedagogy today is indisputable, as it allows to significantly expand the horizons of creativity and increase artistic culture. our society has risen to a new level in terms of quality.

Anvil Studio MIDI Music Creation. Creating MIDI music. MIDI (Musical Instrument Digital Interface) is a music recording format in which music is encoded using special commands. The file format containing such commands is also called MIDI.

MIDI music can be created using special programs similar to sheet music editors. This page is dedicated to one of these free programs.

Anvil Studio



The importance of music in human life is undeniable. Music, which is one of the first types of creativity and has accompanied people almost all the time for many centuries, successfully fulfills not only entertainment, but primarily aesthetic, as well as educational and social functions.

It amazes, soothes, heals, we create a mood by making music, and everything depends only on the colors of this picture. Including our state of mind. A few years ago, the market situation was such that everyone had to spend money, sometimes several hundred dollars, to buy even the most basic software for a music

studio.

But recently, a sufficient number of free sequencer programs have appeared - programs that allow you to write music in MIDI, perform processing, i.e. formation of the final product - ready arrangement. Modern sequencers work not only with MIDI, but also with digital audio. Supports almost all MIDI keyboards.

Features of Anvil Studio.

One of these programs will be discussed today. Meet Anvil Studio - a full-fledged MIDI synthesizer suitable for writing music from scratch, as well as editing a ready-made electronic MIDI score. In terms of capabilities, this utility is superior to many commercial analogues, but it is distributed completely free of charge (although without advanced functions such as printing notes, etc.) and weighs a little more than three megabytes.

And most importantly, it has a simple and intuitive interface for any musician (input of notes from both a virtual piano keyboard and a guitar keyboard is supported).

What this program can do:

- Anvil Studio lets you create and edit MIDI files;
- set the desired rhythm;
- Using WAV files as examples;
- Record music from a MIDI keyboard, if available;
- recognition of notes from the microphone;
- automatically switch music to another time signature/key;
- Create and convert your WAV samples directly in the program.

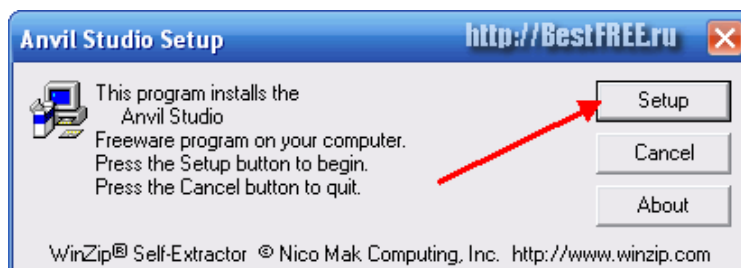
In addition, the program has a built-in metronome and guitar tuner. You can also practice playing the piano.

Installing Anvil Studio MIDI Editor.

Well, I think I have convinced you about the benefits of this utility. First, download and install Anvil Studio.

A few simple steps and the program will be loaded. Run the installer and click the "Setup" button.

After the program is installed, click on the Anvil Studio tab on your desktop and the following image will appear before our eyes:



For English speakers, the program has a great Help tab that provides very detailed tips and help for working with Anvil Studio. But, not all of us are strong in English, now we will take a closer look at how to work with this music editor.

Working with the interface and program.

To get acquainted with the utility, we open the midi file. To do this, go to the "File" menu, select "Open Songs" and select "Songs" in the file types.

Here is the main working window of Anvil Studio. It consists of the following components (from bottom to top): a hint and help panel, a keyboard (or guitar keyboard of your choice), a note settings panel, a staff display panel, a dashboard, a control panel, and a menu bar.

At the bottom, the help panel is displayed. This window describes in detail why it is needed and what you can do with it. Directly above it is a virtual piano keyboard, with which you can enter all the notes in the program.

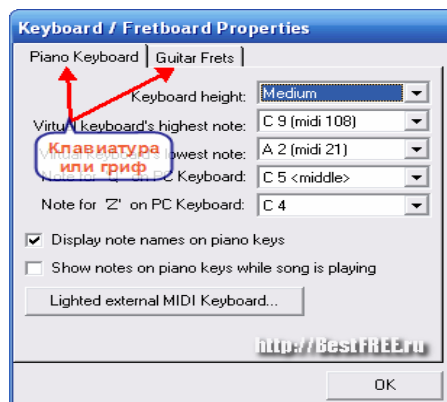
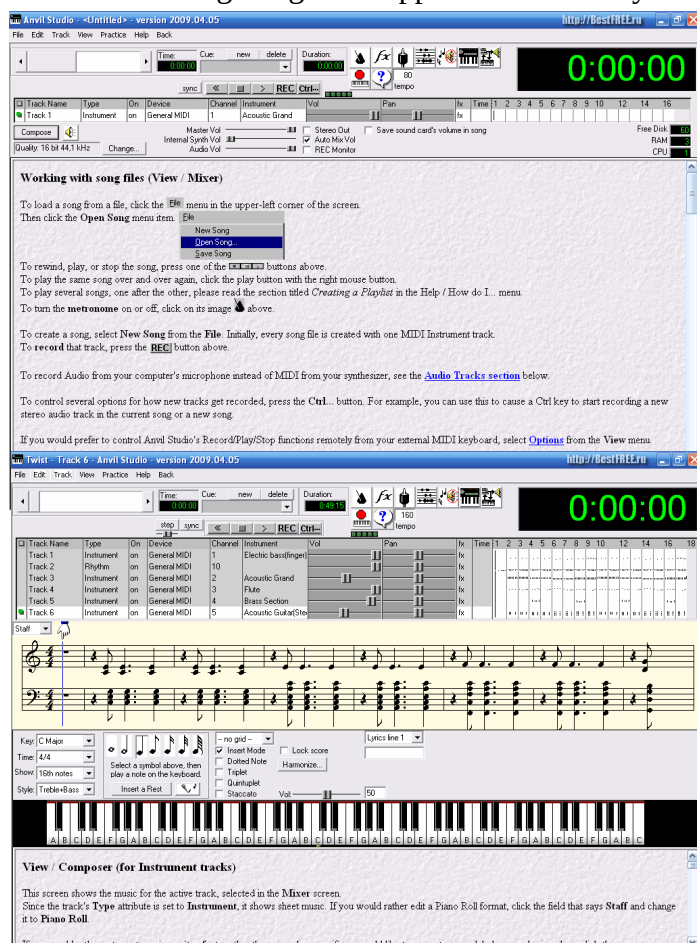
If desired, the keyboard can be replaced

with a guitar neck, both regular guitar and bass (4, 5 or 6 string options available). To do this, right-click on the keyboard area once and select the desired tab in the menu that opens.

Above the keyboard is a reminder settings bar. Here you can adjust the general key, size and display style of the staff for a specific track. On the right is a panel for specifying the duration of the inserted note or pause ("Add Addition" button).

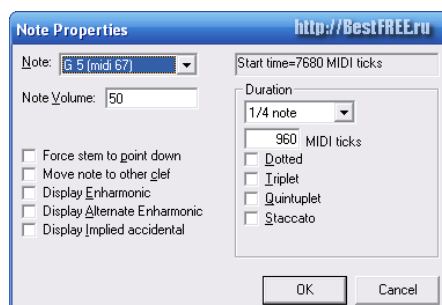
On the same panel there is a button, by activating it, you can enter a note through the microphone. The next panel is responsible for the option of playing notes and the distribution of staff.

Above we see the direct result of our efforts - the staff display panel. All the notes and coincidences we entered will be



displayed here. The pitch of any note can be changed in two ways. The first is to simply drag it up or down the staff, and the second is to go to the "Properties" tab in the context menu.

Here, in addition to the tone, you can change the volume, duration and version of the already entered note.



Tool table.

Let's take a look at the toolbar in the upper left corner.

Column 1 is where you can go to edit the track and give it a specific name of your choice. The second column is responsible for the type of track: instrumental, rhythmic, audio or audio track with a frequency of 24 KB (available only when connecting a paid plugin). The next column allows you to enable, disable or solo this track.

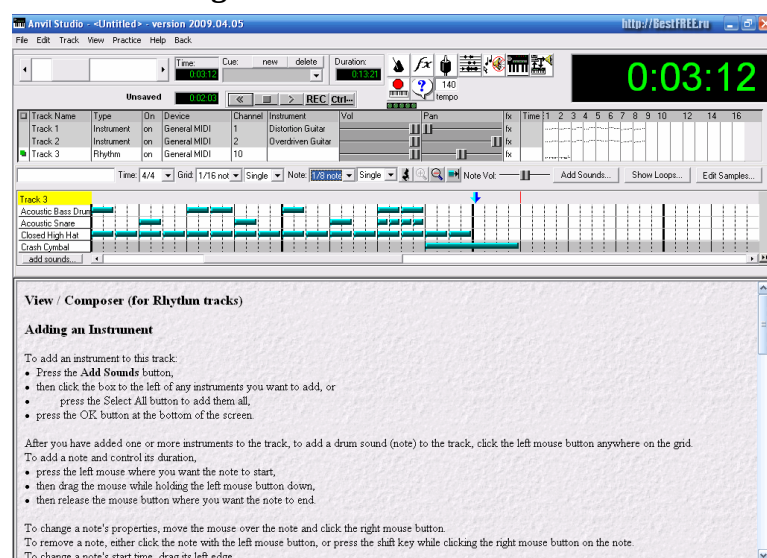
And finally, the last column allows you to set the instrument on which the melody will be played (piano by default). The only downside here is that you can only use General Midi to tame instruments without the ability to connect your own sound banks.

To the right of the icon are the level and pan sliders for that particular track, and below that is a diagram of the entire song. This scheme is convenient to use to quickly go to the desired part of the melody.

At the top of the instrument table are some auxiliary instruments needed to control the program, mainly the MIDI keyboard. Highlights here include the rewind panel, the play/record panel, and the Tempo window, which allows you to set the tempo of your composition.

Now let's move from theory to practice.

Creating MIDI music in Anvil Studio.



Let's make our own. Click the New Song button on the File menu to get started. Only empty employees with one track will appear. To add a new track, you need to select "Create" in the "Track" menu and select one of the items there. You can create the following track options: a simple instrumental track, a rhythm track (drums), a track with a metronome beat, an audio track (recorded in wav) and some of its variations.

Now that you've decided on the number and types of tracks, it's time to start creating and editing the notes themselves. I advise you to start writing music by recording the rhythm section.

For this, Anvil Studio has a very convenient option for visual editing of drums.

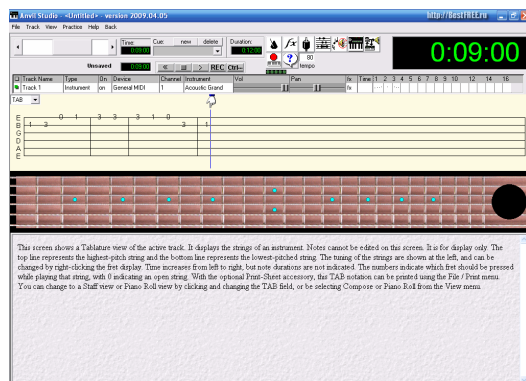
You just need to select the desired drums and cymbals from the list and then draw the rhythm in the square windows. By the way, there is a similar option for working with notes. If you are not very strong with notation, I recommend that you select "Piano Roll" in the drop-down window above the staff, or select the same option in the "View" menu.

We indicate the desired note opposite the desired piano key, and the duration corresponds to the length of the note.

Since we're talking about options for displaying reminders, we can't forget two more options: schedule and event list.

Tablature table and list.

If you are a guitarist, then you should be familiar with the concept of tablature. This is a schematic view of the neck of the



guitar, in which the numbers indicate the numbers of the fret to which one or another string should be fixed. By selecting the "TAB" icon in the window (or in the "View" menu), you will get the chart of the selected track.

In this case, notes cannot be edited, but guitarists can learn this or that composition very conveniently and quickly.

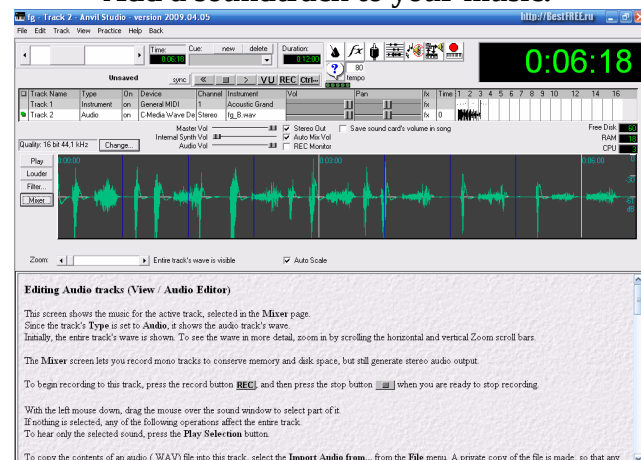
Unlike the previous option, everything in the event list can be completely edited. The MIDI interface is structured in such a way that a certain sequence

of commands is transmitted to the computer's sound card, which is responsible for playing each note. You can edit these exact commands.

In this way, you can fine-tune and achieve a very high-quality result.

Once you've done all the instrumental tracks, you can add more. To do this, you can use the option to insert an audio track.

Add a soundtrack to your music.



You can import the finished sample to wav, record a part of the instrument or add a voice. Just create an audio track and press "Rec" button to start recording. We stop recording, cut as needed and get the finished track.

Save the results.

Now it remains only to save our composition. We can save it as a midi file or rewrite it to wav. To do this, go to the "File" menu and select "Save song (as)" or "Export mixed audio", respectively. Ready! You are now a composer).

Conclusion. The use of computer technologies sets new tasks for teachers, because they have to solve many problems of a methodological nature, which have a clear identity and together form a new field of music and art education methods. Therefore, the use of new teaching tools (music-computer technologies) leads to a change in the goals, tasks and methods of additional music education, that is, to a radical change in its structure and content. And, of course, the problem of forming computer literacy and computer technology application skills of music teachers who have received academic music education is very urgent.

Music computer technology is a very young and rapidly developing field of knowledge located at the intersection of technology and art, combining informatics, sound engineering, pedagogy and musicology. The nature of its development is undoubtedly dynamic, as the constant renewal of scientific and technological progress provides people with ever-improving tools for creativity, learning and scientific research.

Music-computer technologies can be used at all stages of the educational process: in explaining, reinforcing, repeating new material. At the same time, the computer performs various functions for the student: a teacher, a working tool, a learning object, helps to solve the actual problems of education: developing skills and abilities, developing creative abilities, expanding the student's thesaurus. The computer can act as a patient teacher (computer education), a tool for objective assessment of student knowledge (computer control), a modeling environment (computer research models), a source of new information. Depending on the use of specific applications, it can become a multi-channel recording studio, a restorer of recordings from old records, a music typing program, a training program for solfeggio and music literature. If the goal of music education is to introduce students to musical creation, then the programs sought should be designed for music creation. At the same time, for the harmonious development of students' musical abilities, programs should cover various aspects of musical creative activity: composition, arrangement, performance, and sound editing.

I don't want to sound unreasonable, but in my opinion, Anvil Studio is one of the best programs for creating MIDI compositions. If you have a desire or need to create music, start by mastering this program and you won't regret it.

Permission is granted to freely copy and cite this article, with an open active link to the source and keeping the authorship of Ruslan Tertishniy. You may also need another program to help you edit recorded wav samples, etc.:

Music editor: <https://www.bestfree.ru/soft/media/audioeditor.php>

Download: <https://www.bestfree.ru/soft/media/midicreater-downloader.php>

The Windows version is 32-bit.

The 32-bit version of the program is generally compatible with all versions of Windows (including 64-bit).

If you have a new 64-bit version of Windows and are having problems with a 32-bit program, try running it in compatibility mode with Windows XP SP3, or download and install the 64-bit version of the program (if available).

Version for Windows 64-bit.

The 64-bit version of the program only works on new computers with 64-bit Windows installed.

Its advantage is the use of 64-bit addressing, which allows more stable operation of the program and optimal use of system resources of a computer running on the Windows x64 operating system.

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Rezyume: Ushbu maqolada umumiy o'rta ta'lim maktabi musiqa darslarida musiqa madaniyati fani o'qituvchisini yaxshi pedagogic texnologiyalardan foydalanib zamonaviy dars tashkil etishida kompyuter dasturlaridan foydalanish kompetensiyalarini rivojlantirish maqsadida "Anvil Studio" musiqiy kompyuter dasturlari bilan ishlash metodlari yoritilgan.

Резюме: В данной статье описаны методы работы с музыкальными компьютерными программами «Anvil Studio» с целью развития компетенций использования компьютерных программ в организации современного урока с использованием хороших педагогических технологий на уроках музыки в общеобразовательной школе.

Kalit so'zlar: Musiqa darsi, musiqa metodikasi, yangi texnologiyalar, musiqa nazariyasi, kompyuter texnologiyasi, musiqiy dasturlar.

Ключевые слова: Урок музыки, музыкальная методика, новые технологии, теория музыки, компьютерные технологии, музыкальные программы.

THE IMPORTANCE OF INNOVATIVE EDUCATIONAL TECHNOLOGIES IN THE DEVELOPMENT OF STUDENTS' EDUCATIONAL COMPETENCES

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Summary: *The methodological basis of using innovative educational technologies in the process of modern education is explained in the article. This topic is of great importance in developing students' speech, enriching their active vocabulary, forming their speech culture, and forming grammatical concepts.*

Key words: *educational competence, innovative educational technologies, innovation, education, innovative activity, problem teaching, role-playing lesson, educational games.*

Introduction. In the era of modern rapid changes, it is necessary to abandon the usual ideas and constantly improve in some new directions. Scientific and social progress is rapidly changing the conditions and content of people's work. A lot of changes have taken place in the local pedagogical system in the last decade.

In such conditions, the teacher should move in a wide range of innovative technologies and ideas, and should not spend time to discover the known things. Today, it is impossible to become a pedagogically qualified specialist without learning educational technologies.

The main part. Currently, great attention is paid to innovative technologies of education.

Innovation (from the English "Innovation" - innovation) is an activity aimed at changing the internal structure of a certain system. In the pedagogical interpretation and in the most general sense, it refers to innovations that improve the progress and results of the educational process in the pedagogical system.

Explanations of the essence of pedagogical innovation are very contradictory. "Professional pedagogy" has the following definition: "Innovation is a complex process of creating, distributing and using new practical tools (innovation) in the field of technique, technology, pedagogy and scientific research."

Therefore, there is no innovation without new practical tools. However, everything is not so simple: there are not many "new practical tools" in pedagogy. This means that innovation is not just about creating tools. Innovations are ideas, processes, tools, and results, which are the implementation of qualitative improvement of the pedagogical system.

Innovative education is an opportunity for students to create new ideas, norms, and rules, and create new ideas, norms, and rules for natural acceptance of advanced ideas, norms, and rules created by others. *lim.*

The technologies used in the process of innovative education are called innovative educational technologies or educational innovations.

The objects of innovation are the following problems: how to increase the motivation of teaching and educational activities; how to increase the volume of materials studied in the lesson; how to accelerate the pace of learning; how to eliminate time wastage etc.

The introduction of careful methods of using active methods of the educational process, new technologies of teaching and upbringing are the permanent directions of the development of innovative ideas.

Pedagogical technology should have a scientific basis, rely on a certain scientific concept, and scientifically justify educational goals. Pedagogical technology should have all the features of a system.

Innovations come in many forms. The following are the main forms of innovation:

- new ideas;
- specific goals aimed at changing the system or direction of activity;

- unconventional approaches;
- unusual initiatives;
- advanced working methods

V.P. Bepalko writes in the work "Components of Pedagogical Technology": "A good science-based technology of education and training is pedagogical skill itself."⁴

"Today, every teacher and educator, professor-teacher of a university is able to apply the latest positive innovations in the field of education and science to educational processes, possessing deep knowledge and worldview, in a word, should be the most advanced representatives of our time and society."⁵

The skills of the teacher, his ability to skillfully apply modern technologies to the educational process, search for new ways and methods of education, and creative use of advanced pedagogical experiences in primary classes, where the child's mind and thinking are being formed. It is very important to get that is why the preparation of future teachers for future activities and the introduction of modern pedagogical technologies into practice is one of the important requirements of today's higher education. Because modern pedagogical technologies, first of all, create an opportunity for students to learn knowledge, skills and abilities easily and with interest, and secondly, they help the teacher's professional growth and spiritual development.

"The more educated our children are, the faster the economic sectors based on high technologies will develop, the more social problems will be solved. Therefore, if I say that the threshold of New Uzbekistan starts from the school, I think that our entire nation will support this idea" (SH. Mirziyoyev).⁶

The use of various active methods of an innovative nature by the teacher in the educational process serves to develop students and increase their abilities. In particular, problem-based research, conducting small research, debate, discussion, heuristic conversation, alternative exercises, working in small groups, etc.

When organizing classes, pedagogues should pay special attention to ensuring that educational information can interest students, encourage them to think, and be creative, based on their knowledge, skills, qualifications, and experiences.

During the educational process, pedagogues:

- effective, purposeful use of various forms, methods, tools and technologies;
- to enable students to independently choose methods when completing educational tasks;
- students work in pairs, small groups and teams

provide;

- paying attention to the design of classes not only improves the quality of teaching, increases its efficiency, but also creates favorable conditions for the development of students' personality.

Innovative activity requires the acquisition of theoretical knowledge, practical skills and qualifications, supplementing practical activity with theoretical knowledge, development of knowledge, design, communicative speech and organizational skills based on directing the mental, mental and physical strength of the pedagogue to a specific goal. .

Pedagogical innovation activity is manifested on the basis of the following signs:

- striving to master the philosophy of creative activity;
- acquisition of pedagogical research methods;
- ability to create author's concepts;
- ability to plan and carry out experimental work;

⁴ Bepalko V.P. Pedagogy and progressive teaching technologies. M., "Pedagogy", 1995.

⁵ From the speech of the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the ceremony dedicated to the Day of Teachers and Coaches. 2021 year.

⁶ From the speech of the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the ceremony dedicated to the Day of Teachers and Coaches. 2021 year.

- to be able to use the experiences of other researchers-pedagogues;
- cooperation with colleagues;
- ability to exchange ideas and provide methodical support;
- prevention and elimination of conflicts;
- searching for news and adapting them to their own conditions.

The scope of new pedagogical knowledge is expanding based on the requirements of the Law on Education, research directions are focused on the problems of free personality formation. Today, effective use of various teaching methods is important in the educational process.

When native language classes are organized on the basis of innovative technology, the students develop the ability to work cooperatively, they help each other in finding solutions to common tasks, the students develop creative and independent thinking skills, and the students develop their own they feel personally responsible for the result of their work, study, and education.

Currently, problem-based teaching technology is effective in any educational institution. Its task is to encourage the process of active cognition and to form a scientific-research method in thinking that corresponds to the goals of creative, active personality education.

The essence of problem-based teaching is the teacher's management of students' cognitive activities to acquire new knowledge by creating a problem situation in their educational work and solving educational tasks, problems and questions. Certain laws of human activity, personality development and the principles and rules of all sciences formed on their basis lie at the basis of any teaching activity. The process of cognitive activity of a person relies on objective laws and didactic principles in solving logical cognitive conflicts.

The problem situation arises in specific teaching conditions that are organized according to the purpose of certain pedagogical tools. It is also necessary to develop special methods of creating such situations based on the characteristics of the studied subjects. Thus, a problem situation in teaching is not just a state of mental strain associated with an "unexpected obstacle near the thought". It is a state of mental tension specifically required for cognitive purposes. At the basis of such a situation are traces of previously acquired knowledge and mental and practical methods of action to solve a new task. It would be appropriate to emphasize that not all hardships are related to problematic situations. Mental effort is not a problem if new knowledge is not connected to previous knowledge. Such toil does not warrant intellectual pursuit. The problem situation is different from any thinking difficulties, in which the student realizes the internal, hidden connections of the object (concept, fact) that required difficulty with the task, problem known to him before and at the same time.

The essence of the problematic situation is that it is a conflict between the information familiar to the student and new facts and events (the prior knowledge to understand and explain them is lacking). This conflict is the driving force for creative acquisition of knowledge.

Symptoms of a problematic situation include⁷:

- presence of an unfamiliar fact in the student;
- the instructions given to the student to complete the tasks, their personal interest in solving the cognitive difficulties that have arisen.

Being able to get out of a problematic situation is always connected with the understanding of the problem, that is, what is unknown, its verbal expression and solution.

If we analyze the problem situation mentally, it is, first of all, the independent mental activity of students. It leads the student to understand the reasons that caused intellectual difficulties, to enter into it, to express the problem in words, that is, to define active thinking. Here the consistency is clear: first, a problem situation arises, then a learning problem is formed. There are also important signs of a learning problem in the teaching process.

Important signs of a learning problem are:

⁷ Saidakhmedov N. New pedagogical technologies. Tashkent, 2003. 18 p.

- addition of the unknown, which leads to the formation of new knowledge;
- students have a certain knowledge reserve necessary to carry out research in order to find the unknown.

An important stage of students' mental activity in the process of solving an educational problem is to make hypotheses, ideas and justify it.

The learning problem is developed consistently with problematic questions, and each question serves as a step in its solution.

The components of the problem, the character of the relationship between the known and the unknown, create a need for knowledge and encourage the search for active knowledge.

It should be noted that a necessary condition of problem-based teaching is to create a creative attitude in students to the process of searching for the truth and its results.

Problem-based teaching has great potential in revitalizing students' cognitive activities in conscious and solid assimilation of knowledge, determining their active attitude to the environment.

In problem-based teaching, the teacher organizes the cognitive activities of the students, so that the students, based on the analysis of subjects, independently solve intellectual problems, draw conclusions and generalize, form laws, and apply the acquired knowledge to a new situation.

As a result of problem-based teaching, the ability of students to independently acquire knowledge is formed, and the ability to find different ideas on the topic, to find new ways of mental action by proving it, and to transfer knowledge from one problem to another is formed.

Pupils' attention and imagination develop, and their cognitive activity increases through the perception of educational materials.

Thus, the task of problem-based teaching is to help students to master knowledge thoroughly and to make their mental and practical independent activities effective, to form the skills of creative application of knowledge in a new situation.

There are many options of methods and exercises used in the methodology of teaching the mother tongue to develop students' literacy, to form grammatical concepts, and to improve their verbal and scientific literacy. The favorite form of lessons for elementary school students is the game lesson. Educational games play an important role in the strengthening of phonetic, grammatical, orthographic concepts and the perfect formation of speech skills. The difference between educational games and other types of exercises (copying, writing, analysis, dictation, narrative, essay) is that, on the one hand, it eliminates the boredom and fatigue of students, and on the other hand, it accelerates the thinking process of children. , the detailed formation of specific defined skills becomes easier.

A special feature of role-playing classes is that children's psychological foundations are formed by the mechanism of imagination: children imagine themselves in certain roles, find themselves in a certain situation and solve the given tasks together. Using this mechanism as a basis, even the most complex material can be implemented. What is the success of such a lesson? In my opinion, both in its originality (use of a legendary, fantasy plot; inviting favorite characters), and in the understandable presentation of the material and the use of attractive exhibitions. After all, children get tired of "memorizing" textbook material from lesson to lesson. But if you imagine, for example, that you have fallen on a desert island or another planet, and you have to help your fellow tribesmen, you will overcome any difficulties: you will not only move mountains, but also obey all the rules of species and descent, You'll also memorize the rules for spelling and punctuation.

Conclusion.

It is known that the younger the student, the more interesting game elements used in the lesson should be. Because the didactic game used in the lesson, on the one hand, corresponds to the characteristics of some children's nature, such as curiosity and cheerfulness, and on the other hand, it eliminates such aspects as inhumanity, silence, and shyness in some children. So, the game process makes drastic changes in the student's psychology. During the game, the student begins to determine the essence of abstract grammatical-orthographic concepts, signs common to many words begin to take

place in his memory, and orthoepic-orthographic defects in his oral and written speech begin to decrease. Educational games provide free behavior of the class team. The effectiveness of the lesson increases. Active participation of many students is ensured in the game and there is an opportunity to leave rating points.

Another remarkable feature of the games is that the classroom is filled with excitement, good mood, and intensity. When students help each other, the cohesiveness of the class team is strengthened.

Educational games are one of the main methods of activating words in a child's vocabulary.

An educational game is a practical activity of students, because in it children use the knowledge they have acquired during training. It strengthens the mental activity of children, and provides an opportunity for them to use the acquired knowledge in various ways.

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Rezyume: *Maqolada zamonaviy ta'lim berish jarayonida innovatsion ta'lim texnologiyalaridan foydalanishning metodik asosi yoritilgan. O'quvchilarning nutqini o'stirishda, ularning faol lug'atini boyitishda, ularda nutq madaniyatini shakllantirishda, grammatik tushunchalarni hosil qilishda mazkur mavzu katta ahamiyatga ega.*

Резюме: *В статье раскрыты методологические основы использования инновационных образовательных технологий в процессе современного образования. Данная тема имеет большое значение в развитии речи учащихся, обогащении их активного словарного запаса, формировании культуры речи, формировании грамматических понятий.*

Kalit so'zlar: *o'quv-ta'limiy kompetensiya, innovatsion ta'lim texnologiyalari, innovatsiya, tarbiya, innovatsion faoliyat, muammoli o'qitish, rolli dars, ta'limiy o'yinlar.*

Ключевые слова: *образовательная компетентность, инновационные образовательные технологии, инновации, образование, инновационная деятельность, проблемное обучение, ролевой урок, развивающие игры.*

**FROM THE EXPERIENCE OF ORGANIZING FIELD PRACTICE FOR GEOGRAPHERS
(BASED ON THE EXAMPLE OF DZHANGELDI DISTRICT)**

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Summary: *In educational institutions, along with theoretical classes, professional practical classes are also important. This article describes the idea of organizing professional practices in the field of teaching the basics of geography and economic knowledge. The article describes the stages of professional practice and the reasons for choosing a region of practice. Also, using the example of the Dzhangeldi ovule, an approximate plan for organizing a 10-day field practice is given and daily tasks are shown.*

Key words: *Qualifying practice, field practice, stages of practice, practice area, desert zone, Kuljuktau, Dzhangeldi weather station, climate, weather, Dzhangeldi seismic forecasting center, Kyzylkum desert station.*

1. Introduction. Today, one of the important tasks of higher education institutions is to prepare modern, mature and educated personnel in all aspects. Therefore, in educational institutions, along with theoretical classes, special attention is paid to the organization of practical and laboratory classes, especially field practice. In addition, field practice is an integral part of the educational process.

In the curriculum of direction 60111000 - geography and fundamentals of economic knowledge of the Bukhara State Pedagogical Institute (Bukh SPI), a 3-week (in the spring process) field practice is planned.

The curriculum (syllabus) is developed by professors and teachers of the department for professional practice and is designed accordingly. Usually, on the day the qualifying practice begins, a conference dedicated to the practice is organized with the participation of the educational and methodological department, faculty management, professors and teachers of the department and students.

Study area. It presents the essence, purpose and objectives of professional practice, the requirements for practice managers and student practitioners. In addition, practicing students are provided with information about the stages of organizing field practice (organizational, field, desk and final stages) and the work performed in it [2,3]. 60111000 – geography and fundamentals of economic knowledge is an educational practice on the content of this qualifying practice, intended for first-year students.

Half of these on-site classes will be conducted in the city of Bukhara and surrounding areas at enterprises and institutions, in specially protected areas, and the rest will be conducted directly in the field. The Dzhangeldi district, located 200 km away from the city of Bukhara, was chosen as the object of field practice for 1st year students of the BukhSPI in specialty 60111000 - geography and fundamentals of economic knowledge.



Students of the BukhSPI in Dzhangeldi meteorological station

Materials and methods. There are several scientific and practical reasons for choosing the Dzhangeldi region as a place of study:

1. The village of Dzhangeldi has a convenient geographical location. To the north of the microdistrict is Kuldzhuktau, the highest point (785 m) in the Bukhara region, and to the south is the Kyzylkum desert. There, students have the opportunity to see desert and mountain landscapes at the same time;

2. The Dzhangeldi weather station operates in the day practice area. It monitors the weather in the area 8 times a day;

3. The Dzhangeldi seismic forecasting center operates in the region, which regularly studies the seismic activity of the area and the composition of groundwater;

4. Near Dzhangeldi there is the Kyzylkum desert station of the Scientific Research Institute of Botany of ANU, a scientific institution that constantly monitors the flora of the desert zone and plays an important role in the conservation of biodiversity.

Due to the presence of the above-mentioned scientific institutions and observation stations, the Dzhangeldi region was chosen as the region where the field practice will be carried out.

It is generally recommended that 10 days of a three-week field training course be completed in the following order:

Day 1. Observation of changes in nature along the route Bukhara - Gazli - Svetushchiy - Dzhangeldi. Student practitioners follow nature along the route. In the afternoon they will learn about the nature, inhabitants and economy of the village of Dzhangeldi.

Day 2. Study of the geology and geomorphology of the Dzhangeldi region. They are introduced to the geological structure of Kuljuktau, exposed layers, rock formation, landforms and minerals of Kuljuktau.

Day 3. Familiarize yourself with the activities of the Dzhangeldi seismic forecasting center. The center's specialists monitor the seismic activity of the area and the composition of groundwater in laboratory conditions.

Day 4. Study of the climate and weather of the region, practice. Students get acquainted with the activities of the Dzhangeldi weather station - one of the 4 weather stations in the Bukhara region. This is a weather station located at an altitude of 202 m above sea level; weather observations have been carried out since 1950 [6,7]. Practitioners - students observe the daily routine of the Dzhangeldi weather station and take part in the process of determining daily air temperature, humidity, cloudiness, wind and its direction. They will test the theoretical knowledge acquired in the subjects "General Geography" and "Meteorology and Climatology" in practice. In addition, each trainee will have the

skills and qualifications to operate instruments and devices at a weather station and monitor the weather on a daily basis

Day 5. Study of the inland waters of the area. Students will study seasonal flowing waters - rivers and streams flowing from southern Kuljuktau, their activity in the geomorphology of the area [8]. They will have the opportunity to study the composition of groundwater, including artesian wells and thermal waters in laboratory conditions.



Students of the BukhSPI in Kyzylkum desert station of the Scientific Research Institute of Botany of ANU

Day 6. Exploring the Kyzylkum desert and its landforms. Practicing students study landforms created by the wind in sandy deserts 10 km south of the village of Dzhangeldi. In dunes, mobile sand formations are observed, such as sand ridges on a field [4]. They determine their formation and direction of movement.

Day 7. Observation of geographical conditions - clay desert, flora and fauna. The route will be organized along the Dzhangeldi-Kalata route. Students observe clay deserts that occupy large areas in the south and southwest of Kalat. They will learn about the formation of saxaul forests, its flora and fauna in the west of the village.

Day 8. Getting acquainted with the activities of the Kyzylkum desert station of the Research Institute of Botany of the Academy of Sciences of Uzbekistan. Students conduct a geobotanical analysis of the flora of the Kyzylkum desert. Studying the flora of Kyzylkum and its composition, they compile a list of plants included in the "Red Book" of Uzbekistan [5]. In addition, student practitioners will become familiar with the work carried out at the Kyzylkum Desert Station to protect desert plants.

Day 9. Observation of the fauna of the region where the practice is carried out. Students compile a list of representatives of the class of mammals, reptiles, birds and insects living in the Kyzylkum desert (Jongeldy region), and study their zoogeographical areas.

Day 10. Study of the use of natural resources and nature conservation of the Dzhangeldi district. Practitioners - students get acquainted with the state of use of natural (space, climate) and mineral resources of the region in the national economy [1]. They will also learn about conservation and the experiences of local people. In the afternoon, they will follow the changes in nature along the route Dzhangeldi-Svetushchiy-Gazli-Bukhara and complete the field stage of qualifying practice.

Results and discussion. After this, the chamber stage of qualifying practice begins. At this stage, practical students systematize materials collected in the field. Each student prepares a journal, and group members prepare a professional practice report. On the last day of qualifying practice, each unit prepares a presentation about the work done during the practice and their reports are heard.

Conclusions. In general, first-year students in direction 60111000 – Geography and fundamentals of economic education, acquired during this qualifying practice, the ability to apply

theoretical knowledge in “General Geography”, “Geology and Geomorphology”, “Meteorology and Climatology” gives a great positive result. It also helps students develop practical skills.

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Rezyume. *Ta’lim muassasalarida nazariy darslar bilan birga, malakaviy amaliyot darslari ham muhim ahamiyatga ega. Mazkur maqolada geografiya va iqtisodiy bilim asoslari ta’lim yo’nalishida malakaviy amaliyot darslarini tashkil qilish haqida fikr bayon etilgan. Maqolada malakaviy amaliyotning bosqichlari hamda amaliyot rayoni tanlanishining sabablari yoritib berilgan. Shuningdek, Dzhangeldi ovuli misolida 10 kunlik dala amaliyotini tashkil qilish bo’yicha namunaviy reja berilib, kundalik vazifalar ko’rsatilgan.*

Резюме. *В учебных заведениях наряду с теоретическими занятиями важны и профессиональные практические занятия. В данной статье описана идея организации профессиональных практик в области обучения основам географии и экономических знаний. В статье описаны этапы профессиональной практики и причины выбора региона практики. Также на примере оула Джонгелди приведен примерный план организации 10-дневной полевой практики и показаны ежедневные задания*

Kalit so‘zlar: *Malakaviy amaliyot, dala amaliyoti, amaliyot bosqichlari, amaliyot rayoni, cho’l zonasi, Quljuqtog’, Dzhangeldi meteostansiyasi, iqlim, ob-havo, Dzhangeldi seysmik-prognostik markazi, Qizilqum cho’l stansiyasi.*

Ключевые слова: *Квалификационная практика, полевая практика, этапы практики, район практики, пустынная зона, Кулджуктау, метеостанция Джонгелди, климат, погода, сейсмо-прогностический центр Джонгелди, пустынная станция Кызылкум.*

IMPROVING THE COMPETENCIES OF PHYSICAL EDUCATION TEACHERS ON INFORMATION AND COMMUNICATION TECHNOLOGIES

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Summary: *This article describes the issues of improving the professional competence of teachers of physical education in secondary schools in information and communication technologies. The article presents the need to improve the ICT competence of physical education teachers, the existing problems and their solutions.*

Key words: *physical education, information and communication technologies, competence, multimedia, presentation, pedagogy, program, Internet, social networks*

Introduction. In today's rapidly evolving world, advancements in information and communication technologies (ICTs) have opened up new vistas for a variety of sectors, including education. This transformation was further amplified due to the COVID-19 pandemic, which necessitated the swift adoption of digital teaching methods. As a result, teachers of all disciplines, including physical education (PE), have had to adapt to using ICT tools for instruction. This shift implies that PE teachers must now sharpen their ICT skills to navigate this new educational landscape effectively.

Need for ICT competency in physical education

Physical education, traditionally seen as an area heavily reliant on direct physical interactions, may not ostensibly seem to need competence in ICT. However, such an assumption is misplaced. ICT can provide physical educators with tools to create engaging and inclusive learning environments, maintain high teaching standards, and promote active lifestyles outside of the school setting.

Adopting ICT can help in assessment and feedback, planning, and implementing student-centered learning, multimedia presentations, conducting remote PE classes, and offering interactive educational games. Moreover, it enables teachers to monitor their students' progress, engage with them through various mediums, and aid in their overall development.

Training PE teachers in ICT: A critical imperative

Empowering PE teachers with ICT skills can be achieved through targeted ICT training programs. These programs should focus on both general and PE-specific digital competences.

General ICT competencies include understanding and using the basic functions of current technology, like operating systems, software applications, hardware devices, and troubleshooting common technology issues. Furthermore, pedagogical digital competencies involve integrating these ICT tools into teaching strategies effectively to promote active learning.

PE-specific digital competences would include the use of specialized software for fitness tracking, virtual reality for movement learning, video analysis for technique correction, and engaging students in digital physical activities.

Professional development programs need to encourage educators to experiment with different technologies within the PE context. An ongoing, hands-on, and collaborative learning approach can enhance digital literacy, better incorporation of ICT tools in lessons, and improve learners' outcomes.

Challenges and the way forward

While there's considerable potential in integrating ICT in PE, certain challenges in implementing it include lack of proper equipment, training, and the perception that technology and physical education do not mesh.

Overcoming these barriers involves institutional support, adequate resources, regular training, collaboration among teachers, and an overhaul of traditional perceptions about PE. It's critical to

remember that while the ICT tools are essential, they are only facilitifiers. The heart of quality PE instruction will always be creative teaching, positive student interactions, and the promotion of lifelong physical activity.

Practical steps to improve ICT competencies in physical education

Understanding current competence levels

Recognizing the current ICT competencies of PE teachers is the first step of the improvement process. This can be achieved through conducting surveys or assessments to determine their competence and confidence levels in using technology. Through this, you can identify specific areas where teachers lack competence and require further training.

Promoting technology literacy

Physical education instructors need to be well versed in the basic use of technology and digital platforms. This includes developing simple skills like word processing, creating and editing spreadsheet data, managing electronic diaries, and effectively using search engines, social media platforms, and educational management software.

Training in instructional technologies

Teachers should be trained to use software and technical tools that will enhance their teaching methods. These may include fitness apps, virtual reality tools for demonstrating exercises, motion capture technologies for assessing performance or gaming platforms to encourage physical activities. These technological tools when used effectively can enhance student engagement and participation.

Professional development programs

Providing regular and ongoing professional development programs for PE teachers can help in improving their ICT competencies. These training courses should not only focus on theoretical knowledge but also provide hands-on experimentation and opportunities for trial and error learning.

Online communities

Creating online communities for PE teachers can also contribute to enhancing their ICT competencies. They can share experiences, challenges, teaching strategies and even training resources. These online platforms could provide an avenue to solve problems collaboratively, thus enhancing their skills.

Evaluation

In addition to training, regular evaluations are necessary to measure the progress and impact of ICT training. Teachers can take ICT proficiency tests, students can participate in surveys about their learning experiences, and the overall PE performance can also be assessed.

Policy implications

It is imperative that school policy-makers recognize the importance of integrating ICT in PE and place it on their agenda. This can be realized through providing facilities and resources required for the adoption of technology, and implementing rules and regulations that mandate and facilitate the use of ICT in teaching PE.

For instance, a portion of the school budget can be allotted for acquiring necessary ICT equipment. Additionally, clear ICT integration policies and guidelines can provide a roadmap for teachers. Policies can stipulate the necessary ICT training for PE staff, expectations concerning the use of ICT in teaching, and assign roles and responsibilities for ICT implementation.

Inclusion of ICT in PE curriculum

The inclusion of ICT in PE curriculum is another important step. This would mean that PE teacher education would incorporate ICT-related competencies into its curriculum. ICT components can be included in the practicum and coursework to ensure that fresh graduates have the necessary skills. Such a curriculum would foster a generation of PE teachers who are inherent users of ICT.

Encourage research and collaboration

Lastly, the establishment of platforms that facilitate collaboration among PE teachers, ICT experts, and education policymakers can foster new insights and opportunities. Schools can encourage

action researches where teachers experiment with ICT integration in their classes and share their findings.

Furthermore, stakeholder partnerships should be fostered including those with local educational technology firms or digital companies. Such partnerships might help in providing necessary resources and training and could support action research projects.

Conclusion

The enhancement of ICT competencies among PE teachers is essential in the current digital age. As we move further into the 21st century, the use of ICT in PE will only increase. Thus, there is a need to equip PE teachers with relevant ICT skills to improve their teaching efficiency and effectiveness. By overcoming the challenges and embracing ICT in PE, we can usher in an era of more developed, rounded, and technology-enabled physical education that meets the demands of this ever-evolving digital world.

Rezyume: *Ushbu maqolada umumta'lim maktablari jismoniy tarbiya o'qituvchilarining axborot-kommunikatsiya texnologiyalari bo'yicha kasbiy kompetentligini takomillashtirish masalalari bayon etilgan. Maqolada jismoniy tarbiya o'qituvchilarining AKT bo'yicha kasbiy kompetentligini takomillashtirishga bo'lgan ehtiyoj, mavjud muammolar va ularning yechimlari keltirilgan.*

Резюме: *В данной статье изложены вопросы совершенствования профессиональной компетентности учителей физической культуры общеобразовательных школ по информационно-коммуникационным технологиям. В статье представлена необходимость совершенствования ИКТ компетентности учителей физической культуры, имеющиеся проблемы и их решения.*

Kalit so'zlar: *jismoniy tarbiya, axborot-kommunikatsiya texnologiyalari, kompetensiya, multimedia, taqdimot, pedagogika, dastur, internet, ijtimoiy tarmoqlar.*

Ключевые слова: *физкультура, информационные и коммуникационные технологии, компетентность, мультимедиа, презентация, педагогика, программа, Интернет, социальные сети.*

A COMPLEX APPROACH IN THE RESEARCH OF NOMINATIONS OF THE CONCEPT "INTELLECT".

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Summary: *This article deals with features of linguoculture of concept "intellect" in English and Karakalpak languages.*

Key words: *intelligence, concept, nomination, integrated approach, linguoculturology.*

The analysis of studies on conceptual analysis distinguishes two main methods in conceptology - linguistic and semantic [Plotnikova 2008: 29], reveals the difference between them in the analysis of analyzed examples and methods (linguistic studies, first of all, shows the universal / national specificity of the concept, semantic analysis - studies all the specificity of the cognitive and content elements of the concept). In the linguistic and cultural method, the method of cognitive analysis is hardly used or is not used as a single step of the concept analysis method [Popova, Sternin 2007: 199].

Z.D.Popova and I.A.Sternin's scientific work "Ocherki po kognitivnoy lingvistike" shows the two main directions of concept prohibition: "from meaning to language" and "from language to meaning" [Popova, Sternin 2001: 96].

The methodology of conceptual analysis can be analyzed in a completely different form. The research of the concept is mainly divided into three stages, each of which covers its own methods and methods, that is, consists of different research materials. The purpose of the first stage of studying the concept is to identify the units that make it happen: the base word that is the direct nomination of the concept, its synonyms, the nomination of the denotation of the concept, the names of various variations of the denotation, the base so adverbs, proverbs, aphorisms, base words from phraseological units, words that cause the usual association of base word representatives.

As research material, the sources of lexicography are taken: explanatory dictionary, semantic dictionary, dictionary of synonyms, ideographic, encyclopedic, thesaurus, as well as a dictionary of similar words, a dictionary of quotations, a dictionary of aphorisms, etymology, associative dictionary etc. In the next step, together with the data from the dictionary of similar words and the associative survey, the identification of the usual associative relationships of the main lexemes is used. In order to determine the nominations of the studied concept, in addition to dictionaries, the peculiarities of the use of the base word in art, journalistic, scientific texts, as well as in the national corpus of the language are analyzed through contexts.

In the second stage, the actual analysis of the concept is carried out. The purpose of the second stage is to create a model of the studied concept, the data obtained in the previous stage are used as material for analysis.

This stage includes several sub-stages of initial and basic analysis-modeling of the concept analysis. At the initial analysis stage, component, discursive, comparative and statistical analysis of polysemantic words is carried out. The purpose of the preliminary analysis is to determine the semantic components of lexemes that represent the concept.

The concept of "intellect". For this reason, we think it is necessary to review the lexemes involved in naming the studied concept based on dictionary definitions. Using the mass selection method, the corpus of lexemes includes 130 English nouns (including: 69 synonyms, 61 antonyms), 24 adjectives (including: 16 synonyms, 7 antonyms), 15 verbs. From the lexical layer of the Karakalpak language: 144 nouns (including: 72 synonyms, 72 antonyms), 75 adjectives (including: 33 synonyms, 42 antonyms), 60 verbs (including: 30 synonyms, 30 antonyms), 50 adjective verbs (including : we found that it consists of 28 synonyms, 22 antonyms). The data of the lexical units have a general semantic base meaning related to the concept of "intellect". Lexical units were selected from the

Cambridge Thesaurus site in English, and information on the Karakalpak language was collected from the explanatory dictionary of the Karakalpak language and translation dictionaries of the Russian-Karakalpak languages [https://dictionary.cambridge.org/ru/thesaurus, Karakalpak explanatory dictionary of the language, volumes I-IV].

In the list of identifiers of the concept of "intellect" extracted from the annotated dictionary analysis, some of them were not identified in the text: sıyqırshı, ásir adamı, tuz, miy, aq jaǵa, talant, miyler, millet, sur zat, imkaniyat, ziyrek, saqlıq, qıraǵılıq, seziklik, aqıllı pikir, pámlew, ózgeshelik, ayırma, tańlaw, sózge sheberlik, tapqırılıq, sheshenlik, ushırıp aytıwshılıq, ziyreklik, bas kiyim, ańlılıq, túsingishlik, pámlilik, tapqırılıq, ziyreklik, sheberlik, jaramaslıq, bilimpaz. Shuningdek ular semantik ma'nolari bilan ham kontseptni voqealantirib uzoq pereferiya qatlamiga kiradi: miy, miyler, sur zat, ziyrek, aqıllı pikir, pámlew, sózge sheberlik, tapqırılıq, sheshenlik, ushırıp aytıwshılıq, ziyreklik, ańlılıq, túsingishlik, pámlilik, tapqırılıq, sheberlik, bilimpaz.

Among the below-mentioned identifiers, which are not included in this list, there are no corresponding factors in the meaning of the concept of "intellect" in the dictionary, and it was determined that they are part of the concept if they are derived from conceptual peculiarities. In this analysis, we focused on other literature collections to identify conceptual themes. (See Table 1):

Table 1

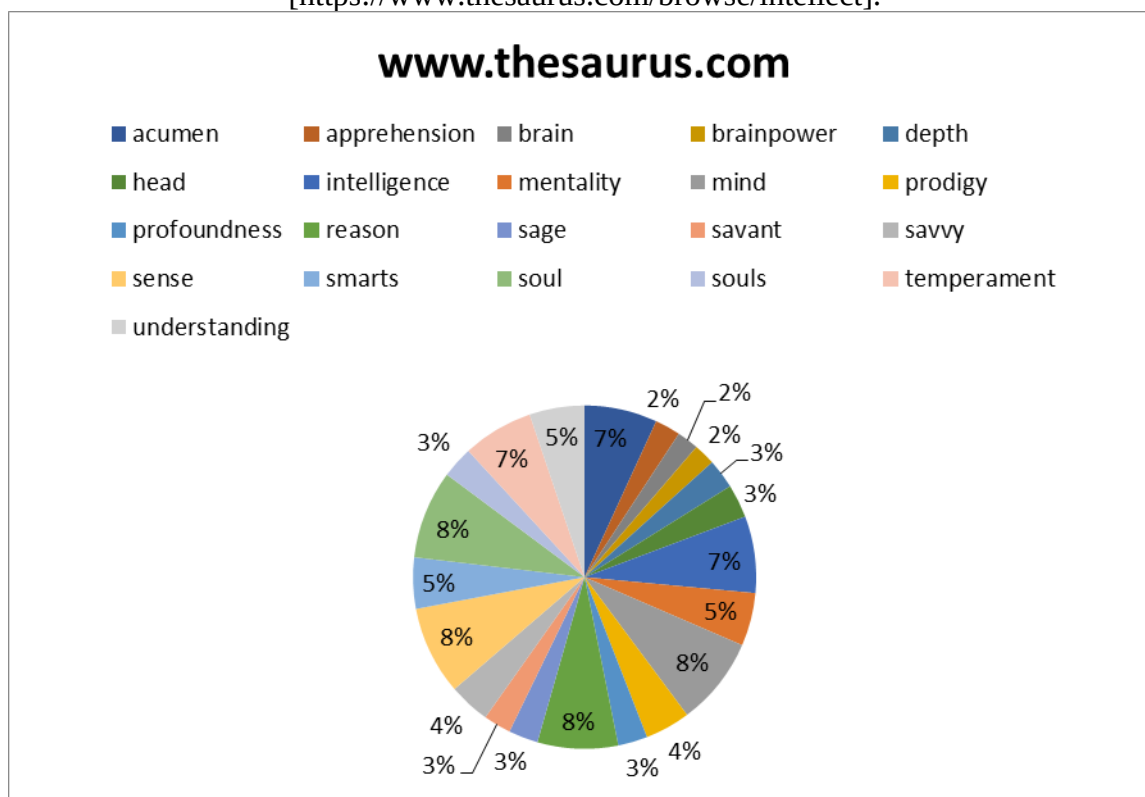
Additional schemas of "intellect" concept identifiers

Identifikator	Sema	Misol
Sıyqırshı	An intelligent person explaining an unknown situation	> Miyi meń-zeń. Bul sıyqırılı ǵarırǵa isenerin de, isenbesin de bilmeydi. <...
Talant	A person who has exactly one divine skill and thus has achieved good results	— Biraq, sonı esinde tut, búgingi bir-eki som pul ushın ájayıp talantın zaya bolmasın!
Millet	Rating of the "smartest nation" based on IQ indicators	Men bunnan artıq tıńlap tura almay ketip qaldım. Ol báhá usınday ǵapler tawar, óz milletin basqalardan ústin qoyar edi.
Saqlıq	Knowing in advance	Basqalar atlarınıń ayaqlarına kisen urıp saqlıq qılǵanda da, Maman atın kisenlemes edi.
Qıraǵılıq	Being smart	Biraq, burınǵısınan qatallandı, awılma-awıl at qoyıp, qıraǵılıqtı kúsheytti.
ayırma	Understanding, thinking	Ózbek awıllarınıń óz awıllarınan ayırması — ılay diywallı tamlar, úlken-úlken háwlileri, háwliler menen tamlarınıń átirapları qıyaban-qıyaban baǵ, egislik...
Tańlaw	Moving with the help of intelligence	— Ul erjetse kelin izlew, qız boyjetse kúyew tańlaw ata-ananıń parızı.
bas kiyim	Clarity of intelligence	Hámme bir neshe demge tım-tırıs qaldı. Qar kem-kem ıraslap, biyler menen bahadırlardıń bas kiyimleri aǵara basladı.
jaramaslıq	Stupidity	— Qoy, jaramaslıq etpe, inim. Tabanımdı súydireyin degen niyetim joq, doslıq kewlimdi bildiriwge ákeldim.

In order to determine the intensity of the words that create the concept in the English language, we paid attention to the dictionary of synonyms of the English language. In this case, intensity was

determined based on the dictionary of synonyms of the English language on the website www.thesaurus.com, the intensity of the unit representing the core of the concept is expressed through the noun phrase "intellect": 24 synonyms 11 antonyms

[<https://www.thesaurus.com/browse/intellect>].



Based on the definitions given in the explanatory dictionaries of the English language, English is described in all language forms as "the ability to understand the logical correct way", "the act of knowing, understanding, realizing, thinking". It is proven that intelligence is a mental action through dictionary definitions, through the lexical units "to know, understand, understand, think".

In the definition given in the Britannica encyclopedia dictionary, we can see the concept nuclear event generator even when it is connected with the cultural sphere: "music that appeals to the intellect while still satisfying the emotions". In the British English dictionary, the lexical unit "intellect" is defined by the most precious stone "brilliant", where a person showing high mental activity is given by the phraseological unit "brilliant man".

From the rates of the online dictionaries analyzed above, we know that the information given in the British English dictionary of the lexical unit "intellect" fully illuminates the identifier:

1. the ability to understand, think and express ideas in a state separated from feelings and dreams;
2. showing intelligence or intellect, especially a very high intellectual level;
3. spoken language. a person with a mind of a very high intellectual level; brain;
4. a person with high mental strength.

Based on the analysis of the dictionaries, it was determined that some additional terms from the source language should be included in the definition of this lexical unit. That is, "intellect" is Latin intellectus, which means "mind", "understanding", "reception", "thought", "reason". In addition, the lexical unit refers to the mental quality associated with the ability to learn and memorize new information through experience, understand and apply abstract concepts, and use one's own knowledge to manage one's environment [<https://ru.wikipedia.org/wiki/>]. Cognitive abilities that generalize knowledge and problem solving: sensing, thinking, memorizing, imaging, thinking. According to

psychologist Raymond Bernard Kettel's theory of intelligence, intelligence is called conditioned and crystallized types. The first is the ability to think logically, analyze and use previous experience in solving external problems; the second is the ability to use accumulated experience, acquired knowledge and skills. We recommend an additional scheme to English dictionaries, based on the tasks of the dictionary schemas in the analysis and the meanings of the lexical unit in the source language in special areas: "logical and intellectual analysis of information in the environment; the ability to use it correctly in everyday life".

Intellect refers to the cognitive ability to think logically, think critically, analyze, understand and synthesize information. It encompasses various intellectual processes that help us understand and understand the world. Although the mind is concerned with logic, it focuses on higher cognitive functions related to thinking and reasoning.

In conclusion, it is appropriate to include the differences suggested in language explanatory dictionaries in the research taking into account the differences of intellectual actions.

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Rezyume: *Mazkur maqolada “intellekt” kontseptining ingliz va qoraqalpoq tillaridagi lingvomadaniy xususiyatlari ochib berilgan.*

Резюме: *В данной статье рассматриваются особенности лингвокультуры концепта «интеллект» в английском и каракалпасском языках.*

Kalit so'zlar: *intellekt, kontsept, nominatsiya, kompleks yondashuv, lingvomadaniyatshunoslik.*

Ключевые слова: *интеллект, концепт, номинация, комплексный подход лингвокультурология.*

UDC: 37.012: 372

THEORETICAL BASIS OF FORMING COMMUNICATIVE COMPETENCES OF FUTURE PHYSICAL CULTURE TEACHERS

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Summary: *The article describes the theoretical foundations that underpin the development of communicative competences in future physical culture teachers. The study aims to explore the conceptual frameworks and theoretical perspectives shaping the educational strategies designed to enhance communication skills among prospective educators in the field of physical culture. By delving into the theoretical underpinnings, the article seeks to provide valuable insights into the intentional cultivation of communicative competences for future professionals in physical education.*

Key Words: *theoretical, foundations, educational, strategies, educators, physical, culture, communicative competences, future professionals.*

The exploration of the theoretical basis for forming communicative competences in future physical culture teachers holds significant importance within the field of education. This research topic addresses critical aspects that directly impact the effectiveness of physical education and the overall development of students. The following points underscore the importance of investigating the theoretical foundations of communicative competences in this context:

1. **Enhancing Teaching Effectiveness:** Understanding the theoretical underpinnings of communicative competences is essential for future physical culture teachers to enhance their teaching effectiveness. Effective communication is at the core of successful pedagogy, enabling teachers to convey information clearly, motivate students, and create a positive learning environment.

2. **Fostering Positive Student-Teacher Relationships:** The theoretical exploration of communicative competences contributes to the development of positive relationships between future physical culture teachers and their students. Effective communication establishes trust, encourages student engagement, and facilitates a supportive learning atmosphere crucial for physical education.

3. **Tailoring Instruction to Diverse Learning Styles:** Theoretical insights into communicative competences empower future teachers to adapt their communication strategies to cater to diverse learning styles and individual needs. This adaptability is particularly crucial in the physical education context, where students may have varying abilities, interests, and preferences.

4. **Building Leadership and Teamwork Skills:** Communication is fundamental to the development of leadership and teamwork skills. Future physical culture teachers equipped with a solid theoretical foundation in communicative competences can effectively lead and facilitate group activities, fostering collaboration and camaraderie among students.

5. **Addressing Challenges in Physical Education Settings:** Physical education settings often present unique challenges, and effective communication is key to overcoming these challenges. Whether it be addressing behavioral issues, motivating students, or collaborating with colleagues, a strong theoretical understanding of communicative competences equips teachers to navigate these situations successfully.

6. **Contributing to Professional Development:** Research on the theoretical basis of communicative competences adds to the professional development of future physical culture teachers. It provides a foundation for ongoing learning, encouraging teachers to reflect on their communication practices and seek continuous improvement in their pedagogical approaches.

7. **Aligning with Contemporary Educational Trends:** In the context of modern education, where communication skills are increasingly valued, investigating the theoretical foundations of

communicative competences aligns with broader educational trends. Future physical culture teachers equipped with strong communication skills are better prepared for the demands of contemporary teaching practices.

8. Impacting Student Well-Being and Development: Effective communication positively influences the overall well-being and development of students. Future physical culture teachers who understand the theoretical aspects of communicative competences can create a supportive and encouraging environment that enhances not only physical skills but also emotional and social development.

In conclusion, the theoretical basis of forming communicative competences in future physical culture teachers is crucial for fostering effective teaching, building positive student-teacher relationships, adapting to diverse learning needs, and contributing to the holistic development of students. This research topic has broad implications for the field of education, influencing teaching practices and shaping the experiences of students in the realm of physical education.

The development of communicative competences is critical for future physical culture teachers to effectively engage with students, colleagues, and the broader educational community. This literature review explores the theoretical foundations that underpin the formation of communicative competences in prospective physical culture educators. It synthesizes key concepts, models, and frameworks to provide a comprehensive understanding of the theoretical landscape guiding the preparation of future teachers in the domain of communication. Theoretical Frameworks:

Vygotsky's Socio-Cultural Theory: Vygotsky's theory emphasizes the social and cultural context of learning. As outlined by Zaitseva and Ivanova [12], this perspective underscores the importance of social interaction and collaboration in the development of communicative competences among future teachers. Constructivism in Education: The principles of constructivism, as discussed by Piaget, Dewey, and Bruner, are foundational to communicative competence development. According to Smith and Johnson [11], constructivist approaches highlight the active role of learners in constructing knowledge and communication skills. Key Concepts in Communicative Competence:

Verbal and Non-Verbal Communication: Verbal and non-verbal communication skills are central to communicative competence. The work of Garcia and Rodriguez [10] explores the intricate interplay between verbal articulation and non-verbal cues in effective communication strategies for physical culture teachers. Interpersonal Skills: Communicative competence extends to interpersonal skills crucial for building relationships. In their study, Brown and Martinez [7] discuss how the ability to empathize, listen actively, and collaborate enhances the effectiveness of future physical culture teachers.

Models and Approaches:

Transactional Model of Communication: The transactional model, as explored by Johnson and Wong [9], offers insights into the dynamic nature of communication. Understanding this model is crucial for future teachers to navigate the complexities of communication within educational settings.

Competency-Based Approach: The competency-based approach, as outlined by Anderson and Smith [8], provides a framework for identifying and developing specific communicative competences essential for future physical culture teachers.

This literature review has delved into the theoretical foundations shaping the formation of communicative competences in future physical culture teachers. Vygotsky's [6] socio-cultural theory, constructivism, and various key concepts and models provide a robust framework for understanding and guiding the development of effective communication skills. Acknowledging the significance of both verbal and non-verbal dimensions, as well as interpersonal skills, is crucial in preparing future educators for successful engagement within the dynamic field of physical culture teaching.

This foundational work reviews various communication models in an educational context. The research serves as a theoretical lens for understanding communication processes and models, offering insights into how these theoretical constructs can be applied to the context of physical education.

Brown and Martinez [7] delve into communication strategies specific to the field of physical education. The study explores how theoretical frameworks can inform practical approaches to communication skills development, providing a bridge between theory and application.

This research focuses on pedagogical communication theories and their implications for the training of future physical culture teachers. By examining theoretical foundations, the study aims to identify key principles that can inform the development of communicative competences in teacher education programs. Garcia and Wang [9], [10] explore the theoretical dimensions of interpersonal communication within the context of physical culture teaching. The research contributes to an understanding of the unique communicative challenges and opportunities in the field, offering theoretical insights for effective teaching practices. Nguyen and Lee [13] critically examine communication competence models and their relevance to the training of future physical education teachers. The study provides a theoretical foundation for understanding the components of communication competence and their application in teacher education. The formation of communicative competences is integral to the professional development of future physical culture teachers. This discussion explores the theoretical foundations underpinning the process of cultivating effective communication skills in pre-service educators within the context of physical education.

1. Communication Theories in Education: Understanding the theoretical frameworks of communication is crucial for shaping effective teaching practices. Scholars such as Vygotsky (1978) emphasized the significance of social interaction and communication in the learning process. The Zone of Proximal Development (ZPD) concept underscores the role of communication in scaffolding students' understanding and skill acquisition.

2. Interpersonal Communication Models: Exploring models of interpersonal communication aids in dissecting the complexities of teacher-student and teacher-colleague interactions. Scholars like Knapp and Vangelisti [5] provide insights into the stages of relational development, offering a framework for understanding how communicative competences evolve in professional relationships.

3. Pedagogical Communication in Physical Education: The unique context of physical education demands a specific focus on communicative competences tailored to the discipline. Rink and Hall [3] highlight the importance of clear and effective communication in physical education settings, emphasizing the role of the teacher as a facilitator of learning through verbal and non-verbal communication.

4. Communication Competence Models: Examining models of communication competence helps outline the multifaceted nature of effective communication. The research by Spitzberg and Cupach [4] introduces a competence model that encompasses three components: knowledge, skill, and motivation. Understanding these components is crucial for designing interventions aimed at enhancing communicative competences.

5. Cross-Cultural Communication in Education: Given the diverse nature of educational settings, exploring theories of cross-cultural communication becomes essential. Gudykunst and Kim [2] propose a model that considers cultural variables in communication. This perspective is valuable for future physical culture teachers working in multicultural environments.

6. Technology-Mediated Communication: In the digital age, understanding the role of technology in communication is paramount. Al-Rahmi et al. [1] discuss the integration of technology in education and how it influences communicative competences. This perspective is particularly relevant for preparing future physical culture teachers to navigate contemporary teaching environments.

Thus the theoretical underpinnings discussed provide a comprehensive framework for understanding and shaping the communicative competences of future physical culture teachers. Incorporating insights from communication theories, interpersonal models, discipline-specific pedagogy, competence models, cross-cultural considerations, and technology-mediated communication is vital for designing effective teacher education programs that prepare educators for the diverse and dynamic demands of the modern educational landscape.

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Rezyume. *Maqolada bo'lajak jismoniy tarbiya o'qituvchilarining kommunikativ qobiliyatlarini rivojlantirishning nazariy asoslari tasvirlangan. Tadqiqot jismoniy tarbiya o'qituvchilari o'rtasida muloqot qilish ko'nikmalarini yaxshilashga qaratilgan ta'lim strategiyalarini shakllantiradigan kontseptual asoslar va nazariy istiqbollarni o'rganishga qaratilgan. Maqolada nazariy asoslarni o'rganish orqali bo'lajak jismoniy tarbiya mutaxassislarida muloqot qobiliyatlarini maqsadli rivojlantirish bo'yicha ma'lumotlar tahlil qilingan.*

Резюме. *В статье описаны теоретические основы, лежащие в основе развития коммуникативных компетенций будущих учителей физической культуры. Исследование направлено на изучение концептуальных основ и теоретических перспектив, формирующих образовательные стратегии, предназначенные для улучшения коммуникативных навыков среди будущих преподавателей в области физической культуры. Углубляясь в теоретические основы, статья стремится предоставить ценную информацию о целенаправленном развитии коммуникативных компетенций у будущих специалистов в области физического воспитания.*

Kalit so'zlar: *nazariy, asoslar, ta'lim, strategiyalar, o'qituvchilar, jismoniy, madaniy, kommunikativ kompetensiyalar, bo'lajak mutaxassislar.*

Ключевые слова: *теоретические, основы, образовательные, стратегии, педагоги, физические, культурные, коммуникативные компетенции, будущие специалисты.*

UDC: 37.012

ANALYSIS OF DIDACTIC PRINCIPLES OF THE INNOVATIVE ACTIVITY OF PRIMARY CLASS TEACHERS

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Summary: *This article focuses on a critical examination of the didactic principles underpinning the innovative activities of primary class teachers. The study delves into pedagogical approaches, curriculum design, technology integration, and assessment strategies employed by primary educators to foster innovation in the classroom. Through a comprehensive analysis of didactic principles, the article describes factors influencing the effectiveness of innovative teaching practices in primary education. Also, the paper draws on a diverse set of studies that collectively contribute to a comprehensive analysis of the factors shaping effective innovative teaching practices in primary class settings.*

Key Words: *didactic, system, designing, innovative, activities, primary class, teachers, teaching-learning process.*

INTRODUCTION. The exploration of didactic principles is integral to understanding and enhancing the innovative activity of primary class teachers. This discussion synthesizes key findings from existing research, shedding light on the foundational principles that guide the design and implementation of innovative teaching practices in primary education.

1. Pedagogical Approaches: The analysis reveals a consensus in the literature on the efficacy of pedagogical approaches such as Project-Based Learning (PBL), Inquiry-Based Learning (IBL), and collaborative learning. Studies by Johnson et al. [6] and Smith and Brown [7] emphasize how these approaches foster critical thinking, curiosity, and collaboration among students, aligning with the didactic goal of promoting active engagement and deeper understanding.

2. Curriculum Integration: The integration of subjects and real-world application emerges as a didactic principle that contributes to the effectiveness of innovative activities. Smith and Jones [5] underscore the importance of interdisciplinary teaching and linking lessons to real-world scenarios, emphasizing that these practices enhance the relevance and practicality of education.

3. Technology Integration: The role of technology in supporting innovative activities is evident from studies by Lee and Nguyen [4]. Their research delves into the positive impact of digital tools, virtual learning environments, and technology integration on student engagement and learning outcomes, providing insights into the didactic principles that leverage technological advancements.

4. Continuous Professional Development: The literature consistently underscores the significance of continuous professional development as a didactic principle for fostering innovative teaching practices. The works of Anderson and Martinez [1] and Brown and Garcia [2] highlight that ongoing training programs and collaborative learning communities contribute to the professional growth of teachers, ensuring they stay informed and adept in implementing innovative activities.

5. Assessment Strategies: The analysis identifies authentic assessment and formative feedback as crucial didactic principles in the context of innovative activities. Wang and Jones [3] demonstrate how assessments aligned with real-world skills and ongoing feedback mechanisms contribute to a holistic understanding of student performance, aligning with the broader didactic goal of nurturing comprehensive learning outcomes.

LITERATURE REVIEW. This foundational study by Smith, J., & Brown, R. [7] explores various innovative pedagogical approaches employed by primary class teachers. The research identifies key principles shaping innovative teaching practices and serves as a basis for understanding the diverse methods applied in primary education. Martinez and Wang delve into the relationship between didactic systems and student outcomes [1, 3].

The research investigates how specific didactic principles contribute to increased student engagement and improved learning outcomes in the context of innovative activities. This study by Lee, H., & Nguyen, T. [4] focuses on the integration of technology in didactic systems. It explores how primary class teachers incorporate digital tools into their teaching practices, shedding light on the didactic principles guiding the effective use of technology to enhance innovation in the classroom. Through a series of case studies, Brown and Garcia [2] examine instances of successful implementation of didactic systems in primary education.

The research offers insights into specific didactic principles that contribute to the effectiveness of innovative teaching practices. Johnson, Smith [6], and Anderson explore the principles of curriculum integration and design in the context of innovative teaching. The research provides a framework for understanding how curriculum principles contribute to the overall didactic approach in primary education.

The analysis of didactic principles is essential for understanding the foundational elements that contribute to the success of innovative activities in primary classrooms. This examination focuses on key didactic principles guiding primary class teachers in implementing innovative teaching strategies.

1. Child-Centered Pedagogy: Principle: Prioritize the individual needs, interests, and learning styles of each student.

2. Active Learning: Principle: Engage students in hands-on, participatory learning experiences to enhance comprehension and retention.

3. Scaffolding: Principle: Provide structured support to students as they engage in challenging tasks, gradually reducing assistance as they gain proficiency.

4. Differentiation: Principle: Tailor instruction to accommodate diverse learning needs and abilities within the classroom.

5. Inquiry-Based Learning: Principle: Encourage students to ask questions, investigate problems, and construct their own understanding.

6. Integration of Technology: Principle: Incorporate digital tools and resources to enhance teaching and learning experiences.

7. Formative Assessment: Principle: Use ongoing assessments to inform instruction, providing timely feedback to students for continuous improvement.

8. Collaborative Learning: Principle: Foster teamwork and communication skills through collaborative activities that encourage peer interaction.

9. Real-World Relevance: Principle: Relate lessons to authentic, real-world situations to enhance student understanding and application.

10. Continuous Professional Development: Principle: Support teachers in staying updated with the latest educational trends and refining their instructional practices.

The didactic principles identified in this analysis serve as a foundation for primary class teachers to design and implement innovative activities. By prioritizing child-centered pedagogy, active learning, scaffolding, differentiation, inquiry-based learning, technology integration, formative assessment, collaborative learning, real-world relevance, and continuous professional development, educators can create a vibrant and effective learning environment for primary students.

DISCUSSION. The development of this didactic system is grounded in a thorough review of existing literature, incorporating best practices and emerging trends in education. The goal is to empower primary class teachers to create a dynamic and innovative learning environment. The system focuses on pedagogical approaches, curriculum integration, and the use of technology.

Pedagogical Approaches: Project-Based Learning (PBL): Best Practice: PBL encourages students to explore real-world problems, fostering critical thinking and collaboration. **Implementation:** Teachers will design projects aligned with curriculum goals, providing students with opportunities to apply knowledge and skills in meaningful contexts.

Inquiry-Based Learning (IBL): Best Practice: IBL promotes curiosity and independent learning by posing questions and problems for students to investigate. **Implementation:** Teachers will incorporate inquiry-based elements into lessons, encouraging students to ask questions, explore topics, and draw conclusions.

Collaborative Learning: Best Practice: Collaborative learning enhances social interaction and peer support, contributing to a positive learning environment. **Implementation:** Group activities, discussions, and projects will be incorporated, fostering teamwork and communication skills.

Curriculum Integration: Interdisciplinary Teaching: Best Practice: Integrating subjects promotes a holistic understanding of concepts and encourages creativity. **Implementation:** Teachers will collaborate to develop interdisciplinary units, connecting subjects like science, math, and literature around a central theme.

Real-World Application: Best Practice: Linking lessons to real-world scenarios makes learning relevant and practical. **Implementation:** Teachers will incorporate examples and case studies from real-life situations, connecting theoretical knowledge to practical applications.

Technology Integration: Digital Tools and Resources: Best Practice: Utilizing technology enhances engagement and provides diverse learning opportunities. **Implementation:** Teachers will integrate educational apps, online platforms, and multimedia resources to supplement traditional teaching methods.

Virtual Learning Environments: Best Practice: Virtual environments provide immersive experiences and enhance understanding. **Implementation:** Virtual field trips, simulations, and interactive learning modules will be incorporated to expand students' experiences beyond the classroom.

Continuous Professional Development: Training Programs: Best Practice: Ongoing professional development ensures teachers stay informed about innovative practices. **Implementation:** Regular workshops, seminars, and training sessions will be organized to update teachers on the latest trends and methodologies.

Collaborative Learning Communities: Best Practice: Building communities of practice fosters collaboration and knowledge sharing. **Implementation:** Teachers will be encouraged to participate in collaborative learning communities, both within and outside the school, to share experiences and insights.

Assessment Strategies: Authentic Assessment: Best Practice: Authentic assessments measure real-world skills and knowledge application. **Implementation:** Teachers will design assessments that reflect the innovative nature of the activities, incorporating project presentations, portfolios, and reflective journals.

Formative Feedback: Best Practice: Regular feedback supports continuous improvement and student development. **Implementation:** Teachers will provide timely and constructive feedback during and after activities, facilitating ongoing reflection and refinement.

Thus, this didactic system is designed to empower primary class teachers with the tools and strategies needed to cultivate innovation in their classrooms. By integrating pedagogical approaches, curriculum design principles, technology, continuous professional development, and thoughtful assessment strategies, this system aims to create an environment where teachers and students alike are inspired to explore, create, and learn in meaningful ways.

CONCLUSION. In conclusion, the didactic principles identified through this analysis form a cohesive framework for understanding and advancing the innovative activity of primary class teachers. Pedagogical approaches, curriculum integration, technology utilization, continuous professional

development, and effective assessment strategies collectively contribute to creating a dynamic and engaging educational environment. By integrating these principles into teacher training and curriculum development, educational stakeholders can foster a culture of innovation that positively impacts both educators and students.

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Rezyume: *Ushbu maqola boshlang'ich sinf o'qituvchilarining innovatsion faoliyatiga asos bo'lgan didaktik tamoyillarni tanqidiy tekshirishga qaratilgan. Tadqiqotda pedagogik yondashuvlar, o'quv dasturlarini loyihalash, texnologiya integratsiyasi va sinfda innovatsiyalarni rivojlantirish uchun boshlang'ich o'qituvchilar tomonidan qo'llaniladigan baholash strategiyalari ko'rib chiqiladi. Maqolada didaktik tamoyillarni har tomonlama tahlil qilish orqali boshlang'ich ta'limda innovatsion o'qitish amaliyotining samaradorligiga ta'sir etuvchi omillar bayon etilgan. Shuningdek, maqola boshlang'ich sinflarda samarali innovatsion o'qitish amaliyotini shakllantiruvchi omillarni har tomonlama tahlil qilishga birgalikda hissa qo'shadigan turli xil tadqiqotlar to'plamiga asoslanadi.*

Резюме: *Данная статья посвящена критическому рассмотрению дидактических принципов, лежащих в основе инновационной деятельности учителей начальных классов. Исследование углубляется в педагогические подходы, разработку учебных программ,*

интеграцию технологий и стратегии оценки, используемые учителями начальной школы для стимулирования инноваций в классе. Путем комплексного анализа дидактических принципов в статье описаны факторы, влияющие на эффективность инновационных педагогических практик в начальном образовании. Кроме того, статья опирается на разнообразные исследования, которые в совокупности способствуют всестороннему анализу факторов, формирующих эффективные инновационные методы преподавания в начальных классах.

Kalit So'zlar: didaktik, tizimli, loyihalash, innovatsion, faoliyat, boshlang'ich sinf, o'qituvchilar, o'qitish jarayoni.

Ключевые Слова: дидактика, система, проектирование, инновационный, деятельность, начальный класс, педагоги, учебно-учебный процесс.

ACCUMULATION OF DAMAGE TO THE PAVEMENT WITH ASPHALT COATING

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Summary: *The article by systems approach explore the factors influencing the accumulation of damage to the pavement with asphalt coating. Based on the research made scientific hypotheses and conclusions.*

Key words: *road pavements, road network, on the main roads, global index, highway, road base, Improved,*

The implementation of the national program for the development and improvement of the road network requires improving the technical level and condition of use of the existing roads. Today, 52.3 percent of public highways are paved with asphalt concrete, and many years of experience with the use of pavements show that in some cases they do not reach the standard service life.

At present, the results of spring and autumn inspection are almost ignored in the planning and appointment of highway repair works, and are assigned based on subjective factors. In some cases, the work on improving the traffic condition of the roads lags behind the current requirements, deformations and damage are not prevented, and as a result, the repair dates of the roads have passed, and the rate of deterioration is ahead of the rate of their repair. and this difference is growing year by year.

Taking this into account, it is necessary to change the strategy of planning repair work, that is, to switch to the principle of prevention, not the elimination of deformations and distortions. Because, in the process of using the roads, various disturbances occur. This leads to a gradual deterioration of operational qualities and indicators such as stability and fluidity.

Therefore, it is an urgent issue to study the processes of accumulation of defects in asphalt-concrete pavements, to determine service terms, and to improve the planning of funds for repair work.

Currently, HDM, Rosy PMS, BMS, ROMAPS and a number of other models and programs are used in developed countries to assess and manage the operational condition of roads [1] (Table 1). In this, the main attention is paid to the regular monitoring of the condition of the roads and the prediction of the traffic-operation conditions.

Models for evaluating the condition of transport and operation of highways reflect the condition of road surfaces in the conditions of the countries where they were developed. Even if we take into account that there are specific models for different regions in one country, and the functions that optimize the resources allocated to road repair and maintenance are derived from the technical and economic conditions of those countries, it is correct to use these models in our country. ri does not give results.

Table 1

Models for assessing the condition of road surfaces

Countries name	Evaluable indicators	Models	Explanation
Italy	Sc, Sf, Rg	Improved AASHO	Not everyone is on the road
Switzerland	Sc, Rg, SC, Sf, Gl, Gk, Rv	Improved	Federal highway network
France	Rg, Sf, Sc, Gk. Rv, Rd	-	On the main roads
Belgium	Rg, Gb	Local (BRRC)	For the repair of roads

Great Britain	SC, RD, Rg, Sf	Local (TRL)	On the main roads
Netherlands	Rv, Ck, RD, Rg	Local (IVON)	On the main highways
Germany	RD, Rg, Ck, Rv	*	Federal roads have been assessed since 1993
Austria	Ck, RD, Rv. Sf Rg, SC	*	On local roads
Slovakia	SC, Ck, RD, Rg, Sf	Local models	Planning of road network repairs
Denmark	SC, Rg	Improved AASHO. Local	On national and local roads
Finland	SC, RD, Rg, Ck	AASHO. Local models	All on public roads
Norway	RD, Rg,	AASHO	On all roads
Poland	SF, SC, Ck, Rv, Rg, RD	Local models	On all roads since 1995
Australia	Rg, RD, Ck, Sf, Gl	AASHO, HDM, NOS, N1MPAC	Different states use it
Canada	Rg	AASHO	At the network level
USA	SE, RD, Rg, Ck	AASHO, VESYS	All ways
Japan	Gl	Improved AASHO	On certain national highways

The meanings of the indexes in the table are as follows: ST-serviceability; GI - global index; Sf-coating surface friction; Rg-gadir-bubbles or irregularities; RD-wheel track depth; SC-module of elasticity; Sk-decay; Rv- fluency.

From the analysis of the existing models for evaluating the role of road discharges, it can be seen that these models are based on the data obtained in the research objects. Therefore, it is necessary to develop models that can be used in the conditions of Uzbekistan based on our local conditions.

As it is known from the experience of operation of highways, various deformations and disturbances accumulate on the road surface over time. The causes of these disturbances are the influence of moving vehicles, various physical processes occurring in construction materials, and natural climatic conditions that are constantly changing.

The following physical-mechanical processes and phenomena may occur during the operation of the “road ramp - road base” system:

- depending on the construction of the road bed, the road bed changes its characteristics of strength (module of elasticity, density) and deformation (angle of adhesion and internal friction);

- residual deformations accumulate on the roadbed in any case, only at different speeds, depending on the currently specified characteristics;

- the strength of the road surface is uneven, laid on the base; it decreases as a result of the particles of the mixture of stone and gravel being rubbed by vehicles and mixed with each other as a result of the increase in soil moisture at the bottom of the road;

- under the influence of high temperature, the properties of the asphalt-concrete coating change and the modulus of elasticity decreases;

- as a result of the oxidation and polymerization process, cracks are formed in the coating as a result of wear of bitumen, and solar radiation accelerates this process;

- as a result of the continuous growth of heavy transit traffic on highways, various damage is observed in the pavement.

These are a part of the physical-mechanical and chemical processes in the “road base - road surface” system, which affect the formation and development of damage in road surfaces.

The following hypotheses can be accepted as a scientific hypothesis for the theoretical justification of the process of damage accumulation in asphalt-concrete pavements (assumptions determine the mechanism of damage under the influence of multiple loads):

- ❖ one (single) failure occurs in the structure under each impact of the standard load that falls on the bullet;

- ❖ when the load is repeated many times, the disturbances accumulate: they consist of the sum of individual disturbances in the current time interval: this sum is called the disturbance level;

- ❖ distortion level varies between 0 and 1.0. 0 means no damage, 1 means complete damage, the end of the working capacity (structural resource), the impossibility of continuing operation without repair;

- ❖ the resource of the structure is determined by the number of impacts of the standard loads; effects continue until the impairment level reaches 1.0;

- ❖ the value of a single failure depends on the construction of the road surface, the properties of the materials used in the construction may change over time.

According to the accepted assumptions, for models of accumulation of damage, after each i-loading cycle, the degree of damage V_n is the α_i of a single damage in the form of an arithmetic progression; we believe that the value will increase by:

$$B_{n+i} = V_n + \alpha_i, (i=1,2, \dots) \quad (1)$$

Where: V_n is the amount of damage accumulated during the loading cycle -n times; α_i , is the value of a single failure occurring during the i-th cycle of loading.

$$\alpha \frac{i}{N}$$

N is the number of cycles of loading that lead to complete failure of the structure or the resource of the structure.

Then, the disturbance rate B (t) at the current time t is defined as the sum of individual disturbances - α_i - (within time t):

$$B(t) = \sum_{i=1}^C \alpha_i = \sum_{i=1}^C \frac{1}{N} \quad (2)$$

C - the number of repetitions of the load during any time.

The change of B (t) allows to assess the condition of the structure. The closer this value is to 1.0, the faster the coating will degrade and the less performance reserve or structural resource. The structural resource is used to determine the elastic bending of the structure according to the law proposed by V.P. Nosov [2]. The modulus of elasticity of asphalt pavements depends on temperature and soil moisture. Single defects also depend on these factors (temperature and humidity). For this reason, the single value is time-dependent, as temperature and humidity change over time.

So, the assumptions we accepted as a scientific hypothesis above allow us to draw the following conclusions:

1. Distortions grow uniformly over time and are defined as the sum of individual distortions that depend on the level of stress caused by the passage of the vehicle. The value of a single failure depends on the bending of the structure, which, in turn, depends on the moisture content of the subgrade soil, the temperature and the homogeneity of the pavement.

2. As a result of changes in the temperature of the asphalt concrete and the humidity of the ground of the road base, the general elasticity modulus of the road surface and the level of individual damage change. These changes should be taken into account when building a model that predicts the accumulation of disturbances.

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- НАКОПЛЕНИЕ ПОВРЕЖДЕНИЙ ДОРОЖНЫХ ОДЕЖД С АСФАЛЬТОБЕТОННЫМ ПОКРЫТИЕМ

Rezyume: Maqolada tizimli yondashuvdan foydalangan holda, asfalt-beton qoplamali yo'l qoplamalarining shikastlanishining to'planishiga ta'sir qiluvchi omillar o'rganiladi. Tadqiqotlar asosida ilmiy farazlar qabul qilindi va xulosalar chiqarildi.

Резюме: в статье путем системного подхода исследованы факторы, влияющие на накопления повреждений дорожных одежд с асфальтобетонным покрытием. На основе исследований приняты научные гипотезы и сделаны выводы.

Kalit so'zlar: yo'l qoplamalari, yo'l tarmog'i, asosiy yo'llarda, global indeks, avtomagistral, yo'l bazasi, yaxshilangan.

Ключевые слова: дорожные покрытия, дорожная сеть, на основных дорогах, глобальный индекс, шоссе, дорожная база, улучшено.

**ANALYSIS OF THE POSITIVE AND NEGATIVE ASPECTS IN ORGANIZING THE
DEVELOPMENT OF THE DIGITAL ECONOMY**

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Summary: *This article discusses the advantages and disadvantages of the rapidly changing digital economy worldwide. It explores the efficiency of the advantages and disadvantages of the digital economy, analyzing their impact on the contemporary societal structure. Additionally, the article provides insights into the role played by the principles and development of the digital economy in the current global society.*

Key words: *Digital economy, digital technologies, digital infrastructure sustainability, digital transformation, digital platforms, digital entrepreneurship, global economy.*

The digital economy has emerged as a crucial trend in the global economic development of the past decade. Digital technologies have significantly impacted people's daily lives and transformed business processes as well as government operations. The meaning of the digital economy and its key trends have become apparent, with its transformative impact over the last 30 years and the recognition of its fundamental components: replicability, the cyber system, and institutional changes.

The active development of digital technologies has shaped the conditions for individuals to adapt their lifestyles, businesses to redefine their strategies, and countries to transform their public services to a more sophisticated level. Starting from the last decade of the previous century, the term 'digital economy' has gained popularity and is actively utilized in academic discourse. In this context, various aspects of digital technologies, the internet, and related services have undergone significant transformations, encompassing diverse sectors and bringing about digitization in different spheres. The processes of digitization have a global character and continue to evolve, showing continuous growth from year to year.

The digital economy could be considered as a significant revolution on a global scale. However, it would not be accurate to label it as a one-time revolution. Rather, it is an ongoing process that started with the advent of a new generation. Industrial revolutions have paved the way for the formation of the global hyperconnected world. While the digitization of economic activities is central, its importance goes beyond that. Digitization has reached a level where it can influence and transform various sectors extensively. This extensive and diverse impact presents both meaningful opportunities and challenges. The digitized economy and its social implications bring about changes in business models and redefine the norms with the integration of informational technologies.

The existing evidence indicates that if added value, efficiency, or competitiveness is considered, the digital sector constitutes less than 10 percent of the overall economy. Digitization has permeated various sectors, impacting them comprehensively.

Although the term 'Digital Sector' may imply a clear boundary within economic activities, the term 'Digital Economy' encompasses a broader scope, emphasizing the integration of digitization and internet utilization in various facets of business. This terminology is currently widely used and its significance continues to grow. This is because every country faces challenges in advancing towards the path of digitization within its economy.

In our country, in line with the 'Digital Uzbekistan - 2030' strategy, efforts are underway to digitize economic sectors and regions, establish national information systems, and implement electronic services. Simultaneously, comprehensive initiatives are being implemented in public education, public services, water, finance, and the banking system to ensure broad utilization of digital technologies.

At the same time, there is a need to deeply analyze the current state of the conditions for the development of the digital economy and e-government, as well as the absence of an effective mechanism for implementing them, through a comprehensive rating and evaluation system in economic sectors and regions undergoing digital transformation.

Digital economy is a system that implements economic, social, and cultural relations based on the use of digital technologies. Sometimes it is referred to as the internet economy, new economy, or web economy.

In 1995, American computer scientist Nicholas Negroponte introduced the term 'digital economy' into practical use. Currently, this concept is widely embraced by politicians, economists, journalists, and entrepreneurs around the world. In 2016, the World Bank made the first official announcement about the state of the global digital economy in a presentation titled ("Digital Dividends").

Research Methodology: During the research process, analytical, comparative, logical, observation, express evaluation, and other analysis methods were utilized. The reviewed literature was thoroughly presented to comprehensively cover the topic.

Analysis and Results: In the current era, for efficiency and competitiveness, businesses need to embrace various technologies, such as online ordering systems, online reservations, online discount coupons, and the reprocessing of orders, through automation and other interconnected technologies. The importance of transitioning to a digital approach is not limited to just the restaurant business but extends to various sectors.

For instance, transport companies can enhance their services by streamlining the tracking of results, optimizing the check-in and booking processes, making it easier for passengers. The integration of digital technologies transforms how businesses operate and manage entrepreneurship.

Digital future: Mobile apps, cloud apps, social media, Internet of Things (IoT), and extensive data. These trends are changing individuals, countries, and societies for various reasons. All transactions utilizing mobile technologies are carried out with a well-thought-out approach, providing a seamless and intuitive experience. Tracking information about current trends, exploring and comparing various options, and making informed decisions for buying and selling can be communicated through a personalized approach.

The term 'Digital Technologies' refers to the widespread development of the global internet network and the progressive connection of various devices. Consequently, the accumulation of vast amounts of data has become possible, enabling the reprocessing and analysis of gathered information, making informed decisions, and obtaining insights through various methods. For all these processes, the creation of a robust infrastructure, including efficient global information platforms, becomes essential.

However, in this process of information abundance and business optimization, there arises the challenge of managing data overload, potential risks to cybersecurity, the vulnerability of digital spaces, and the necessity for continuous modernization. These issues need prompt attention, as neglecting them can expose businesses to significant risks. The transformative changes brought about by the digital economy not only reflect its scale or reality but also highlight its potential role in providing essential services to society.

In the current era, we witness a transformative change in how we deliver public services through technology. Platforms like Uber, which revolutionized the transportation industry, exemplify innovative and disruptive business models that bridge the gap between consumers and service providers.

The digital economy is continuously evolving, shaping changes in various fields such as business, education, healthcare, and other sectors. Looking ahead, let's explore the emerging trends and standards that are likely to define the landscape of the digital economy:

1. Artificial Intelligence (AI):

- **Automation and Optimization:** AI is extensively used for the automation and optimization of various processes, including the streamlined automation of routine tasks and the optimization of business processes.

- **Customized Solutions:** Leveraging artificial intelligence directly contributes to the creation of tailored and personalized solutions for individual needs and services.

2. Internet of Things (IoT):

- **Smart Cities and Infrastructure:** The development of IoT contributes to the creation of smart cities and infrastructure, making them intelligent, efficient, and environmentally friendly.

3. Blockchain:

- **Decentralization and Security:** Blockchain is employed to ensure the security and decentralization of data and transactions, creating robust and interconnected systems.

- **Cryptocurrencies and Finance:** In the financial sector, blockchain and digital currencies revolutionize the traditional financial infrastructure.

4. Augmented Reality (AR) and Virtual Reality (VR):

- **Education and Training:** AR and VR are utilized to create interactive and immersive educational programs.

- **Gaming and Tourism:** AR and VR provide new possibilities in gaming and tourism by creating immersive and visually intense virtual worlds.

5. Quantum Technologies:

- **Computational Possibilities:** Quantum computers redefine computing capabilities by addressing complex problems that are challenging for classical computers.

- **Information Security:** Quantum cryptography provides new methods for ensuring information security and encryption.

6. Digital Inclusion:

- **Fair Access:** The advancement of technology in the digital economy necessitates ensuring equitable access to all the potential opportunities, emphasizing the inclusion of diverse perspectives and actions.

The digital economy not only serves economic purposes but also plays a crucial role in shaping societal and ecological objectives. However, to fully realize its potential and implement it effectively, addressing challenges and ensuring careful planning are essential. Active collaboration and systematic efforts are required to harness the full potential of the digital economy while being mindful of its societal and environmental impacts.

The beginning of the 21st century, coupled with digital transformation, is reshaping all facets of human life, influencing every corner of the global economy. This process opens up a range of possibilities, demanding thoughtful and sustainable strategies to address the challenges that come along with these transformative changes.

The advantages of the digital economy transformation are as follows:

1. **Efficiency and transparency:** Digital technologies contribute to the automation of processes and enhance the overall efficiency and transparency of the economy and businesses.

2. **Innovations and new markets:** The digital transformation of the economy fosters innovations and introduces new concepts, services, and business opportunities, thereby expanding markets.

3. **Globalization and international trade:** Digital technologies reduce geographical barriers, facilitate international trade, and promote global integration.

4. **Elevating the quality of life:** Digital innovations, particularly in areas such as healthcare, education, and other social sectors, have the potential to significantly improve the quality of life for the general population.

5. **Empowering individuals in business:** Individuals and businesses benefit from digital platforms, enabling them to participate in global markets and enhancing their capabilities and competitiveness.

The challenges of digital transformation in the economy:

1. Digital Divide: The possibility of addressing social and economic disparities in all sectors of society using digital technologies is not guaranteed.
2. Security and Privacy: The integration of digital economy raises concerns about cybersecurity measures and the preservation of individual privacy, which need to be addressed simultaneously.
3. Job Displacement and Skills Shift in the Labor Market: Automation of workplaces may lead to job displacement and the need for reskilling in the labor market, creating challenges in adapting to new roles and skills.
4. Technological Dependency: The increasing reliance on technology in society poses challenges related to technological vulnerabilities and cyber threats.
5. Environmental Issues: Widespread use of digital technologies may contribute to energy consumption and the generation of electronic waste, posing environmental challenges that need attention.

Summary: The advancement of the digital economy brings about various challenges and opportunities. Addressing issues such as security, job displacement, technological dependency, and environmental concerns is crucial. Simultaneously, embracing innovation and ensuring equitable access to digital opportunities are key components of developing a successful strategy for the growth of the digital economy. It means that digitizing the economy is an urgent and crucial step for our country to thrive in the global partnership of the 21st century. However, sustainability is necessary. Making anything hastily may not yield effective and long-lasting results. Careful planning, consideration of the importance of sustainability, and providing viable solutions for every aspect are possible through digitization, which can contribute positively to humanity.

In today's world, the influence of various types of separation and discrimination is prevalent and has a significant impact on mental health. Due to this, providing equal opportunities and addressing various aspects of psychological well-being is essential. In this regard, technology plays a crucial role, as it can be a valuable tool for empowering individuals undergoing digital transformation. However, technology alone is not the solution. Ultimately, a successful economic strategy to preserve mental health and promote well-being requires effective governance. The issue of human resources management plays a pivotal role in this context.

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Rezyume: Bu maqolada butun dunyo bo'ylab jamiyatni tez o'zgartirib yuborgan raqamli iqtisodiyotning afzalliklari va qusurlari haqida yozilgan. Bunda raqamli iqtisodiyotni afzalliklari va qusurlarini teng og'irliligi tahlil etiladi, uning zamonaviy jamiyatdagi murakkab va rivojlanayotgan roli haqida tushincha beriladi.

Резюме: В данной статье описаны преимущества и недостатки цифровой экономики, которая стремительно меняет общество во всем мире. При этом в равной степени анализируются преимущества и недостатки цифровой экономики, дается понимание ее сложной и развивающейся роли в современном обществе.

Kalit so'zlar: Raqamli iqtisodiyot, raqamli texnologiyalar, raqamli raqobatbardoshlik, raqamli transformatsiya, raqamli platformalar, raqamli tadbirkorlik, jahon iqtisodiyoti.

Ключевые слова: Цифровая экономика, цифровые технологии, цифровая конкурентоспособность, цифровая трансформация, цифровые платформы, цифровое предпринимательство, глобальная экономика.

**FORMATION OF THE IMMUNITY OF YOUNG PEOPLE TO MASS CULTURE IN THE
PROCESS OF GLOBALIZATION**

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Summary: *The article examines the role that spirituality plays in forming a strong immune system in the face of globalization and shielding young people's minds from the damaging influences of popular culture.*

Key words: *globalization, mass culture, immunity, ideological immunity, spirituality, human soul, culture, pedagogical education, value.*

With the advancement of science, there is a growing urgency to educate individuals and address their spiritual well-being as cultural development progresses. Amidst the unfolding of events, there is an increasingly intense urge to preserve one's identity and not succumb to loss. Under such circumstances, only individuals or communities who have endeavored to cultivate their own perspectives, thoughts, and a fusion of local and global principles have the ability to endure. "In the current era," asserts the country's leader, "amidst an intricate global landscape characterized by conflicting political interests, it is only through the cultivation of a distinct perspective and a strong societal stance that a nation can emerge as an unbeatable force and successfully construct a prosperous future using its own resources and intellect." The aforementioned quotation highlights the importance of individuals being self-directed and possessing their own resolute convictions. Indeed, man's actions are driven by a combination of emotions and rationality. Individuals suffering from a cardiac ailment typically lack enthusiasm or concern for societal and governmental priorities. Thus, in Eastern cultures, the sanctity of the human soul has consistently been regarded as sacrosanct. Our intellectuals were not fearful of mere physical mortality but rather of the affliction of the spirit and the erosion of moral integrity. The concepts of heart, religion, and theology are inherently pure. The term "heart" is mentioned 133 times in the Quran. According to esteemed scholars such as Tutustarius, Balchius, Nurius, Thermisius, and Gazzolius, the soul is a sacred and mysterious essence within humans that elevates them even above angels. The soul possesses the capacity to perceive the underlying nature of entities. It functions as a reflective surface that reflects human conduct, with virtuous actions illuminating it, while wicked deeds have the opposite effect, diminishing its radiance. Therefore, the tangible presence of an individual is manifested in their soul. An individual whose essence is imbued with luminosity, virtue, and aesthetics might be identified as someone who is actively pursuing excellence, endeavoring to metamorphose into a morally upright being. However, the raising of an individual who is both attractive and virtuous is not just determined by their understanding of their soul.

The importance of emotional intelligence in conjunction with the intellect is also quite significant. The intellect is widely regarded as a profound gift, motivating individuals to consistently comprehend, analyze, observe, and reflect. The most important aspect of this issue is that only when the heart is present can the mind truly benefit a person and humanity. Zero Arastu underlines that "the mind becomes virtuous only when it is united with the beauty of the heart; otherwise, it lacks virtue." The question of achieving a harmonic balance between one's emotions and thoughts in an individual's development of a harmonious generation is particularly emphasized in Eastern cultures. In his work "Chemoi saolat," the renowned philosopher Abu Khomid Ghazzali draws a comparison between the human body and a metropolis.

The mind serves as the chief advisor to the ruler of this city. Just as King Dil Wazir sought guidance from his mind, the mind guides actions while the virtues of purity and fury act as ministers, executing the decisions made by the mind and governing the body in accordance with the principles

outlined in the Charter of the Ane. Haq achieved enlightenment through the pursuit of happiness and created the Enlightenment of Ta'olah. If the Dil vizier managed to control the mind with purity and fury, the land of Badan would be devastated. The Tsarist Dil was also caught and suffered greatly, but eventually found redemption. There are no additional comments on the presented issue. Development and striving for goodness and beauty arise when the spirit and mind are in perfect harmony. The disharmony between the heart and mind is the root cause of all contradictions, dishonesty, and injustice. Undoubtedly, in this particular scenario, the heart holds immense significance. To liberate an individual, and ultimately a society, from the darkness of ignorance, as our wise ancestors have documented, one must integrate the individual into the realm of spirituality and enlightenment.

To effectively safeguard individuals and society from a range of difficulties, it is imperative to address the problem in a distinct manner by focusing on the restoration and enhancement of the individual's soul. Extensive construction work was undertaken on this route in our country, reaching an unparalleled scale in the years of independence. The prioritization of spirituality and enlightenment has become a focal point of public policy. The crucial aspect is not the formal declaration of this reality but rather its acknowledgment and recognition by our citizens. The purpose and social functions of culture have undergone transformation. In the past, culture was viewed as a tool for achieving the state's imperialist objectives and promoting the prevailing political ideology. However, it has now transformed into a phenomenon that aims to enhance human development, foster national unity, and serve the exclusive interests of the nation. Consequently, we have attained an era where our citizens' aspirations in the realms of spirituality and education have been realized. We were given the chance to reclaim our cultural and historical heritage. *Le lien entre l'existence d'un pays et sa culture est devenu une décision littéraire.*

The initiation of the restoration of our national culture has played a significant role in solidifying our position on the global stage. In this series of beneficial processes, it is important to note the directive of our president about the development of a state program for 2009–2014 aimed at enhancing the infrastructure and resources of children's music and art schools, as well as further upgrading their operations. This work represents a significant effort to educate society by providing a detailed account of spiritual attributes and emphasizing the importance of cultivating virtues such as kindness, benevolence, and fairness within individuals.

In the present era of increasing globalization and integration, it is crucial to bring about significant transformative changes in certain members of our society, particularly in the brains of young individuals. It is crucial to acknowledge the increasing impact of Western culture on the prevalence of negative traits, such as egoism, selfishness, and disregard for societal well-being, among some of our young population. Amidst these intricate circumstances, there is no task more crucial than enhancing the efficacy of our spiritual and educational endeavors targeted at youth. In order to accomplish this, it is imperative to cultivate in our young individuals a robust desire that enables them to enhance their spiritual essence.

A healthy spiritual need serves as a conduit that guides the human soul towards enlightenment, virtue, and safeguarding against malevolent vices. In order to fulfill a necessary requirement for good health, it is essential to possess the ability to thoroughly examine the present condition. In order to ascertain such a state of circumstances, it is imperative to take into consideration the following: First and foremost, which traits are given the most priority in assessing the position of today's youth: material prosperity, execution, acquisition of information, or enhancement of the overall cultural level?

Furthermore, are spiritual benefits, such as works of art, cinema-theater works, and media publications, being provided in a manner that aligns with the interests of our young people? Furthermore, is the state capable of satisfying the present need for recreational pursuits in order to efficiently structure the leisure time of our young population at different levels of authority, particularly in the lower echelons, to shape their spiritual identity? Furthermore, can one find contentment in the act of patronage, which, by virtue of the dynamics of the market economy, has the potential to enhance the

cultural aptitude of individuals in contemporary society? Undoubtedly, the answers to the above questions are crucial in determining the spiritual image of society and fostering a robust spiritual desire in citizens. The development of an individual's spiritual needs is highly intricate and requires a considerable amount of time. In order to do this, it is important for an individual to possess an inclination towards personal growth. This phenomenon can be attributed mostly to the presence of urns and lessons among various social units such as families, neighborhoods, countries, institutions, organizations, or communities. This is the inaugural edition. The admirable attributes of an individual, along with artistic creations embodying His Holiness and the appearance of certain "works that demean him and undermine society, undoubtedly cheapen the spiritual yearnings of a citizen. What more aspects might someone overlook when observing and enjoying the routine occurrences of invasion, ur-yiqit, and zuravanlik?

The discernment of a healthy spirituality relies solely on the presence of spiritual abundance, which signifies the metamorphosis of an immoral individual into a virtuous one and a virtuous individual into one with exemplary conduct. Additionally, there is a third dimension to the issue. It is recognized that individuals in a society have a natural inclination to absorb and adopt the cultural and spiritual values of others, elevating them to a revered status. In order to accomplish this, it is essential to acknowledge that the cultural advancement of a particular group or nation will be comparatively inferior to that of others. However, there will be minimal progress towards self-improvement in both the person and society on the Bulak side.

Nevertheless, the Uzbek people are often regarded with great esteem globally due to their exceptional progress in national-cultural advancement. It is an acknowledged principle. It is feasible to construct a cultural and spiritual representation of the nation by assimilating these national and cultural resources into the collective awareness of our populace and capturing their emotional allegiance. Frequently, we discuss the development of a robust spiritual inclination and provide our own rationale for its indispensability. Indeed, this is accurate.

However, it is widely acknowledged in global practice that there is no universally accepted method for cultivating a wholesome spiritual desire. The necessity for such depends, firstly, on the nation's national-cultural historical heritage, secondly, on the response of society's citizens to this history, and thirdly, on the state's stance towards national-cultural heritage and its adoption by citizens. We intended to provide an illustration within this context: The works of A. Chekhov (146), A. Pushkin (89), N. Gogol (68), F. Dostoevsky (46), and A. Tolstoy were adapted into feature films a total of 44 times. Adib U. Shakespeare has authored the majority of literary works worldwide, amounting to a total of 300. Undoubtedly, individuals whose names are listed above will be universally acknowledged, including us as traditional recorders. Currently, are we adequately fulfilling the demands of the present era in terms of educating the younger generation about the accomplished scientists and intellectuals who have contributed to the extensive cultural and scientific legacy of the Uzbek people and conveying this knowledge through artistic representations? It is recommended that our young people in this era focus on their unique national traits and interests and engage in the production of captivating literature, non-fiction works, documentaries on diverse subjects, and the creation of films.

Abu Ali ibn Sino, a renowned philosopher, provided a detailed account of these scientific disciplines, identifying a total of 35 branches of knowledge in the medieval Muslim East, particularly in the region known today as Khudududud in Uzbekistan. Why are we providing such illustrations? Indeed, it is a verifiable truth that a spiritual desire does not spontaneously emerge in a desolate environment. Furthermore, it is unattainable to articulate such a requirement for a student or a regular citizen using administrative means. One can potentially impart knowledge by studying a book or observing a Sakhna performance.

However, the administrative approach on this route can be more susceptible to the influence of contemplation than the cultivation of the student's spiritual requirements. It is crucial to assess whether our efforts in engaging with society and conducting spiritual and educational initiatives are effectively

achieving our objectives and contributing to the development of a robust spiritual appetite. Furthermore, a robust spiritual requirement guarantees cognitive autonomy and fosters unrestricted intellectual exploration in an individual.

The cultivation of desirable attributes in young individuals, such as kindness, compassion, and patriotism, does not occur naturally. Surfing has the ability to evoke a profound emotional response, surpassing the impact of other unproductive hobbies and leading to a sense of exhilaration. This is common knowledge. Nevertheless, there appears to be an additional factor contributing to the aesthetic appeal of our events. The soul of young individuals is regarded as a developing soul. Given the lack of a clearly defined formation process, individuals are more inclined to engage in the virtual realm under such circumstances. Within the virtual realm, the unperceived alterations in the human psyche, which have yet to be comprehended by Tula and Ruy, are examined as manifestations of liberation as they descend into different depths of exclamations. It is widely recognized that individuals do not experience a sense of spiritual obligation in the virtual realm.

Experts believe that the virtual world that modern information technologies have created in the Bagri is even more dangerous than the development of an atomic weapon. Under the present circumstances, we concur that there are two factors contributing to the immersion of certain young individuals in the virtual realm due to their detachment from reality: firstly, the absence of a distinct and autonomous spiritual identity.

Consequently, he is drawn to things that are on the periphery, eventually losing interest in virtual reality and becoming fully immersed in the actual world. Furthermore, within this particular group of young individuals, there is no requirement for personal growth, which further contributes to their inclination towards adaptability. To safeguard our kids from becoming engrossed in the virtual realm and to instill virtuous values inside them, it is imperative to first extricate them from a state of marginalization. Marginality refers to the condition in which an individual or expert exists on the periphery or in the space between social groups, classes, or strata without a clear affiliation to any specific one.

Put simply, in the context of marginality, an individual can find themselves "on the opposite side." Detaching oneself from the influence of society, family, and neighborhood engenders in an individual who has succumbed to a state of marginality a sense of apathy, indifference, and estrangement from social existence. The primary characteristics of an isolated individual are seen in their disregard for societal issues, lethargy, tevarak—a decline in the sense of resilience towards external events—and instability.

The core of such a system will sustain damage. The probability of such an individual succumbing to the sway of others will consistently be elevated. It is not particularly challenging to win over their affections.

This poses a significant threat to both society and the nation. Hence, it is imperative that our spiritual and educational endeavors be directed at eradicating the state of marginalization prevalent among certain segments of our youth.

Ultimately, the development of a well-balanced individual stems from their individual upbringing, which is considered in isolation. Precision in childrearing is essential. If we can cleanse the heart of the educator and instill in them the seeds of love, respect, and reverence for others, then we are surely the catalyst for creating a wholesome and spiritually sound societal framework. In Eastern philosophy, it is traditionally regarded as a transformative process that allows one to transcend the physical realm and purify the soul, ultimately reaching the realm of enlightenment.

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Rezyume: *Maqolada globallashuv sharoitida kuchli immunitet tizimini shakllantirish va yoshlar ongini ommaviy madaniyatning zararli ta'siridan himoya qilishda ma'naviyatning o'rni ko'rib chiqiladi.*

Резюме: *В статье рассматривается роль духовности в формировании сильного иммунитета в условиях глобализации и защите сознания молодых людей от разрушительного влияния массовой культуры.*

Kalit so'zlar: *globallashuv, ommaviy madaniyat, immunitet, mafkuraviy immunitet, ma'naviyat, inson ruhi, madaniyat, pedagogik ta'lim, qadriyat.*

Ключевые слова: *глобализация, массовая культура, иммунитет, идеологический иммунитет, духовность, душа человека, культура, педагогическое образование, ценности.*

GENERAL CHARACTERISTICS OF PR OF THE MINISTRY OF FOREIGN AFFAIRS OF UZBEKISTAN IN THE SYSTEM OF FOREIGN POLICY CONTACTS

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Summary. *In the article, the author examines the activities of the PR service of the Ministry of Foreign Affairs of Uzbekistan, its priority tasks, goals and legal framework established by the Decree of the President of the Republic of Uzbekistan.*

Key words: *Ministry of Foreign Affairs, PR, media, press conference, briefing, press secretary*

The PR service of the Ministry of Foreign Affairs of Uzbekistan builds its work in accordance with the Decree of the President of the Republic of Uzbekistan dated February 25, 1994 “On improving the activities of the Ministry of Foreign Affairs of the Republic of Uzbekistan”, the Law of July 3, 1992 “On the establishment of diplomatic classes and ranks for diplomatic workers”, the resolution Cabinet of Ministers “On issues of organizing and improving the activities of the Ministry of Foreign Affairs of the Republic of Uzbekistan” dated March 16, 1994 No. 140 and the Consular Charter of the Republic. The Ministry carries out its activities under the direct leadership of the President of the country. The main tasks and functions of the Ministry of Foreign Affairs of Uzbekistan are set out in Appendix No. 1 to the Resolution of the Cabinet of Ministers of March 16, 1994 No. 140 “Regulations on the Ministry of Foreign Affairs of the Republic of Uzbekistan”. Amendments to this Regulation were made in 2000, 2002, 2003, 2005, 2010 and 2011.

The priority areas of PR activities are the implementation of the principle of state sovereignty of the republic, the implementation of the foreign policy course of the President of the country, the protection of the state interests of Uzbekistan and the rights of its citizens in relations with foreign countries, as well as in international and regional organizations. Together with the National Information Agency of Uzbekistan (UzA), the Uzbek Press and Information Agency, the Ministry of Foreign Affairs coordinates the dissemination of information about the socio-political and economic life of Uzbekistan on the Internet. The PR services of the ministry also draw up plans and organize the publication of literature on issues of foreign policy and international relations, cooperate with the University of World Economy and Diplomacy. The structure of the Ministry of Foreign Affairs of the Republic of Uzbekistan also includes the provision of communications, computer systems and the Internet, “the Jahon news agency”, diplomatic service service “Diphorizhizmat”.

The Ministry of Foreign Affairs of Uzbekistan is a government agency at the level of the Cabinet of Ministers in Uzbekistan, responsible for conducting and developing the foreign policy of Uzbekistan. The ministry is divided into several departments. Recently, a new department for cultural and humanitarian cooperation, tourism and sports were formed in the Foreign Ministry of Uzbekistan. It is noted that the new unit plays a coordinating role in the implementation of foreign policy objectives of the Republic of Uzbekistan in the assigned areas, ensuring the country’s active position in the global dialogue of civilizations, and promoting its positive image on the world stage.⁸ Takes part in the search and return, including by obtaining copies or duplicates of originals, of the national cultural and scientific heritage of Uzbekistan stored in foreign museum funds, archives and collections. PR provides assistance in expanding cooperation and implementing joint projects to study and present the Uzbek language, culture, history, and literature abroad. It also takes measures to organize student internships,

⁸.<https://kun.uz/ru/news/2022/06/30/v-strukture-mid-obrazovano-novoye-upravleniye>

conclude inter-university and inter-academic agreements and memorandums in areas within the competence of the Office. Priority in the PR activities of the new department will be given to the active use of “soft power” tools, public, cultural and sports diplomacy. It also became known that from July 1, 2022, Anvar Abdukhalimov, who is also an adviser to the minister on improving the efficiency of spiritual and educational work and ensuring compliance with the legislation on the state language, was appointed head of the department.

In accordance with clause 10 of Appendix No. 1 to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 140 dated March 16, 1994. “On issues of organizing and improving the activities of the Ministry of Foreign Affairs of the Republic of Uzbekistan”, a board is being formed in the Ministry consisting of the Minister (chairman of the board), deputy ministers (by position), as well as heads of structural divisions of the Ministry coordinating the main directions of its activities. The number and personal composition of the board is approved by the Cabinet of Ministers of the Republic of Uzbekistan on the proposal of the Minister. Diplomacy is a completely non-public sphere. What the press secretaries of foreign affairs agencies, heads of state or government inform about, has in fact already moved from the sphere of diplomacy to the sphere of public policy. Hence the absolute misunderstanding by a significant part of society of the goals, objectives and methods of the press services of the Ministry of Foreign Affairs of states. In the minds of the average citizen, the task of the press service is to scold everyone that the average citizen of some foreign state doesn't like, preferably using profanity, and also regularly threaten the enemies of the people and the state with punishments on earth and in heaven (at least a nuclear strike). In fact, as already mentioned, the press service of the foreign policy department is making every effort to maintain negotiation platforms and to find compromise options for resolving contradictions. The structure of the press service of the Ministry of Foreign Affairs of Uzbekistan has the position of coordinator for briefings and press conferences. Briefings and press conferences are an effective events for the press, which are also technologies used by the PR service of the Ministry of Foreign Affairs. The range of technologies that the press service uses in its work is quite well known (how effectively they are used is another matter). This includes preparing press releases, press conferences, briefings, as well as informal meetings with journalists, preparing comments from specialists, authoritative people - public opinion leaders. Most often and most willingly, the press service of the Ministry of Foreign Affairs of Uzbekistan resorts to organizing press conferences and briefings, which are based on communication between the leadership of the foreign policy department and invited journalists. Briefing is a meeting of officials or a press secretary with representatives of the media, which briefly outlines the position of the government or relevant organization on a particular issue or provides information on the progress of international negotiations, the positions of the parties, etc. In other words, a briefing is a short (lasting up to half an hour) working event for media representatives, during which officials of the Ministry of Foreign Affairs and its representatives report the news, express their attitude and indicate their position on a particular issue.

Briefings are usually promptly organized in cases of emergencies - terrorist attacks, political conflicts, etc., in order to explain, as far as possible, what happened, its reasons, to prevent panic, possible errors, distortions of facts and exaggerations in the media. As PR practitioners note, “a briefing is also the most convenient format for communicating sensational information designed to obtain the effect of surprise, since with this method the desired information message or ideological thesis, veiled by sensational news, will be uncritically perceived by an audience under the influence of strong emotions.” The peculiarity of the coordinator of briefings and press conferences is that, when organizing these PR events for the public, he coordinates the messages of the speakers in a publicizing manner, illustrating it with specific facts. Most often, the organizers of the briefing limit themselves to only the message, without entering into dialogue with representatives of the press. Especially if the briefing is organized when it is urgently necessary to inform the media on a significant issue in the activities of the Ministry of Foreign Affairs or individual diplomatic events. If questions are raised at such meetings, this happens on the initiative of the organizers themselves and only within the

framework of the designated topic. However, depending on the goals and topics, sometimes a briefing “may be entirely devoted to answering quick questions from journalists, since there is no presentation part in it. Before communicating with the press, a short – no more than 10–15 minutes – speech of one or more - The entire event is held standing. A press conference is a meeting of representatives of government agencies, socio-political organizations, commercial structures with journalists with the aim of informing the public on current issues of a certain topic, as well as attracting attention to the solution of a problem. Like any working event for journalists, organizing and holding a press conference includes three stages: preparatory, holding a press conference and the final stage, during which the results are summed up. At each of these stages, PR employees or the coordinator for briefings and press conferences have to carry out a number of steps, which determine how fully the goals of the event will be achieved. The work of the Public Relations Service of the Ministry of Foreign Affairs is not limited to the activities listed above. Other actions can also be very productive and mutually interesting, for example, holding presentations, round tables, thematic seminars, informal meetings, etc. At the same time, it is crucial. As a rule, they have a well-thought-out theme of the event, the composition of invited participants, the novelty of the information offered to journalists, and the level of possible business contacts that will ensure journalists’ participation in such events. While writing the article, we learned that the press service of the Ministry of Foreign Affairs of Uzbekistan not only cooperates with the media, but is often forced to place advertisements in publications with warnings about the inadmissibility of unverified information on the pages of newspapers and magazines. Broadcast on radio stations and TV channels. Thus, on May 6, 2022, the press service of the Ministry of Foreign Affairs of the Republic of Uzbekistan published a statement about provocations in its Telegram channel. The statement said that many foreign publications continue to unreasonably replicate implausible information, as well as quote leaders of different countries on the topic related to the expansion of various Unions and the accession of our Republic to them. “The Ministry of Foreign Affairs notes the inadmissibility of such statements, which could lead to the destruction of Uzbekistan’s friendly relations with foreign partners. The Ministry of Foreign Affairs declares that our state pursues exceptional goals of independent development and will continue to firmly follow this path to preserve our independence,” writes the press service of the Foreign Ministry of the Republic of Uzbekistan. Often the press service of the Ministry of Foreign Affairs of the Republic of Uzbekistan publishes video reports from official meetings of representatives of the Ministry of Foreign Affairs of the Republic of Uzbekistan with foreign diplomats. ⁹Thus, on May 12, 2023, Deputy Minister of Foreign Affairs of the Republic of Uzbekistan Bahromjon Aloev held negotiations via videoconference with Deputy Minister of Foreign Affairs of India Sanjay Verma. A video report from this meeting was posted on the Foreign Ministry’s Instagram page.¹⁰

Thus, the main task of the press service of the Ministry of Foreign Affairs of the Republic of Uzbekistan is to make every effort to maintain negotiation platforms and to find compromise options for resolving contradictions between strategic partners.

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Rezyume: *Maqolada muallif O‘zbekiston Tashqi ishlar vazirligining PR xizmati faoliyati, uning ustuvor vazifalari, maqsadlari va O‘zbekiston Respublikasi Prezidentining Farmonida belgilangan huquqiy asoslarini o‘rganadi.*

Резюме: *В статье автор рассматривает деятельность PR службы МИДа Узбекистана, ее приоритетные задачи, цели и правовые основы установленные Указом Президента Республики Узбекистан.*

Kalit so‘zlar: *Tashqi ishlar vazirligi, PR, OAV, matbuot anjumani, brifing, matbuot kotibi*

Ключевые слова: *МИД, PR, СМИ, пресс-конференция, брифинг, пресс-секретарь*

**CURRENT PROBLEMS OF EUTROPHICATION OF AQUATIC ECOSYSTEMS
SITUATIONAL ANALYSIS**

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Summary: *The article presents the results of the analysis of the distribution of biogenic elements in the aquatic ecosystems of the Aral Sea region by the method of principal components. The analysis performed shows that, in general, the studied system of characteristics of the state and distribution of biogenic elements in the studied water body does not differ in the stability of correlations; in certain periods of observation, correlations between the studied indicators weaken or even are absent.*

Key words: *Aral Sea Area, monitoring, biogenous elements, water ecosystems, eutrophication.*

At the global level, great attention is being paid to solving the problem of progressive anthropogenic impact on water resources and preservation of biological diversity in aquatic ecosystems. Especially due to the sharp increase in anthropogenic pressure on water ecosystems, the quality of the water environment is becoming increasingly worse, and it is playing an important role in solving the issues of threats to the ecological, food and national security of our country. In this direction, the study of anthropogenic degradation of water bodies is becoming more relevant in the field of ecology, as well as the creation of laws of rational use of natural water bodies and their protection.

The problem of environmental protection has an increasingly significant impact on international life, and is becoming one of the main directions of international cooperation of various countries. Studying the changing processes in the biosphere, influencing environmental factors, studying the laws of development of natural systems is one of the important tasks of modern ecology. An ecologically unstable environment is characterized by anomalously rapid changes in natural systems and intersystem interactions.

Despite the fact that the term "degradation of water bodies" is very common in scientific publications, there is still no generally accepted definition of it. Usually, only the definition of "environmental degradation" is given in the vocabulary related to ecology, which means the joint deterioration of the natural and social environment of human life. But man does not live directly in the water environment. Therefore, the degradation of water bodies, in the scientific literature, refers to the loss of the most diverse properties of water bodies that are potentially used by humans, namely, water management, fisheries, recreational potentials, social and cultural-historical importance. In general, anthropogenic degradation of water bodies can be defined as a joint process with complex factors associated with various types of human activity, not only the ecological condition of water bodies and watercourses, but also changes in their resource-exploitation parameters. Methodologically, the process of degradation of environmental elements is related to the development of an emergency environmental situation or environmental disaster. Moreover, in most cases, degradation processes are seriously studied only when such situations arise.

An important and currently understudied aspect of the problem is finding interactions between the ecological situation in this emergency and the development of other types of emergency situations. In a comprehensive analysis of personal materials and literature materials, anthropogenic degradation of water bodies can cause ecological, biological and man-made emergency situations.

Ecologically unstable arid zones lead to the emergence of a number of new laws and dynamics of the natural environment, as a result of which not only their composition and structure change, but also the conditions and strategies of the organic world undergo changes. It is necessary to consider this in environmental forecasting. Taking into account the concept of partial load on the balance of various

components of the natural environment, it is necessary to take into account new laws when developing a strategy for the use of natural resources and planning a rational use of nature.

According to the definition, eutrophication is an increase in the biological productivity of water bodies as a result of the accumulation of biogenic elements under the influence of anthropogenic or natural factors.

Eutrophication means the introduction of biogenic elements (nitrogen and phosphorus) into natural water bodies and the negative consequences of this process. Eutrophication disrupts the ecological balance of water bodies, harms fishing and has a negative impact on the use of water for drinking, domestic and recreational purposes.

Pollution of water bodies with excess biogenic elements increases the level of primary production: in eutrophic water bodies, there is a lot of development of microscopic water plants and water "blooming" is observed. An increase in the number of microscopic water droplets reduces the clarity of the water. A phenomenon characteristic of highly productive water bodies is the bloom of water with blue-green algae, most of which are poisonous.

Symptoms of eutrophication of water bodies include the covering of the water's edge by aquatic plants, as well as an increase in the number of epiphytes (plants that live on other plants) and "alien" microscopic aquatic organisms. The main source of biogenic elements entering water bodies is municipal and industrial wastewater, as well as agriculture. Reducing the load on biogenic substances, especially phosphorus, is very important to improve the condition of water bodies, because in many cases phosphorus is the biogenic element that controls the productivity of phytoplankton in inland water bodies.

The source of anthropogenic deposition of biogenic elements can be residential areas, agricultural land, waste water of industrial enterprises. Eutrophication is often accompanied by "blooming" of water, strong development of higher water plants. Eutrophication leads to a decrease in the fishery and recreational potential of water bodies, and has a negative impact on systems that purify water from water bodies for drinking water supply.

Currently, anthropogenic eutrophication is considered as the most important factor of negative impact of human activity on water bodies.

The study of eutrophication has a long history. Research on the clarification of the causes of eutrophication has been carried out since the end of the 18 th century. But until the middle of the 20 th century, the work became mostly descriptive. About the first signs of eutrophication of water bodies at the beginning of the 20 th century, L.L. Rossolimo spoke. In the second half of the 20 th century, the processes of anthropogenic eutrophication covered Central and Southern Europe, the USA, Northern Europe, the countries bordering Russia, Asia, especially China and India, most of the lakes of Japan, and a number of lakes in Central and South America, Africa and Australia. Numerous examples of lake degradation are discussed in reviews of the development of eutrophication research.

In the second half of the 20 th century, the number of experimental works in this direction increased with the increase in the scale of eutrophication of water bodies. The current state of freshwater ecosystems is characterized by a decrease in the productivity of many links of the trophic chain, which causes the main attention to be paid to the study of the primary link as a natural factor in the formation of the quality of the water environment. The causes and mechanisms of changes in the trophic status of water bodies are not always clear due to the insufficient study of the structural and functional structure of different types of water ecosystems, as well as the imperfection of the methods used. The main difficulties arise in the study of reservoirs, because, unlike lakes, the level of formation of organic matter in them does not correspond to the concentration of biogenic elements in water. Exceeding the rate of destruction over the primary productivity is indicated as a sign of heterotrophic orientation of water reservoir ecosystem activity. But the new approach and methods make it possible to recognize the relationship between productive and destructive processes as almost balanced.

The change of abiotic factors can be determined directly, that is, by conducting a physico-chemical analysis of water bodies, as well as indirectly, by changing the structure and parameters of the population characteristics of living organisms in water bodies. It is known that primary trophic level producers, including phytoplankton, are the first stage in the development of eutrophication processes. Therefore, the change in their condition serves as an indicator of the processes taking place in water bodies. Goryunova's study presents information on the species composition of phytoplankton of 23 small eutrophic water bodies of Russia under special protection. It is shown that the studied water bodies can be divided into two groups according to the list of species. The first group includes water bodies of different origins, environmental reaction (pH), color, and mineralization.

The identification and quantitative registration of the physico-chemical factors of the environment that cause the processes that worsen the ecological condition of biocenoses of natural ecosystems is the main fundamental issue of ecology.

The degree of influence of abiotic factors on water ecosystems against the background of geographical and climatic characteristics of the studied area can be determined using the method of ecological probability levels of environmental factors. 2) to calculate the important physico-chemical ecological probability levels of the water environment; 3) makes it possible to classify important factors according to their danger to the ecosystem. The biotic concept of natural environment control is taken as the basis of this method. The basis of this concept is that it is necessary to assess the state of the ecosystem on the scale of "normo-pathology" not by the level of abiotic factors, but by a complex of biological indicators.

Water acidification is a complex process that changes biogeochemical cycles in a water body. The intensity of acidification is determined by two main conditions:

- taking into account the duration of exposure to acidifying substances, their aerotechnological load level;
- the natural sensitivity of the territory in terms of geological, landscape-geographical and climatic factors.

The degree of acidification of surface waters is determined by two factors: the sensitivity of regional water bodies to acidification and the amount of natural and anthropogenic acid reagents. The range of pH values, or the susceptibility of a water body to acidification, depends on the buffer volume of the water. The analysis of publications dedicated to the research of the mechanism of water acidification under different natural conditions shows a great variability of the share of natural and anthropogenic factors in this process. Based on the analysis of scientific data, the following main factors are distinguished:

- displacement of natural weak acids (HCO_3^-) by stronger match acid ($\text{S}_2\text{O}_4^{2-}$), which occurs as a result of atmospheric pollution and its absorption into water bodies and dry absorption of SO_2 ;
- occurrence of nitric acid with precipitation or its release from the upper organic layer of the soil;
- removal of organic acids (the most mobile fraction of humic acids) from soils and wetlands located in water catchment areas.

In most cases, the mechanism of acidification is determined by a combination of several factors that can mutually enhance each other's effects.

Contaminant inputs to aquatic systems occur from natural geographic (e.g., sulfide ores) as well as anthropogenic sources (emissions from polluted atmospheres or dry absorption). Volcanic activity and the oxidation of dimethyl sulfide formed in the ocean contribute to the emission of sulfates from natural sources.

The main source of anthropogenic soot into the atmosphere is the burning of fossil fuels (especially fuel oil and coal-fired thermal power plants), metal smelting from ores containing soot, etc.

According to the data on the precipitation of acid-forming agents, the precipitation of sulfates is 2-3 times more than that of nitrates. The dry absorption of sulfuric acid can be 40–80%. In the case of high amounts of sulfuric acid and their dry absorption in lake water, sulfates displace much weaker natural acids.

It should be noted that currently only water quality sanitary-hygienic and fisheries regulations have been developed and approved. Ecological and nature protection regulations do not exist yet, only possible ways of their creation are being considered. Accordingly, in this monograph with a specific practical orientation, the assessment of the state of water pollution is carried out on the basis of current regulations regarding the conditions of water use.

Water environmental factors that lead to the degradation of water ecosystems are formed depending on the intensity and amount of biogenic elements entering water bodies and create certain conditions at the level of a specific biological regime and production and destruction processes that lead to their accumulation in ash.

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Rezyume: Maqolada biogen elementlarining Orol dengizining suvi ekosistemalarida asosiy komponent metodi sifatida joylashgan analiz natijalari keltirilgan. Utkarilgan analiz natijasi kursatgichi buyicha umumiy urganilaetgan xarakteristik vaziyat sistemasi va biogen elementlarining joylashishi urganilaetgan suv ob'ekti korreliyatsion aloqalar barqarorligi bilan ajralmaydi, ayrim muddat kuzatuvlarida korreliyatsion aloqalar urganilaetgan kursatgichlar orasida kuchsizlanadi eki utuman yo'q bo'lib ketadi.

Резюме: В статье приведены результаты анализа распределения биогенных элементов в водных экосистемах Приаралья методом главных компонент. Проведенный анализ показывает, что в целом изучаемая система характеристик состояния и распределения биогенных элементов в исследуемом водном объекте не отличается стабильностью корреляционных связей, в отдельные сроки наблюдений корреляционные связи между изучаемыми показателями ослабевают или даже отсутствуют.

Kalit so'zlar: Orolbuyi, kuzatish, biogen elementlar, suv ekosistemasi, evtrofikatsiya jaraeni.

Ключевые слова: Приаралье, мониторинг, биогенные элементы, водные экосистемы, эвтрофикация.

THE PROBLEM OF THE ARAL SEA, THE PROBLEM OF THE WORLD

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Summary: *The tragedy of the Aral Sea is one of the biggest global environmental disasters, causing various environmental problems depending on its nature and scale. That is why the countries of Central Asia, which are directly experiencing the negative consequences of the decline of the Aral Sea, first of all, Uzbekistan, have been calling on the world community to save this increasingly dry sea, stabilize the ecological situation in the region, and most importantly, improve the lives of the people living here.*

Key words: *green cover, desert plants, The Aral Sea is a region of environmental innovation and technology, special program, ecotourism, desertification and salinization, Karakul and Muynak*

The island problem is important not only for Karakalpakstan or Uzbekistan, but for the entire region. That is why greening of the dry seabed, opening water basins and mitigating the consequences is an urgent issue today.

Work on ensuring environmental safety and environmental protection on the island coast, mitigating the negative consequences of sea erosion has not stopped.

Establishing "green cover" in the dry bottom of the Aral Sea and in the coastal areas, developing land in the territory of the Republic of Karakalpakstan, creating a drip irrigation system of land areas, implementing the state programs "Abod kishloh" and "Abod mahalla" The personnel of the system of the Ministry of Emergency Situations is also contributing to its work.

In particular, significant work has been done to strengthen sandslides on the island coast, to reduce the rise of toxic aerosol dust into the air from the dry part of the island, to grow seedlings of desert-resistant and nutritious plants, and to turn the dry part of the sea into trees and shrubs. .

In recent years, in cooperation with the Ministry of Emergency Situations, the State Forestry Committee and other agencies, a total of 1,769,000 hectares have been cleared in the dry areas of the Aral Sea. 1 million 244 thousand ha of forest reclamation works were carried out in the area. aviation to the field, 405 thousand ha. special equipment for the area, 19.4 thousand ha. 90,000 hectares of desert plant seeds were planted by hang glider. various seedlings were planted on the field.

To date, 403 specialists-workers and 136 drilling and other special equipment have been mobilized to regions of the Republic of Karakalpakstan where there is a shortage of drinking water and running water for the population and livestock. With the help of these tools, wells were dug by drilling in 41 settlements in Moynaq, Bozator, Karaozak and Takhtakopir districts of the Republic of Karakalpakstan. 177 artisanal wells have been prepared for the supply of local population and greening of the Aral sea region as a result of the drilling of wells with a depth of 15-500 meters at 103 points in the territory of 26 villages, and more than 10,000 people have a guaranteed water source. provided.

This year, a total of 100,000 ha will be allocated for the establishment of "Green Covers" protective forests in the dry areas of the Aral Sea planned. Extensive work is being done in this regard.

On October 25, the Karakalpak State Academic Musical Theater named after Berdak held a high-level international conference "Aral sea - a region of ecological innovations and technologies". More than 200 guests gathered at the high-level event - diplomatic corps of foreign countries, representatives of international environmental organizations, experts in the field were first shown exhibitions and agricultural products dedicated to the consequences of the Aral sea crisis, investment projects for its elimination. .

The event was conducted by Boriy Alikhanov, Deputy Speaker of the Legislative Chamber of the Oliy Majlis.

At the international conference, the address of the President of the Republic of Uzbekistan to the participants of the conference was read by the First Deputy Prime Minister of the Republic of Uzbekistan Achilboy Ramatov.

After that, the video address of UN Secretary General Antonio Guterres sent by the participants of the conference was shown.

At the conference, Musa Erniyazov, the Chairman of the Supreme Caunal of the Republic of Karakalpakstan, made a speech and said that the resources of a number of international donor organizations were gathered within the framework of the Trust Fund for Human Security for the Aral sea region, which was established under the leadership of the Honorable President, to improve the living standards of local residents. The emphasized the support of the World Bank, the Asian Development Bank, the Global Environmental Fund and other international organizations with the government of Uzbekistan to eliminate the consequences of the environmental tragedy in the Aral sea region.

Also, on the direct initiative of the Honorable President, the implementation of state programs to mitigate the effects of environmental disasters in recent years, especially the adoption of the special program for the period 2018-2021 for the Aral sea region, has a special place in the lives of the local population, holding, today the planting of desert-resistant plants in the bottom of the Aral Sea is in full swing, in the past short period, more than 1 million 100 thousand hectares have been prepared for planting, of which 500 thousand hectares have been planted with haloxylon, the winter and spring of 2019-2020 during the season, these works will be continued and it is planned to plant desert and salt resistant plants on 700,000 hectares.

Natalia German, UN Secretary General's Special Representative for Central Asia, Abdoulaye Dia, UN Assistant Secretary General, Peter Burian, European Union's Special Representative for Central Asia, spoke at the conference.

The main goal of the event is to develop measures to create conditions for attracting foreign investments in the development and implementation of environmentally friendly technologies, comprehensive implementation of the principles of green economy, environmentally friendly, energy and water saving technologies, technologies that ensure food safety introduction, prevention of desertification, development of ecological migration and ecotourism.

The drying up of the Aral Sea is a tragedy that goes beyond national and even regional borders. Undoubtedly, this is one of the biggest global ecological disasters caused by human activity, which has ecological, climatic, socio-economic and humanitarian consequences, and has worsened the climate conditions in the region.

Unfortunately, it is no longer possible to completely restore the Aral Sea, but it is possible to mitigate the negative consequences associated with it. Reducing the devastating impact of the Aral Sea crisis on the environment and the lifestyle of millions of people living in the Aral Sea region, as well as preventing further deterioration of the climate impact, is the most important obligation of our time.

Promotion of three initiatives of the President at the conference: the project of the concept of establishing an ecological innovation and technology area in the Aral sea region, a special resolution of the UN General Assembly on declaring the Aral sea region as an "Ecological Innovation and Technology Area", water in Central Asia a presentation and discussion of the regional program on rational use of resources was held.

Within the framework of the conference, creating conditions for attracting foreign investments in the development and implementation of environmentally friendly technologies, comprehensive implementation of the principles of "green economy", environmentally friendly, energy and water-saving technologies, ending the continuation of desertification and ecological migration, and developing ecotourism. meetings were organized.

In his speech at the 75th session of the UN General Assembly, the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, drew the attention of the entire world community to the environmental tragedy in the Aral sea region:

Another acute problem of our time is global climate change. Today, every country feels the negative impact of this process. Unfortunately, such changes pose a great threat to the development of Central Asia. We propose to adopt a special resolution of the United Nations General Assembly to declare the Aral sea region as a region of ecological innovation and technology. It would be appropriate to celebrate the date of approval of this important document as the International Day of Protection and Restoration of Ecological Systems...

Based on this proposal of the President, the UN adopted a special resolution. Currently, a group of scientists from the Northwest Institute of Ecology and Environmental Resources of the Chinese Academy of Sciences and Samarkand State University are conducting scientific research in order to drastically reduce desertification, based on the United Nations' plan to achieve sustainable development by 2030. As part of the research, experimental sites were established in Karakul and Muynak. The regional ecological environment of the Aral Sea is causing great damage to the climate, economy and human health. This is a universal problem facing humanity. Cooperation with the international community is important in solving this global problem.

As a result of field research on the current state of desertification in the Amudarya basin, this group created a quantitative index system of the level of desertification. From a scientific point of view, desertification zones are divided into light, medium, heavy and extreme according to the degree of degradation (crisis, decline).

In order to study the desertification of the Amudarya basin in 1990-2015, at first, the characteristics and causes of desertification in the basin in the last 30 years were scientifically analyzed using modern technologies. Stability and spatial differentiation of vegetation cover were discussed. Based on the above results of the research, the scientific importance of innovative models in the development of measures for the ecological restoration of desertified and saline lands was emphasized. Desertification in Uzbekistan has increased significantly since the 1990s. From 1990 to 2015, the dynamic change of the desertification area (including desert, saline-hydric land, desert and desertified land) increased from 64.66 percent to 73.16 percent, respectively. As a result of this, the resulting desert areas correspond mainly to the Amudarya basin and the Aral Sea region.

Light, moderate and severe desertification zones in 1990 showed a significant "increasing" trend. In the first years, it was from 15.9 thousand km² to 21.1 thousand km², and in 2000 it increased from 21.4 to 25.0 thousand km². By 2015, areas of extreme desertification showed a "slowing down" trend. In general, the desertification of agricultural lands gradually prevailed, and during the five years from 2010 to 2015, their desertification area doubled from 10.5 to 31.8 thousand km². Because of this, the desertification situation is getting worse. Desertification of agricultural land is closely related to water scarcity or problems in the irrigation system.

From 1990 to 2010, the area of unstable vegetation increased from 391.6 km² to 572.0 thousand km², and from 2010 to 2015, it changed to 755.0 thousand km². In 25 years, the unstable land area has increased by 18,200 km². The risk of desertification has increased significantly. It was found that the crisis of vegetation cover shows spatial heterogeneity.

On a spatial scale, the vegetation cover potential in the lower reaches of the Amudarya basin is better than in the middle reaches of the river. In terms of time scale, the overall potential of vegetation cover was higher than in 1990. In 2010, the potential for vegetation cover decreased significantly. For this reason, the restoration of vegetation cover by bushes on a large scale and its implementation became unusable. Flowering grasses and spore plants have become important in restoring the vegetation cover. In addition, the possibility of implementing complex measures with a combination of shrubs, flowering grasses, ground and high spore plants (Cryptogamae) was put forward as a proposal.

Taking into account the degree of desertification, its spatial distribution, and the difference in strong factors, scientists created an experimental observation area. Through the experimental platform, valuable information was obtained on the vegetation, geography, ecological restoration, soil improvement and efficient use of water resources of desert and saline lands. This is intended to restore vegetation cover. Genetic resources (gene and seed banks) of xerophytes growing in sandy deserts and halophytes in saline environments are of great importance in the reconstruction of the plant community. This is done through a comprehensive analysis of environmental comparative experiences in research and development of key technologies. Ecological restoration of desertification and salinity, environmental protection through the full and effective use of the technology system is envisaged.

Samarkand State University and its Chinese partners have established experimental sites in Karakul and Muynak districts. Through it, research is being conducted on the restoration and reconstruction of desertified and saline lands. Currently, the research team is studying the system of "optimal ecological restoration" through experiments, monitoring and technical integration to restore degraded desert areas.

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Rezyume: ushbu maqolada jahon hamjamiyati tashkilotlari bilan birgalikda Orol dengizi muammolarini hal qilish yo'llari muhokama qilinadi.

Резюме: в данной статье рассматриваются пути решения проблем Аральского моря совместно с организациями мирового сообщества.

Kalit so'zlar: yashil qoplamı, cho'l o'simliklari, Orol dengizi ekologik innovatsiyalar va texnologiyalar mintaqasi hisoblanadi, maxsus dastur, ekoturizm, cho'llanish va sho'rlanish, Qorako'l va Mo'ynoq.

Ключевые слова: зеленый покров, пустынные растения, Аральского моря - регион экологических инноваций и технологий, специальная программа, экотуризм, опустынивание и засоление, Каракол и Мойнак.

PEDAGOGICAL- PSYCHOLOGICAL FACTORS OF CHILD EDUCATION

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Samarkand State University named after Sharof Rashidov

Summary: *In this article, the relationship between parents and children in families, the psychological characteristics of the influence of the father's position in the family on the upbringing of children, the influence of the father on the formation of the child's personality, distinguishing the influence of fathers and mothers on child development, father's and mother's methods of upbringing, father and the child's cooperation is emphasized.*

Key words: *Education, modern society, family, socialization, "father-child" pair, parental role, behavior, parenting style, positive interest, directiveness, confrontation, autonomy, discretion.*

Today, tomorrow, socio-economic and spiritual way of life of Uzbekistan and raising it to a high level are in the hands of young people. As long as this is the case, it is necessary to inculcate in the minds of young people who are just starting their lives on the basis of family education, that they should first of all rely on their strength, knowledge and endurance, enthusiasm, selflessness, let them understand that it depends on their hard work.

Many centuries of experience show that the real wealth of the society is man, human generation. That is why our ancestors brought up their descendants in the spirit of universal feelings and national values. In this way, they came to protect our language, language and religion. Because the sacred task of every intelligent person, the meaning of his life is to raise worthy children, to see them mature, to educate them to be loyal to their parents, family, society, and Motherland. Family and parents play an important role in fulfilling such a responsible task.

A family is a social group of people connected by blood, consanguinity (by marriage), or cohabitation.

The role of families and the strength of families in the development of any society is incomparable. Because the health of a living organism depends on the health of every cell that makes up it, and every cell has its proper place in the functioning of the whole organism, so the family also forms a whole organism called the state and society. is a producing cell. The health of every family, the rule of a positive psychological climate in them, being born in this environment, being formed as a person, and then as a citizen of the country where he lives, ensuring the development of the economy and social life of his country, The role of the family in human development, which is a decisive factor, is incomparable.

If we look at our history, a number of works created in the East, which are unique examples of Muslim ethics, have served as the main criteria, rules, guidelines and notes of advice in the spiritual and moral formation of young people. In this regard, Yusuf Khos Khajib's "Kutadgu Bilig", Kaikovus' "Qabusnama", Sheikh Sa'di's "Gulistan" and "Buston", Abdurakhman Jami's "Bakhoristan", Navoi's "Makhhub ul-Qulub" and "Hayratul Abror", Husayn Works such as Koshifi's "Ethics of Mukhsini" and Jalaluddin Davani's "Ethics of Jami" are of great importance in raising Uzbek national ethics, spirituality, and values.

It is known that a small social group connected by moral responsibility, mutual respect, understanding and affection based on marriage and close kinship is called a family.

It is important to strengthen the family, to use the heritage of Eastern thinkers as national values in raising children as a perfect human being, to eliminate some of the unnatural relationships that exist in families today, and especially the methods of education forcibly introduced into the family. In order to eliminate and prevent such defects, to strengthen the family, and to educate the children growing up in it as perfect human beings, we should use the precious thoughts, masterpieces of Eastern thinkers, their records and narrations wisely.

The heritage of our national spirituality is important for the spiritual and moral upbringing of children in the family, and it is an important condition for the economic, political, spiritual, and cultural development of the society.

Children's upbringing in the family is the main factor in raising young people as perfect people with the educational content of events and events that glorify the wise words of thinkers, progressive views and universal dreams of the people's pedagogy. Because in the stories and fairy-tales of the thinkers' legacy, the opposite of positive qualities such as honor, purity, honesty and justice, benevolence and truthfulness, etc. Great sages draw conclusions based on their life experiences, refined tastes, sophisticated mental states, and level of knowledge.

It is characteristic that the ideas arising from the content of the works of Eastern thinkers are important in solving not only youth education, family problems, but also a number of moral, educational and social problems of state importance.

Life experience shows that the way children treat their parents, their children treat them in the same way.

The atmosphere in the family becomes stable when parents feel their responsibilities. In order for children to grow up politely, together with their parents, the neighborhood is a great example school. It is not for nothing that our people say, "A bird does what it sees in its nest." A parent who is raising a child should be able to demonstrate noble qualities in every movement, posture, behavior, and interaction with others. Because the child is extremely imitative and observant by nature. That is why those around him influence them with their habits, sometimes without realizing it. Rough relationships in the family, a lot of lying, unpleasant behavior create an unhealthy environment that negatively affects the upbringing of a child. Parental behavior plays an important role in raising a child. If a child grows up hearing harsh words from his parents and being beaten, this will have a negative effect on his nature. And this, in turn, makes "spiritually sick" people from children raised in an unhealthy environment in the family. They also have a negative impact on the morale of the society. In the family, parents are influenced by "mass culture", which has a negative impact on children's upbringing.

The etiquette given to children in the family should teach them to know the difference between good and bad, benefit and harm. Because by the means of manners, a person protects his soul from bad qualities, cleanses himself from unpleasant faults, and builds his character with beautiful qualities.

Family education is a kind of social education, as a continuous process lasting a lifetime, in which all members of the family take an active part, teach each other their knowledge and experience. Sonship, brotherhood, sisterhood formed in the family is a third world that is born from the mutual union of two living bodies and two worlds. Undoubtedly, the meaning of unity and harmony is embodied in the expression of union, and if the family is truly peaceful and harmonious, family life will continue to strengthen. Otherwise, marriage will turn into hell, husband and wife will become hostile rivals to each other, bring the fate and upbringing of children to an existing state, and damage kinship relations. As a result, the society suffers material and moral damage.

In the legacy of the great thinker, intelligence, decency, modesty, and humanity, which are instilled in the child in the family, are considered as the main moral criteria. The role of wisdom in the formation of such moral qualities is great. It is known that wisdom is the source of all knowledge, it leads a person to eternal happiness. It is advisable to start the spiritual and moral upbringing of children in the family very early, even from infancy. The views of Eastern thinkers on the family and child education in the family have been translated into the languages of the peoples of a number of Asian and Western countries and have been reprinted several times. According to Eastern thinkers, it is the only reliable reason for family and family upbringing, as well as in all other matters.

In conclusion, the creation of our current national ideology, the strengthening of Uzbekistan's independence, the recovery of society from moral decline, and the strengthening of families depend on the upbringing carried out in this family. The national spirit of the family determines the national spirit of the nation. In this sense, the family is a social institution that forms national psychology in each

member. The richer, deeper and deeper the spirituality of the family, the richer the society. Let's cooperate taking into account that the future depends on young people and their education.

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Rezyume: Ushbu maqolada ota-onalar va farzandlar o'rtasidagi munosabatlar, oilada ota mavqeining farzandlar tarbiyasiga ta'sirining psixologik xususiyatlari, otaning bola shaxsining shakllanishiga ta'siri, bola rivojlanishida otalar va onalar ta'sirini farqlash, tarbiyaning ota va ona uslublari, ota va bolaning o'zaro hamkorligi masalalariga e'tibor qaratiladi.

Kalit so'zlar: Ota, tarbiya, zamonaviy jamiyat, oila, ijtimoiylashuv, "ota-bola" juftligi, otanalik roli, xulq-atvor, tarbiyaning ota va ona uslubi, pozitiv qiziqish, direktivlik, qarama-qarshilik, avtonomlik, noizchilik.

Резюме: В данной статье рассмотрены взаимоотношения родителей и детей, психологические особенности влияния положения отца в семье на воспитание детей, влияние отца на формирование личности ребенка, разница между влиянием отцов и матерей по вопросам развития ребенка, отцовским и материнским методам воспитания, отцу и вниманию уделяется вопросам взаимодействия детей.

Ключевые слова: Отец, образование, современное общество, семья, социализация, пара «отец-ребенок», родительская роль, поведение, стиль воспитания отца и матери, позитивный интерес, направленность, оппозиция, автономия, усмотрение.

UDK: 796.08:159.947.5

MINI-FOOTBALL AS AN EFFECTIVE MEANS OF DEVELOPING PHYSICAL AND FUNCTIONAL PREPARATION OF PEOPLE

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***Summary:** This article highlights the importance of physical training, the results of scientific research on the fact that mini-football is an effective means of developing people's physical and functional readiness. Also, information on calculating hours of theoretical and practical materials on mini-football for students in the annual cycle is presented.*

***Keywords:** physical training, sport, competition, football, mini-football, development.*

It cannot be denied that an active lifestyle helps to solve the problem of an imbalance between the emotional component of a person and his physical needs. Sport is the right way to strengthen the spiritual and physical health of a person. Each of us must have trained, healthy body capable of performing the necessary amount of work in the process of work. The result of the study proves that today physical culture and sports occupy a leading position in the life of every person, which has no analogues and replacements. Therefore, it is very important that modern sport serve universal values and ideals. It follows from this that physical culture should be formed in such a way that it becomes an integral element of the spiritual life of people. That is, so that corporeality not only does not interfere, but, on the contrary, contributes to the formation and development of a person as a person. Sport is an integral part of physical culture, as well as a means and method of physical education, a system for organizing and conducting competitions in various complexes of physical exercises and preparatory training sessions. It has historically developed as a special area for identifying and unified comparison of people's achievements in certain types of physical exercises, their level of physical development. Sport in a broad sense covers the actual competitive activity, special training for it (sports training), specific social relations arising in the field of this activity, its socially significant results. The social value of sports lies in the fact that it is a factor that most effectively stimulates physical culture, contributes to moral, aesthetic education, and the satisfaction of spiritual needs.

Sports games are used in the physical training of cadets: football, basketball, volleyball, handball, rugby. Sports games are distinguished by rules that clearly define the composition of the players, the size and layout of the site, the duration of the game, equipment and inventory. Competitions in sports games are of a sporting nature and require great physical effort and volitional effort from the participants.

At the same time, such a sporting game as mimi football did not find its place in the physical training of cadets. Multi-football is characterized by constantly emerging unexpected situations that require quick reaction, the ability to concentrate and pay attention, and spatio-temporal accuracy. All these characteristics are associated with the manifestation of coordination abilities, which are one of the leading ones for mini-football players.

Research by D.K. Ismagilov determined that on average an athlete at the student level runs 3235 m per game and the total number of technical-tactical actions (TTA) was 84. In importance, the first place is passing the ball (48.8 $\pm$ 11.8 %), which are the main means of interaction with partners. The highest influence is equal to $R=19$ for the parameter effectiveness of technical and tactical actions. In practice, the player moves during the game in an aerobic-anaerobic mode (28.6 minutes). It has been proven that the use of sports-organized physical education of students based on the technology of using mini-football contributed to an increase in speed-strength qualities and competitive activity by an average of 10%.

Many authors consider a sports-oriented approach that most effectively influences a person's personal qualities, which allows for successful self-affirmation and self-realization in various fields of activity. Along with this, sport, as a performance activity, ensures the dominance of competitive motives for achieving success.

It is important to note that certain sports can be practiced both during practical classes and outside of school hours in educational and training groups. Then the educational process in the subject "Physical Training" receives an innovative sports-oriented approach.

It is recommended at the first stage, due to the large number of people who want to play mini-football, to conduct a selection based on the level of physical and technical preparedness. Thus, it's like organizing two groups. The first is based on sports improvement, the second is educational and training.

The purpose of the first group is to prepare for and participate in various competitions; the second group - to provide an opportunity to master the technique and tactics of the game. The first group participates in competitions among cadets of 1-4 courses and branches of the military.

A necessary condition, according to a specialist, for the effectiveness of managing the training of students is proper planning. Planning for different courses of study is carried out in the following forms: 1) long-term (for several years); 2) current (for one year); 3) operational (for a month, a week, separate training sessions).

Researcher D.K. Ismagilov [2] provides a calculation of the hours of theoretical and practical materials on mini-football for students in a yearly cycle.

Calculation of hours of theoretical and practical materials on mini-football for students in a yearly cycle			
	september- november	december- april	may
I. Theoretical section			
History of the development of mini-football in the Republic of Uzbekistan	1		1
Competition rules and behavior on the field	2		1
II. Practical section			
a) General developmental exercises	4		
б) Special exercises	8		
в) Training and improvement of individual tactical actions	4		
г) Training and improvement of group tactical actions	6	2	
д) Training and improvement of team tactical actions	18	14	
е) Training, friendly and official games	10	22	
ж) Analysis of matches using video recordings			
з) Testing	2	2	
и) Independent studies	++	++	++
Total hours:	55	40	2

It is important to note that the most effective method of educating the improvement of technical and tactical actions is the method most appropriate to gaming activity, namely situational.

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Rezyume: *Ushbu maqolada jismoniy tarbiya bilan shug'ullanishning ahamiyati, mini-futbol odamlarning jismoniy va funksional tayyorligini rivojlantirishning samarali vositasi ekanligi borasidagi ilmiy tadqiqot natijalari yoritilgan. Shuningdek, yillik siklda talabalar uchun mini-futbol bo'yicha nazariy va amaliy materiallar soatlarini hisoblash haqidagi ma'lumotlar bayon etilgan.*

Резюме: *В данной статье освещается значение физической подготовки, приводятся результаты научных исследований о том, что мини-футбол является эффективным средством развития физической и функциональной подготовленности людей. Также представлена информация о расчете часов теоретических и практических материалов по мини-футболу для студентов в годовом цикле.*

Kalit so'zlar: *jismoniy tarbiya, sport, musobaqa, futbol, mini-futbol, rivojlanish.*

Ключевые слова: *физическое воспитание, спорт, соревнования, футбол, мини-футбол, развитие.*

UDK: 574.11

ISSUES OF STUDYING THE SPIRITUAL HERITAGE OF MAHMUDKHOJA BEHBUDI

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Summary: *This article provides information about the life path of Mahmudhoja Behbudi, his painstaking research in the scientific and creative fields, and the reforms he carried out in the field of national awakening.*

Key words: *madrasah, school, textbooks, enlightenment, national awakening, knowledge, language, life.*

Mahmudhoja Behbudi came to the field as one of the dreams of Turkestan on the threshold of the 20th century. He was the greatest figure who actively participated in social and political movements of his time, the founder of modern Uzbek culture. He was the recognized leader of Turkestan moderns, the bearer of the idea of an independent republic, the theoretician and practitioner of the idea of a new school, the first playwright, theater artist, publisher, and journalist who started Uzbek drama. He lived in a very difficult and complicated period of our history. The crisis and stagnation that started in the 16th century, ignorance and bigotry peaked, mutual quarrels, local clan disputes exhausted the nation, and Russia, which conquered the country using this opportunity, tried to keep it stable and peaceful. In such a situation, it was up to the devotees of Behbudi, who went down in history in the name of Jadids, to protect the nation from the danger of complete destruction and complete plundering of the country, to educate the generations in the spirit of freedom and independence, to start enlightenment and progress.

In such a situation, it was up to the devotees of Behbudi, who went down in history in the name of Jadids, to protect the nation from the danger of complete destruction and complete plundering of the country, to educate the generations in the spirit of freedom and independence, to start enlightenment and progress.

Uzbek education and culture of the 20th century, moreover, today's independence thinking, probably owes a debt to these moderns. They founded the new school in Turkestan, which became famous with the names "Usuli Jadid" and "Usuli Savtiya". They were the first to put forward the idea of a modern higher school, organized dozens of societies and associations, and with their help, they managed to send many young people to study in developed European countries. They are the ones who laid the first brick of the Uzbek theater and started the publishing press.

Jadids opened schools at their own expense, prepared the young generation for independence, tried to form national consciousness, inculcate feelings of national pride and pride through poems, articles, and plays, and raised the flag of independence high during the years of the revolution.

A number of researchers have studied the life and scientific and creative activities of Behbudi. Mahmudhoja Behbudi's life and scientific and creative activities, especially B. Kasimov, N. Karimov, D. Alimova, H. Muin, Kh. Davron, N. Rahmat, I. Gofurov, M. Kuronov, I. who conducted research in this field. It is reflected in the works of our scientists such as Haqqul, Sh. Rizayev, N. Namozova, P. Ravshanov, Q. Rajabov, H. Saidov, D. Kuronov, M. Khojayev.

Historian Begali Kasimov said: - Mahmudhoja Behbudi came to the field as one of the dreams of Turkestan at the threshold of the 20th century. He was the greatest figure who actively participated in the socio-political movements of his time, the founder of modern Uzbek culture. Recognized leader of Turkestan Jadids. He was the bearer of the idea of an independent republic, the theoretician and

practitioner of the idea of a new school, the first playwright, theater artist, publisher, and journalist who started Uzbek drama.

Behbudi is one of the first theoreticians and practitioners of Jadid schools, and one of the founders of Jadidism. He created works in Uzbek and Tajik languages such as "Kitobul-atfol" (Children's book), "Mukhtasari tarikhi islami" (Brief history of Islam), "Practical Islam", "Introduction to the geography of population". He established "Behbudi publishing house" and printed textbooks, maps of Turkestan, Bukhara, Khiva. He leads the opening of a library and reading room in Samarkand. The pen also vibrates in the field of dramaturgy. The basis of this opinion is the vivid example of the drama "Padarkush".

"Padarkush" is the first example of Uzbek drama, which everyone recognized unanimously. Experts evaluate it as a work that started a new Uzbek literature, both in terms of genre and content.

He well understood the role of science in the development of society and calls on young people to learn science, and condemns ignorance in the drama "Padarkush".

Since 1913, Behbudi has been engaged in press work. From April, the Samarkand newspaper will be published. The newspaper is published in Turkish and Persian, twice a week, first with two, then four pages. After 45 issues, it stopped being published due to lack of funds. On August 20 of the same year, he started publishing Oyna magazine. Mahmudhoja Behbudi regularly appears in the press with journalistic articles. It is known that acute social and political problems of his time were raised in his articles. His views on the issues of nation and nationality are expressed in his "Kitabi muntakhabi georifiyai general and model geography textbook", "Duma and Muslims of Turkestan", "Khayr ul-umuri avsatuho", "An impartial appeal to the respected Samarkandians" and similar articles. The national idea, which matured in the mind of enlightened moderns, occupies a leading place in the publicism of Mahmudhoja Behbudi.

In 1913, Behbudi was active in publishing the magazine "Oyna". He went to Turkey and Egypt, brought important books and textbooks from there, prepared a new school program, wrote textbooks and books. As a writer, he wrote his drama "Padarkush", and more than two hundred articles and works in Uzbek and Tajik languages. The colorful literary and cultural heritage left by Behbudi has become a unique gem of our nation.

Behbudi believes that knowledge becomes a decisive force in social development only when it is mastered by the masses. He connected the freedom of the nation with the level of enlightenment and believed that enlightenment is the only factor for achieving freedom. He concludes that social justice cannot be restored until the nation becomes free and establishes its own independent state. Behbudi required people to learn the achievements of worldly sciences, to follow the social requirements of their time, mainly to follow the norms of morality and to form humanitarian ideas, and to be familiar with the teachings of Islam. He connected the freedom of the nation with the level of enlightenment and believed that enlightenment is the only factor for achieving freedom. To understand the homeland, to feel love for it, you need to look at history. In Behbudi's words, Moziy is the scale of truth. In order to appreciate independence, peace and well-being, it is necessary to know how these days were reached, how many patriots were martyred, and how much work was done in the name of freedom and liberty. Said by Mahmudhoja Behbudi - Right is taken, not given! Abdurauf Fitrat's speech - Let's unite, let's ignore personal disputes and class divisions! His calls for the unification of the nation, in a certain sense, were of great importance in our achievement of independence.

The problems raised by Behbudi in his article 100 years ago have not lost their relevance even today. For example, in his article, Behbudi wrote: "When you say the diseases that bite us, do you suspect wounds and diseases? Or, do you mean tuberculosis, syphilis and leprosy? No, it is even worse and even more debilitating, widow, house-wrecking and alienating. one pain, we - Turkestans, who have invaded the cities and villages, or even our semi-civilized, semi-savage classes, have affected our entire existence and brought us to crisis, danger and hell, two deadly enemies named Azo medicine". Behbudi's activities, the details of the political life of that time were not sufficiently studied during the

former Union, the topic was considered closed. By the time of independence, historians and experts began to pay attention to this topic, especially the political activities of the Jadids.

In conclusion, it is sustainable to educate today's young people to become well-rounded people by studying the life and work of thinkers like Mahmudhoja Behbudi, who made a great contribution to the development of the education system and culture by instilling our national and religious values, which have been raised and appreciated in our country for centuries, into the consciousness of society. it is one of the conditions for ensuring the social and spiritual environment and is among the priority tasks.

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Rezyume: *Ushbu maqolada Mahmudxo'ja Behbudiyning hayot yo'li, ilmiy-ijodiy sohadagi mashaqqatli izlanishlari, milliy uyg'onish yo'lida olib borgan islohotlari haqida ma'lumotlar berilgan.*

Резюме: *В данной статье представлена информация о жизненном пути Махмудходжи Бехбуди, его кропотливых исследованиях в научной и творческой сферах, а также о реформах, проведенных им в области национального пробуждения.*

Kalit so'zlar: *madrasa, maktab, darsliklar, ma'rifat, milliy uyg'onish, bilim, til, hayot.*

Ключевые слова: *медресе, школа, учебники, просвещение, национальное пробуждение, знание, язык, жизнь.*

UNDERSTAND THE ESSENCE OF MIRACLES THROUGH THE TRADITIONS OF THE MASTER-STUDENT AND NATIONAL VALUES IN THE DEVELOPMENT OF ARTISTIC POTTERY.

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Summary: *Through this article, the creation of creative works from the raw material of clay in the art of pottery is covered in detail. The development stages of pottery art in our country, the relevance of artistic pottery in the next period have been described in detail. The purpose and tasks of the article is to explain the relevance of the master-apprentice traditions of pottery in Uzbekistan. The schools and styles of artistic pottery, modern pottery, i.e. pottery of the period of independence, are explained in detail. Based on the main content of the research, the role and importance of simple clay, which is considered a natural raw material, in people's lives has been highlighted.*

Key words: *Art ceramics, master-disciple traditions, artisans, earth and clay, ornaments, potter's wheel, master potter, work and effort, color and mystery, ceramics, equipment.*

Shahrisabz, a unique historical city of Kashkadarya region, which is a part of our heavenly land, has raised many great people, scientists, craftsmen. Even today, there are many young people in Sahrisabz who continue the traditions of their ancestors. Despite the fact that the potters of the oasis are young, they have a lot of experience in pottery making. Shahrisabz is an ancient center of both architecture and household pottery.

The products they create are unique, each one is unique, turned into a work of art by the skill of a simple clay master. It is produced according to the master-apprentice tradition, the work process is not too difficult, women can also work in pottery. Only the work is very hard, many years of experience are required. It is necessary to work for at least 10-15 years. In the course of work, the advice of teachers is always used, mistakes and shortcomings are considered together.

Archeological objects found in Africa and other parts of Central Asia show that pottery has been developed in our country since ancient times. Over the centuries, craftsmanship has improved and different styles of pottery have emerged in different places. People's masters prepare dishes and decorate them with high taste.

Pottery products are characterized by the clarity and simplicity of decoration, the jugs made by young potters show that the traditions continue. are creating. Every item put on the exhibition by potters attracts the attention of tourists with its elegant patterns and natural colors. Craft centers of each region have been formed in our country since ancient times, each of them has preserved its own local characteristics.

Any young craftsman who wants to practice pottery and artistic pottery must first have an understanding of clay, the types of clay and where to find the necessary clay. Red clay is used as a natural raw material from the earth. It goes through the stages of making the clay needed for use in pottery.

The most fragrant tea can be made only in a porcelain teapot, and the tastiest cow's milk and yogurt can be made only in clay pots. In a word, clay is always a modern material, without which it is impossible to imagine both the present and the future. Since ancient times, clay has served man not only as a raw material for ceramics and construction. Doctors used mud as a healing agent. For example, a plaster made of yellow clay diluted with vinegar was useful in the treatment of varicose veins. To relieve joint pain, mud diluted in hot water with kerosene is applied to painful areas.

Physicians prefer clay heated on a stove to treat fevers. Various pottery vessels were used as medical equipment. Medicines were prepared in some vessels, and dried herbs and roots were stored in others. The first medical heating equipment was also made of clay. Initially, the jug with a narrow neck

was used as a heating device, with hot water inside. Then, at the suggestion of doctors, potters began to make special medical heating pads in the form of a low bowl with a wide flat bottom and a neck. Even a simple red brick is said to be used for health. It is heated in the oven, then poured over onion skins, and the resulting smoke is inhaled. Modern medicine confirms that such inhalation helps with colds. With the help of red hot brick, you can disinfect the room, remove mosquitoes and insects from it.

Clay is found everywhere and in its raw form (before cooking) can be white, gray, black, blue, green, brown, red, yellow. Sometimes the color of the clay is given by organic substances that burn during cooking. For example, red clay turns white to yellow after firing.

The composition of clay found in nature is so diverse that underground you can find a ready mix of clay suitable for making all kinds of pottery, from bright white faience vessels to red stove bricks. Each potter had his own precious mines, or, more simply, clay pits, however small. Sometimes it was necessary to travel many kilometers for the necessary clay and extract it from the pits with incredible difficulties. In addition, one deposit is not always enough, because different products require different clay composition.

For example, oily black clay is suitable for polished ceramics. It is very plastic, forms perfectly on the potter's wheel and can be glazed after drying. Products made of such clay are impermeable to moisture and have high durability. Products made of clay containing a large amount of sand have a rough surface and, in addition, they strongly absorb air. However, lean clay rarely cracks during drying and cooking. For good mud, mud with moderate oil content is preferred.

Oily mud contains no less than 5% sand, and non-oily mud contains up to 30% sand. An average oily fluid mud contains 15% sand. In pottery, finding the right clay to shape the pieces is important. Healthy clay can occur at a shallow depth below the soil layer. It can be found in different places of our living area. Mud layers are often found on the banks of rivers and lakes, on the slopes of ravines.

A number of steps are carried out from the selected soil to the finished clay that the potter uses. Clay preparation technology has its own difficulty and is mainly carried out with hard work. The clay used in the workshop is made to a soft state and left to cool for a while. After the clay has been thoroughly kneaded, i.e. after it has been cooked, it is started to be shaped, and the better the pottery clay, the more beautiful works of art can be made.

The Rishton pottery school is famous for its fine and perfect designs, while the ceramics typical of the Khorezm school are very beautiful with their pictorial decorations in blue and turquoise colors. Bright colors and integrated patterns are visible in the creations of Samarkand masters, while the Tashkent pottery school is distinguished by dark embossed lines. Shakhrisabz pottery products can be recognized from afar at any exhibition, because they have their traditional color.

Lead glaze and yellow-green, brown paints occupy an important place in the resounding elegance of Bukhara-Samarkand ceramics. Plant-like motifs dominate the decoration of products made based on the traditions of "Asian ceramics", geometric motifs and animal images are rarely used. They are mainly used in Gijduvan pottery. The masters of Gijduvan and Shakhrisabz work with brushes, while the masters of Urgut and Denov often use drawings.

Potters deeply feel the responsibility of their service, the secrets of the industry are carefully taught by the apprentices, because the thousand-year-old traditions are passed down to generations due to the experience of the master's skills, to continue the traditions of the school to develop the art of Shakhrisabz, to be able to present a pinch of soil to the guests as a masterpiece of Kashkadarya. Such dreams of hand-made flower masters have come true, sincere feelings, love for craftsmanship, desire for creativity never leave pottery.

There are pottery schools in many regions of Uzbekistan. Master potters study the styles and traditions of all pottery schools in order to become a master of their craft. Through this exchange of experience, they create their own style and direction. There is a power of mutual influence of schools in

the development of pottery art. Each work of art is based on accumulated experience and knowledge, and such creative works do not lose their beauty over the years.

Pottery made in each school differs from each other in its style, color and secret. If the valley pottery uses more blue color, the fire color, that is, warm colors, is used more in the oasis. Taking these characteristics into account, we can find out in which region the pottery works were made.

In Shahrissabz pottery, the images given to the objects are used as patterned decoration by stylizing the images of birds, peppers, pomegranates and flowers. Through such ornaments, used by master potters since ancient times, we can understand the pottery school, style and skill of that area. The image of a bird with a bird's head, used by more Shakhrisabz master potters in the oasis, has its own symbolism as a "bird of happiness". Depicting birds through such stylization is the master's skill and expresses his inner feelings through his own work of art. Such a unique style of painting can be found only in the foothills of the oasis, Shakhrisabz, Kitab and Yakkabog. Young artisans used it as a decorative image not only in ceramics, but also in other types of applied art.

Our national craftsmanship plays a very important role in the development of tourism and attracting more attention of tourists. Among them, the works of ceramic art are increasing the interest of the guests of our country. Tourists who come to our country do not leave without seeing the Oksaroy complex in Shahrissabz. Taking advantage of these opportunities, it is necessary to take measures to display pottery works around the complex. This will be one of the activities for the development of pottery. We need to attract the attention of the guests of our country and our nationality through such works of art.

Pottery art is one of the important branches of national craftsmanship. A number of works are being carried out in the oasis to ensure the implementation of the decision of the President of Uzbekistan on the rapid development and support of pottery. Students of applied art (art ceramics) are studying at the Faculty of Arts of Karshi State University in the oasis center. These students contribute to the development of our national pottery with their creative works. In artistic ceramics, any work is polished and polished to the level of a work of art. Workshops were organized to create a free creative environment for them.

The techniques of making ceramics passed down from the masters to the next generation are preserved even now. By studying the style of each school, improving knowledge in the field of ceramics, interpreting the work of masters in a new way, creative works are being carried out without losing our nationality. There are young people who have entered the field of ceramics, and they need hard work, perseverance and patience. A potter must be matured over the years, as the master potters say, if he accepts clay, he becomes a potter, if he does not accept it, he cannot learn this craft. This process is very complicated and determines the fate of the potter.

Working in the art of pottery shapes our young people as skillful potters, the environment in which they live, diligence and the search for knowledge. It is necessary not only to continue the traditions of the oasis, but to follow the traditions of the master-disciple.

Pottery art is one of the important branches of our national craftsmanship. A number of works are being carried out in the oasis to ensure the implementation of the decision of the President of Uzbekistan on the rapid development and support of pottery. The development of creative activity of young people in the field of ceramics depends on the continuity of the master-disciple tradition. The forms and styles used by the masters in their creative works, the technique and technology of forming vessels, color and cooking processes are used as values by the current young master potters. Without departing from such traditions, each young potter is working in a new direction and in terms of design, without departing from the national style. This process should be continued for the potters of the next generation, which will certainly serve for the development of our national craft.

Nowadays, young people are given many opportunities to develop crafts, especially pottery. It is necessary to develop the ancient pottery in a new system, use modern techniques and technology, and show the works of art created from this craft to the world. The policy of supporting our youth by

organizing large-scale exhibitions of ceramic works of this type is being carried out to improve the economy through the domestic and foreign markets.

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Rezyume: Ushbu maqola orqali kulolchilik san'atining xom ashyo loydan ijodiy asarlar yaratilishligi atroflicha yoritilgan. Yurtimizda kulolchilik san'atining rivojlanish bosqichlari, keyingi davrda badiiy kulolchiligini dolzarbliqi atroflicha aytib o'tilgan.

Maqola mavzusining maqsad va vazifalarini yozishda, O'zbekistonda kulolchilikning ustozshogird an'analari dolzarbligini, yoritib berishdan iborat. Badiiy kulolchilikning maktablari, uslublari, zamonaviy kulolchilik ya'ni mustaqillik davri kulolchiligi to'g'risida batafsil yoritilgan. Tadqiqotning asosiy mazmuni mavzudan kelib chiqqan holda, tabiiy xom ashyo hisoblangan oddiygina loy insonlar hayotida tutgan o'rni va ahamiyati yoritib o'tilgan.

Резюме: В этой статье подробно рассматривается создание творческих произведений из глиняного сырья в гончарном искусстве. Подробно описаны этапы развития гончарного искусства в нашей стране, актуальность художественной керамики в следующий период.

Цель и задачи статьи – объяснить актуальность традиции мастера-ученика традиций гончарного дела в Узбекистане. Подробно объяснены школы и стили художественного гончарного искусства, современного гончарного искусства, то есть гончарного искусства периода независимости. На основании основного содержания исследования выделена роль и значение простой глины, которая считается природным сырьем, в жизни людей.

Tayanch iboralar: Badiiy keramika, ustalik an'analari, hunarmandlar, tuproq va gilos, zargarlik buyumlari, sopol g'ildirak, usta potter, mehnat va mehnat, rang va glazur, keramika, asboblari.

Ключевые слова: Художественная керамика, традиции мастера-ученика, ремесленники, почва и глина, украшения, гончарный круг, мастер-гончар, труд и тяжелая работа, цвет и глазурь, керамика, инструменты.

THE ROLE OF ALISHER NAVOI'S WORKS IN THE SPIRITUAL DEVELOPMENT OF STUDENTS

(Using the example of the work "Mahbub ul-Kulub")

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Summary: *In the article, Alisher Navoi's thoughts on the formation of a perfect person, his educational and moral views are important in the development of pedagogical thought.*

Key words: *"Khamsa", "Mahbub ul-Kulub", "Munozhot", "Wakfiya", "Majolisun nafais", "Mukhokamat ul-Lugatain", "Arbain", architecture, linguistics, madrasah.*

Alisher Navoi, the owner of encyclopedic knowledge and a great thinker, paid great attention to the development of various fields of science and art: literature, history, linguistics, music, calligraphy, fine arts, architecture, etc. In his major educational and moral works, such as "Khamsa", "Mahbub ul-Kulub" (Mahbub ul-Qulub), as well as in the works "Munozhot" (Munozhot), "Wakfiya" (Waqfiya), "Majolisun nafais" (Majolisun nafa'is), "Mukhokamat ul-lugatayn" (Muhokamat ul-lug'atayn) and Abdurakhman Jami "Arbain" (Arba'iyin). The translation of his work "Chikhil Hadith" ("Forty Hadiths") expresses his views on education.

Alisher Navoi in his artistic works created images of a perfect person and expressed thoughts about education, and in his educational and ethical works he described the meaning, ways and methods of forming a perfect person.

Alisher Navoi, as a progressive and enlightened scientist of his time, traditionally continued the beliefs of Islamic education and the views of thinkers who came before him. In particular, it sheds light on the role of science in human development, the importance of intelligence and the essence of intellectual education.

Navoi's imagination is characterized by the highest qualities characteristic of a perfect person: creativity, ability, love. That is why, explaining the importance of science, Navoi describes science as a lamp that illuminates the darkness, a sun that illuminates the path of life, a factor that shows the true image of a person.

The word is what brings message to the soul about the beloved:

- that is, a scientist, an intelligent person overcomes all difficulties to achieve his goal, whoever takes science as a basis will never stumble, will never be humiliated and claims that this is to serve humanity.

In the eleventh article of the epic "Ayratul Abror" (Hairatul Abror), Alisher Navoi interprets science in exactly this way, compares it with the sun, moon and day and wants to say that it brings happiness to a person.

That is, this article: "Whoever speaks of the sky of knowledge, as high as the stars, shows the letters of the Arabic alphabet: "ayn" - the sun, "lom" - the moon, "mim" - illuminating day and night; from the dark appearance of the evening of ignorance, revealing the dawn of ignorance from the night of darkness; that night he expresses the opinion that the entire unfortunate body of a scientist is higher than the sun, and the entire existence of an ignorant person is wealth, even if he has wealth, he is humiliated by the earth.

Therefore, Alisher Navoi considers knowledge one of the most necessary qualities for human improvement. He described science as a factor that saves people and people from ignorance. Accordingly, in his works he encourages people to be knowledgeable. He believes that learning is everyone's human duty. He argues that the purpose of acquiring knowledge is to serve the happy and prosperous life of one's people, one's country. For example, characterizing Ulugbek as one of such people, he says that his name remains forever in science and history.

Navoi also pays special attention to the issue of applying his knowledge in life and applying in life what he has learned. For example, in his work “Mahbub ul-Kulub” it seems that a person who did not use knowledge after learning it did not plow the field or did not rejoice in the harvest after sowing the seeds.

Even the poet himself, at the age of 4-5, took lessons and memorized Farididdin Attar’s work “Mantik ut-tair” (Mantiq ut-tair). The heroes of Navoi's works, Kays and Farhadlar, also begin to study at the age of 4-5 and show their abilities in acquiring knowledge.

Alisher Navoi advocates the study of all subjects in education. At the same time, he pays attention to the development of science, collecting through them scientists and virtues.

For example, Navoi opened a school next to his Ikhlosia madrasah and allocated funds from his fund. Every student studying at the madrasah was required to observe strict discipline in science. It also encourages independent study of science and learning from mature scientists.

Navoi gathered mature scientists of his time in the Ikhlosia madrasah he founded, and students interested in science studied with the leaders of science in these madrasahs.

Therefore, Navoi shows the importance of science in the intellectual development of every young person, and also pays attention to the issues of improving the living standards of people with knowledge, which are the basis for the development of society.

Navoi repeatedly emphasized that the ideal person he dreamed of should not be content with only knowledge, but should also have patience, generosity, hard work, honesty, honesty, humility, decency, love and loyalty and similar qualities. That is why Alisher Navoi, based on his life experience, wrote the work “Mahbub ul-Kulub” (“Beloved of Hearts”) and expressed his moral views in this work.

The purpose of writing this work is also stated in the introduction: “I run down every street and meet all kinds of people from all over the world. I learned the nature of good and evil, experienced good and bad qualities.”.

I have tasted the essence and poison of good and evil. Some of the interlocutors of the people of that time and some of the friends of the people of that time do not know about these incidents, and their hearts are not affected by this good and bad.

It was considered necessary to inform and warn friends and associates about such situations, so that they would have information about the characteristics of each category and knowledge about the state of each caste, then they would rush to the service of worthy people and they would consider it necessary to refrain from talking with unworthy people and not open to all people of secret secrets. Don't let Satan's adjectives become a plaything for his tricks and deceptions. My experience is good enough for young people who want to talk and get closer to different people.”

The work consists of three parts, as Navoi himself stated: the first part is devoted to the character, condition and mood of different types of people; the second part – good verbs and bad verbs; and the third part consists of the appearance of various benefits and stories, that is, rosaries about good deeds and qualities.

In the introduction, Alisher Navoi divides people into two groups: “Suitable People” and “Unsuitable People”, and emphasizes the need to avoid these unsuitable people in life and use Mahbub ul-Kulub (Mahbub ul-Kulub) to distinguish between good and evil. So, based on his life experiences, Navoi encourages young people to become real, perfect people and says that he can use this work to draw conclusions from life lessons. According to Navoi, the ideal person is a clean, hardworking, conscientious, honest, correct, generous, polite, modest, creative, kind person. He says that in order to develop such qualities in people, it is necessary to cultivate these noble qualities in them, and he defines moral qualities and explains their consequences.

For example: In the first part of the work “Mahbub ul-Kulub” (Mahbub ul-Kulub), Navoi pays special attention to their spiritual characteristics, reflecting on people of different classes. He says that when kings act justly, peace, tranquility, prosperity and abundance reign in the country and that his servants act fairly towards the king. Reflecting on different professions, he pays special attention to the

professional qualities, conscience and behavior of each owner of the profession. For example, doctors are called “A doctor should be skilled in his work and compassionate with the sick, be harmonious and wise by nature. A. Navoi continues his thoughts: let his words be gentle and entertaining, he has modesty and goodwill. Navoi dwells on the moral qualities of a person and good character; first of all, he gives a definition of each human virtue.

To good deeds he adds such qualities as contentment, patience, modesty and decency, love and fidelity, generosity, hard work, kindness, gentle volunteerism (hilm) and after describing each, he concludes his thought with reprimands and stories. Along with describing the above qualities, Navoi talks about the bad vices opposite them, and also describes ways to get rid of them.

Reflecting on manners, which is considered the most important criterion of morality, he said: “Manners earn the blessings of the elders for the younger ones, and they will enjoy the benefits of blessings for life. Adab puts the love of the small in the hearts of the great, and this love remains in the heart forever.

It makes young people look great. It closes the door to public disrespect and protects against ridicule and humiliation. Love is embellished and embellished by morals, and friendship flourishes and is valued through manners. Modesty and humility make the mirror of friendship shine and light comes from both sides. He bows and respects the humble and polite and reaps the precious harvest he sows. These qualities are the starting point of good morals in human relationships, and this quality cannot interfere with strong love. If both parties behave well, politeness and humility will lead to bowing. So, the basis of good behavior is manners, this is the beginning of all human qualities in the eyes of Navoi. In this way, the characteristics of an ideal person are determined.

Because the qualities characteristic of a real person - contentment, patience, humility, love, loyalty, generosity, hard work, generosity, kindness, hilm (gentle volunteering) are contained in the same decent person. For example, contentment is a fountain that does not dry up when water is drawn. It's a treasure, it doesn't diminish when you spend it. This field, its seed, bears the fruits of honor and love. This tree - its branch bears the fruits of shyness and respect.

So, contentment is a sign of humanity. It protects a person from bad days. Because satisfaction, no matter how difficult and difficult it may be, frees a person from worries about himself, from friends and enemies, from selfishness. That is why the scientist emphasizes how great it is to never give in to greed, to live your life with honest work, and describes greed as the scourge of humanity.

“Patience is bitter but beneficial, hard but repels harm, patience is the key to joy and the opener of bonds. Nature is taken away from him, like a bitterly speaking exhorter, but the goal is formed on earth. Like a doctor who gives bad medicine, the patient will suffer from it, but in the end health will come,” it is said.

It is defined as the real criterion of generosity and humanity: “Generosity is the fruitful tree of the garden of humanity, but it is the sweet fruit of the tree, the wavy river of the land of humanity, but it is the real pearl of the tidal river. So, at the heart of generosity, Navoi understands that he is receiving thankless help in alleviating people's problems, and encourages this quality in him.

Kindness, kindness and generosity were highlighted as components of generosity: “Kindness is the kindness that bears the burden of the victim's hardships and saves him from those hardships. Karam is not mentioning the work done, not mentioning it, not thanking the person and not putting it in their face,” he explains its true nature.

Navoi presents loyalty and modesty as a whole and says that they cannot be separated from each other. That is why the Navoi proverb “There is no humility in the dishonest, there is no loyalty in the dishonest” became a saying. However, Navoi did not perceive any donations as generosity. He condemned wastefulness and generosity, which was called generosity.

He says that satisfaction is triumph and glory, and calls the majestic greedy person despicable. That is why it is important to value youth, cultivate the best qualities in yourself, refrain from lust, as well as arrogance, vanity, actions only for one's own benefit, lies, ignorance and hypocrisy, greed,

rashness, envy. He condemns such vices as gossip, laziness, corruption, laziness and neglect of the forbidden, and also describes ways to get rid of them.

For example, this reprimand seems to be proof of our above-stated opinion: “A painful heart is a burning lamp; fountain of youth; The ostrich must not be burdened; fry in grass, fry in elish; the taste of soup is with salt, the kindness of a person is with words; if you want health, don’t say too much; if you want honor, don’t say too much; good clothes, jewelry for coins; do not ask good things from the greedy, do not ask much from the poor; It’s amazing how a miser keeps his savings. It is strange that a good person can betray; do not demand modesty from the corrupt, do not demand loyalty from the oppressor. His next verse seems to be a judgment that these evil vices can lead a person to spiritual death.

Thus, Alisher Navoi, along with artistic works, in his educational and moral works understood contentment, justice, generosity, hard work, kindness, fidelity, correctness, humility, honesty, manners, etc. He believed that if a person has good qualities, there will be no evil and malice, the society in which such people live will prosper, and all people will be able to achieve happiness.

In accordance with the educational requirements of his time and the traditions of education, the works of Alisher Navoi also paid serious attention to the physical health and strength of a person in order to become perfect in all respects.

In accordance with the educational requirements of his time and the traditions of education, the works of Alisher Navoi also paid serious attention to the physical health and strength of a person in order to become perfect in all respects.

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Rezyume: *Maqolada Alisher Navoiyning barkamol shaxs shakllanishiga oid pedagogik tafakkurining ahamiyati, uning ma'rifiy va axloqiy qarashlari haqida so'z boradi.*

Резюме: *В статье важны в развитии педагогической мысли Алишера Навои о формировании совершенного человека, его воспитательные и нравственные взгляды.*

Kalit so'zlar: *"Khamsa", "Mahbub ul-Kulub", "Munojot", "Vaqqiya", "Majolisun nafais", "Mukhokamat ul-lug'atayn", "Arbain", me'morchilik, tilshunoslik, madrasa.*

Ключевые слова: *«Хамса», «Махбуб ул-Кулуб», «Муноджот», «Вакфия», «Маджолисун нафайс», «Мухокамат ул-лугатайн», «Арбаин», архитектура, языкознания, медресе.*

**TECHNOLOGY FOR DEVELOPING THE COMPETENCE OF MUSIC TEACHERS OF
GENERAL SECONDARY SCHOOLS IN WORKING WITH MUSICAL COMPUTER
PROGRAMS. (IN THE EXAMPLE OF KARAOKE COMPUTER PROGRAMS)**

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Summary: This article describes the technology of developing the skills of music culture teachers of general secondary schools to work with karaoke performance programs from musical computer programs.

Key words: Karaoke, phonograms, player, musical programs, music lesson, music methodology, new technologies, music theory, computer technology.

Introduction.

Simple and interesting "methods" should be used in order not to strain the thinking abilities of the students when introducing the innovative system. In the course of the lesson, it will be interesting for the student, especially if he draws landscapes in the heart of nature, he will create freely. By enriching their spirituality, first of all, the growing young generation should have independent thinking about their ancestors, wealth, especially our traditions and customs. As we develop the rules of independent thinking in students, it is especially important for elementary school students to speak burro-burro, to be able to think independently, and most importantly, to consciously perceive national music and draw a picture vividly.

When introducing innovative technology in music lessons, it is necessary to pay attention to educational skills when bringing innovations from other countries. Because the music art of another country may not match our age-old music or reflect our traditions. Then we can give an example of their strengths, such as the fact that even elementary school students can easily sing according to the notes, they can distinguish speed and tempo, they can quickly progress to different musical sounds, and they can sing in two voices as a team.

Another aspect of innovative technology is to connect, study, and implement skills such as natural skills, creative research, deep knowledge of techniques, music and visual arts, as well as speech and imagination. In particular, by learning the norms of morality, the child's sense of striving for perfection, expanding the scope of knowledge, and fighting for survival increases.

The main part.

Karaoke. Karaoke (a compound word formed from the joining of two Japanese words chán kōng 空[から] kara - emptiness and English orchestra - orchestra; in Japanese: オーケストラ - ōkesutora, literally "empty orchestra") - non-professional or entertainment without the use of electronic devices, in advance allows you to sing to recorded music (phonogram or plus); and the device itself.

The issue of the use of phonograms by authors and performers is controversial and remains open to this day.

Working principle. As for the sound device, the singer's voice from the microphone is mixed with the phonograph music in the mixer and output to the amplifier (hereinafter referred to as the speaker system).

In the case of Karaoke video, the TV/monitor screen will display a list of files with player songs. After selecting a track, the soundtrack will play and the lyrics will appear in a scrolling line below. In most media, the credits alternate with each new line and change color depending on the fragment of the song played. This is done for convenience so that one knows where to enter and how to sing properly.

As a rule, these devices have the function of adjusting the volume from the microphone; as well as frequent, echo canceller and reverb. Most of them have a filter that cuts off the frequency range of

the sound in the phonogram (necessary when using original audio tracks that are not specially prepared for karaoke) - in this way the voice of the original performer is muted/muffled.

Recently, the capabilities of karaoke systems have expanded significantly. In addition to background sound and video, CDs appeared with the functions of changing the tempo and key of the melody, automatically turning on and off the sound of the solo, programming and sorting compositions, conducting team competitions, and scoring singing.

Technology. A basic karaoke machine consists of a music player, microphone inputs, a volume changer, and an audio output. Some low-end machines will try to suppress the sound in order to input ordinary songs into the machine and remove the original singer's voice; but this has historically rarely been effective. The most common machines are CD+G, Laser Disc, VCD or DVD players with microphone inputs and built-in audio mixers, although VHS VCRs are sometimes used. CD+G players use a special track called a subcode to encode the songs and images displayed on the screen, while other formats display audio and video natively.

Many karaoke machines have technology that electronically changes the pitch of the music, allowing amateur singers to select a key that matches their vocal range while maintaining the original tempo of the song. (Older systems using cassettes changed the volume by changing the playback speed, but none of these are still on the market, and there are almost no commercial uses for them.)

A popular game with karaoke is to enter a random number and call out a song that the participants try to sing. Some machines have this game pre-programmed to be genre-restricted so that they can't call out an obscure national anthem that none of the contestants can sing. This game has become known as "Kamikaze Karaoke" or "Karaoke Roulette" in the United States and parts of Canada.

Many low-end entertainment systems have a karaoke mode that attempts to remove the vocal track from regular audio CDs using the Out Of Phase Stereo (OOPS) technique. This is done by extracting the center channel, which takes advantage of the fact that vocals are centered in most stereo recordings. This means that as part of a piece of music, the sound has equal volume and no phase difference in both stereo channels. The left channel of the original audio is subtracted from the right channel to obtain a quasi-karaoke (mono) track. The Sega Saturn also has a "mute" function based on the same principle, able to adjust the pitch of a song to match the singer's vocal range.

Karaoke music sources.

Optical discs. There are two main formats of optical discs for karaoke - CD and DVD. The difference between these formats is that karaoke CDs contain MIDI files, so the quality is usually lower than DVDs. Their sound quality depends on the sound card installed in the computer or musical instrument. Professional cards (and samplers for bank recording) are now only available on Korg, Roland, Kurzweil and Yamaha professional keyboards. In the latter, the sound is recorded in WMA format, which allows you to add a soundtrack of professional singers.

Also, OGG[clarify] format is used to record songs on DVD karaoke discs, which allows to achieve better sound quality.

Manufacturers such as AST and Studio Evolution include a built-in database of songs stored on the device and updated over the Internet - songs that cannot be played on other karaoke systems.

Hard drives. A professional karaoke machine's hard drive holds between 10,000 and 58,000 protected songs. The repertoire is updated via the Internet or by replacing the hard drive - most of the time you can't write your karaoke files to the hard drive, sometimes at your personal request you will be given the option to record your file in the next update. Storing karaoke files on hard drives is used by AST and Studio Evolution manufacturers.

This crude approach often results in poor denoising performance. General effects - hearing reverb effects on the vocal track (since the stereo reverb is not centered on the vocals); Also, other instruments (snare/bass drum, bass guitar, and solos) mixed into the center are removed, making this approach a trick on these devices. In recent years, new techniques based on fast Fourier transform have

been developed. While still not perfect, the results are usually much better than with older techniques, as stereo left and right comparisons can be made at individual frequencies.

Files

MP3. Karaoke mp3 files are recorded in studios or represent the original musical composition without words, which the artist uses during the performance. Mp3 is the most common format in professional karaoke systems.

WAVE. An improved version of MP3 files that are often used by the leading manufacturers of karaoke systems (ART SYSTEM and Evolution).

MIDI. The MIDI Karaoke file format is an unofficial extension for MIDI files. Text is added to the music, which can be played using a dedicated program (such as Encore! Karaoke Player, KMid, or PyKaraoke), but does not affect playback by normal MIDI players. Also used in professional AST karaoke systems, played through a dedicated MIDI sound card. Provides an alternative to MP3 and WAV format files. Allows you to expand the range of transposition (changing the key and tempo) of songs without losing the quality of the performance.

OGG. A compressed audio file that uses the free, non-proprietary Ogg Vorbis audio compression. The ogg format is similar to the .MP3 format, but sounds better than an MP3 file of the same size, and can contain audio metadata, including artist and track information.

UltraStar. One of the popular modern formats is a set of files for UltraStar and compatible programs. This is a text file containing the song's title, author, version, style, language, background, lyrics (divided into pieces by its pitch and duration), etc., as well as the file names of the song's cover, the background used during the singing, and the composition itself. The last field is called "MP3" but is used for other file formats as well.

EMP. One of the latest karaoke formats for Encore! Karaoke player and compatible. This is a file that contains a soundtrack (usually background music with background vocals) and lyrics synced with syllables. This format is now becoming increasingly popular in karaoke clubs. In most cases, original backing tracks are used as the soundtrack, sung by the singers themselves.

CD+G. CD+G is an image file with music. It uses the Compact Disc plus Graphics (CDG) format. It often has low resolution images. It is used in conjunction with an audio file to store song tracks on a CD. CD+G (format) is commonly used by karaoke software to display graphics and text while playing music.

Now for those of you who don't know karaoke, karaoke is the Japanese abbreviation of karappo (where the first syllable is "kara"), which means "empty" and "okesutura" (the first syllable of which is taken as "oke"), "orchestra". " means Literally translated, karaoke means "empty orchestra", and a karaoke song means singing accompanied by a recorded instrument, that is, songs that were originally recorded without the singer's voice, or songs where the singer's voice was artificially removed using special software.

The fashionable pastime called "karaoke", which appeared in Japan twenty years ago, has long gained many followers around the world. Russia was no exception: those who love to sing actively show their talent in karaoke bars, karaoke restaurants, special karaoke clubs and karaoke halls, where they can demonstrate their vocal skills in front of a large audience and stand out from the crowd only by their presence. stands professional equipment and a comfortable environment for singing.

Fields of application of karaoke. Karaoke turned out to be fun and, on the face of it, has no utilitarian pretensions even today - except maybe to keep the neighbors out of the noise, as many house-singers have moved from apartments to karaoke rooms.

However, let's try to look at it from a slightly different perspective. Karaoke has many possibilities for entertainment and other purposes. If we talk about entertainment, then you can not only sing your favorite songs in karaoke, but also use karaoke as a basis for holding discos, holidays, parties, etc., which is important, for example, for DJs. Their arsenal of possibilities can be significantly

expanded thanks to various competitions and games, for example, "Who can sing the least out of tune", "Find the melody", "Who can make the funniest parody of a famous artist".

Other aspects of karaoke singing are not interesting, but here you need to be careful when choosing equipment and software. Karaoke opens wide prospects for rising talents and those who sing well and want to record popular hits in their own performance: recording CDs with popular songs in their own performance is much cheaper than going to a recording studio. Karaoke singing can be useful for anyone who needs to develop their voice and ear for music, because karaoke programs give you a more or less objective assessment of your performance, keeping a close eye on all your mistakes. There is another interesting trend: experts have concluded that karaoke songs help to learn a spoken foreign language, and therefore the corresponding exercises have begun to appear on some educational CDs for children.

Karaoke on computer. If you want to speak in front of a very large audience, then you have a direct route to a karaoke room with professional equipment and an interested audience at your service. It's also perfect for a party with friends.

And if you are completely satisfied with your home audience or you don't need listeners at all, then you can easily install the same karaoke room within the walls of your apartment. There are several options for home karaoke: you can buy a music center with a built-in karaoke player, buy a home karaoke player or Leadsinger radio microphones, or create a library of karaoke files with a simple computer and install special programs.

Karaoke file formats. Typically, a karaoke file is a midi file with the MID, KAR, or ST3 extension and contains the sheet music of the piece. An important feature of karaoke files is that the music is written not in the usual digital form, but in the form of notes (a sequence of commands) for various instruments, the sound of which is simulated by the computer's sound card. In addition, karaoke files contain lyrics that are displayed synchronously on the monitor screen. This greatly simplifies the process of singing: on the one hand, there is no need to memorize the lyrics, on the other hand, it is much easier to fall in time, because the words need to be sung at the same time. or another shown in opposite color.

It is not difficult to create your own collection of karaoke files - most of them are distributed on the Internet, and first of all you should look at <http://www.karaoke.ru/>, where there are thousands of songs, including by Russian performers.

If you cannot find a karaoke file for your favorite song on the Internet, there is a second option, which is not so simple and fast: you can use special programs that allow you to create karaoke files.

Types of karaoke programs. All karaoke programs can be divided into three groups: karaoke players, karaoke file editors, and various utilities designed mainly for changing and organizing karaoke files, but the first two groups of programs are the most common.

First, about karaoke players or karaoke players. In theory, you can play karaoke files in the standard Windows player, but you won't experience all the benefits of real karaoke players. The difference in the latter is that the lyrics of the song being played scroll around the screen while you listen, and the syllables or words that need to be sung at a certain time are highlighted in a different color - this is a standard karaoke tip. it's easier for deaf performers to get in time with the beat (this is considered perfectly acceptable karaoke singing). If desired, all this can be supplemented with a video sequence that rotates while the song plays. In addition, karaoke players have other functions: they allow you to change the tempo, volume and tone, and display the words in a separate window and in full screen.

It would be a waste to list karaoke players that are offered on the computer market today, because the list is huge, so we will focus only on the most interesting and popular ones. The most popular program is GoSing Karaoke Player, but Russian karaoke fans mostly prefer vanBasco's Karaoke Player. Both programs are still free. A more professional solution is the popular but already

paid Karaoke Kanta Player application. And if we talk about learning to sing, then the best solution for Russians can be the local paid program Vocal Jam.

The second group of karaoke software, as mentioned above, consists of karaoke file editors. The choice here is not as wide as karaoke players, but you can find a program for every taste and budget, from professional programs aimed primarily at studios to free editors with minimal functions. The leader in this group for Russian users is the free local Karaoke Maker program, which can be a great choice for home users who do not go beyond singing with the whole family during the holidays. To create karaoke files in the West, home users prefer the free Karaoke 5 software, which successfully combines the capabilities of a karaoke player, editor and organizer with the inexpensive winOKE software. However, Karaoke 5 has problems recognizing Russian fonts, so it is not presented in this review. As for professionals, they should first pay attention to software products such as DART Karaoke Studio, PowerKaraoke Plus and Karaoke Builder Studio.

Let's get acquainted with the characteristics of some karaoke software performers.

GoSing Karaoke Player 2.71

GoSing (Figure 1) is the world's most popular program for singing karaoke on a computer. It is compact, very easy to use, accessible to a wide range of users and perfect for house parties.

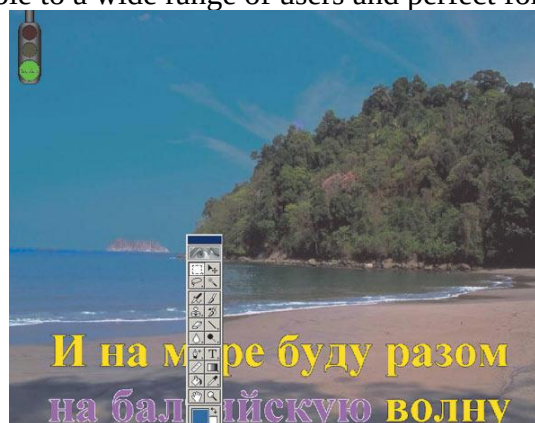


Figure 1. GoSing is a karaoke performance game

The program is compatible with KAR, MID and MK1 formats and has only one context menu that allows you to load and launch karaoke files, change the graphic background screen and determine the font of the lyrics displayed on the screen, which is quite enough. to sing with the family.

vanBasco's Karaoke Player 2.5.3

VanBasco's Karaoke Player is one of the richest free karaoke players out there, so it can appeal even to professionals. In addition, the program has a user-friendly interface, which makes it attractive for inexperienced users.



Figure 2. Open the MIDI output window from the main window

This karaoke player is designed to play KAR files as well as standard MIDI files with MID, MIDI and RMI extensions. The application has a multi-window, well-designed, ergonomic interface: each window can be opened or closed, and the settings of some windows can be completely changed according to the user's preferences.

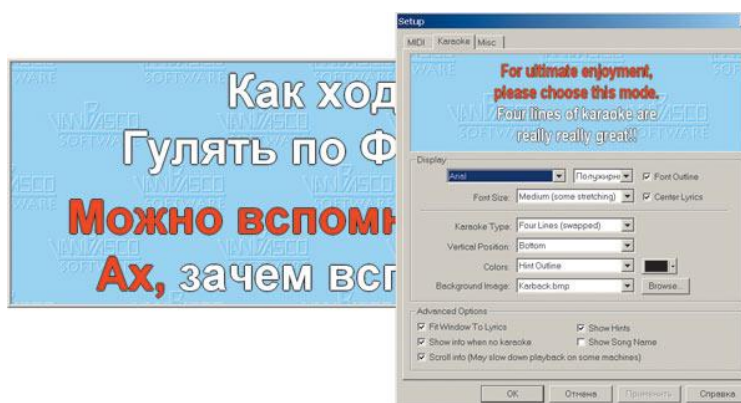


Figure 3. Setting up the karaoke window

A total of six windows can be opened in the program:

- Main window - the main window for controlling all other windows (Fig. 2) and for changing program settings. You can use the search engine button in the browser window to make it easier to find the songs you want;
- Karaoke window - a window that displays the lyrics of the song being played. The window is fully customizable: you can adjust both the window size and text display properties (font, text size and color, number of lines, etc.) (Figure 3). The display of the lyrics is very convenient: the two current lines to be sung are shown at the bottom, and the next two are shown at the top. It's handy for playing the tune in time even if you can't hear it or don't know the lyrics;
- Control window - a control window for changing the volume while adjusting the tempo and tone at the same time. If desired, the sound settings can be saved in the current playlist, and the changed settings will be automatically set when a certain song is selected in the future;
- MIDI output window - a panel for displaying the MIDI data of the KAR file in real time, which allows not only to visually evaluate the contribution of each instrument to the tone, but also to delete unnecessary instruments or control some instruments if necessary, and the result is the same as before or another Save in KAR file;
- Piano window - a piano window that displays the notes being played in real time in sync with the soundtrack. This window can be useful in the practical study of vocal art;
- Playlist window (Fig. 4) - a window of the selected musical repertoire or a playlist created in the form of two panels: on the left - the songs selected for this playlist, on the second - the working folder of the disc. Any playlist can contain up to several thousand songs located in different folders on the hard drive, and the playlist editor allows you to easily add new songs to a particular playlist, sort the list of songs in ascending and descending order, create new playlists, rename and delete them.

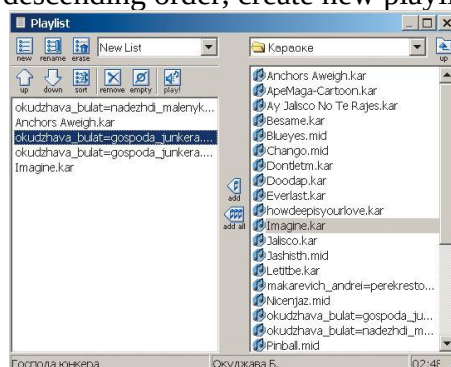


Figure 4. Playlist window
Vocal Jam 2.0

Vocal Jam is rightfully considered the best local karaoke program for singing on the computer (Figure 5) and is interesting from several points of view. Offering great opportunities for those who

love to sing karaoke in a group, it's a simple and easy learning tool for anyone who needs to develop their voice and ear for music, as well as helping those who want to record hits. own performance.



Figure 5. Singing karaoke in the Vocal Jam program

The program has many advantages. Thus, the objective assessment of singing in the scores will be useful for all those who are improving in the art of singing, and at the same time, it will allow to organize comic karaoke competitions and increase the constant and objective monitoring of the performance with quick indication of the mistakes made. performance level. Improved sound allows you to record popular songs in high quality at your own performance, and these services allow you to do without expensive recording studios. Vocal recording mode records a song or soundtrack in standard WAV format (16-bit/44.1kHz). In this case, you can try several times and save all the options, then listen to them and choose the best one, and using the usual CD burning procedure, you can even create a real audio CD if you want. songs in your performance.

The unique technique allows you to quickly learn to read notes and develop an ear for music, and the self-study solfeggio course is based on many years of Russian practice and includes many examples based on folk songs and romances. and classical repertoire.

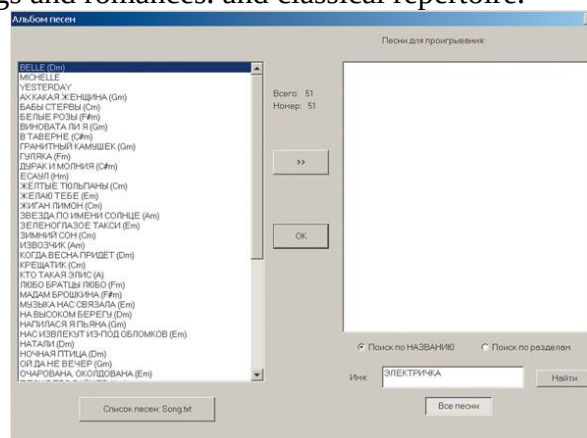


Figure 6. Quickly search for a song in an album

Vocal Jam's ease of use, ease of use, and versatility cannot be understated:

- song input, tempo and key control via the keyboard - this allows you to quickly switch from song to song; in addition, while one artist is singing, you can prepare a program for the next artist using a simple key combination;
- Individual setting of parameters for each of the 16 MIDI channels;
- display the remaining time until the end of the song being played on the control panel;
- the ability to use still (BMP and JPEG formats) and video screen savers (AVI format);
- quickly search for the right songs to keep up with the fast pace of speaker switching at karaoke parties (Figure 6);
- possibility to change design styles: Studio, Video or Standard;

- automatic recording of performers' performances, which is useful in the educational process and interesting in the company, because it is liked by both the singers themselves and their friends, especially when there are funny situations;
- the ability to record video files in AVI and MPEG formats based on karaoke files and create entire video karaoke albums on CDs;
- support for a large number of file formats (from the usual KAR and ST3 to MID, MP3, AVI, etc.), which allows you to always have a wide repertoire of songs, because the necessary files (for) in popular music formats. For example, WAV and MP3) are much easier to find than karaoke files.

Summary.

In the independent task given to the student, it is recommended to widely use game methods in the implementation of musical activities, instrumental creations.

Music classes are distinguished from other subjects in school by their artistic, fun and imaginative experiences. Music has a positive effect on the mental and moral education of children. Artistic education is its logical content.

Music is an art associated with a definite measure of time. If you don't tune in to the rhythm of the music and listen to every element of it, you won't understand the piece perfectly. That's why when you listen to music again and again, new artistic aspects of it open up.

Music lessons are organized on the basis of didactic theory and principles of pedagogy. These principles determine the main requirements and directions of the lesson content, methods and structure of the lesson.

The main laws of the teaching process are clearly expressed in the didactic principles. The principles of teaching should be understood as the primary laws that determine the content, methods, and forms of organization of the educational process underlying the teaching and the entire process of its implementation.

There is an integral relationship between the principles. Violation of one of them automatically leads to the violation of the other. From the principles come the rules of teaching. rules determine the nature of certain methods of the teacher and lead to the implementation of principles. rules are developed not only by didactics, but also by specific methods relevant to the educational situation.

The organization of the principles of music education in a modern form is carried out based on the creative abilities of the teacher. All kinds of principles can be taught in a modern way, but it is necessary to organize the program according to the age of the child without mixing. For example, when using the principles of awareness and activity, the lesson itself is interesting, so the teacher can conduct the lesson in the form of an interesting game method, but as I mentioned above, it is necessary to achieve non-tension in this principle, because this principle is implemented in connection with the mental processes of children.

Principles of Consciousness and Activity. This principle is one of the leading principles of didactics. The principles of awareness and activity of students based on the leadership role of the pedagogue imply that during the teaching process, the student has a deep understanding of the studied musical materials, understands the content and essence of the works, and as a result, is able to apply the acquired knowledge and skills in practice, because mastering musical knowledge is the main quality of the student's mental activity. depends on the process.

Conscious perception and knowledge of music, in turn, ensures that the work is kept stable in terms of artistic tone and logic. It is important not to forget that attention, interest and consciously learned song melody and listened music will remain in the memory for a lifetime. Although it does not repeat itself from time to time. Methodical features of music, its polyphony, song materials, musical records, not just memorizing the dates of the life of composers, but also to think about some images and ideas created by awakening various emotional feelings, mental experiences, imagination, aesthetic and artistic tastes in children. should be encouraged.

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Rezyume: *Ushbu maqolada umumiy o'rta ta'lim maktablari musiqa madaniyati fani o'qituvchilarining musiqiy kompyuter dasturlaridan karaoke ijrochi dasturlari bilan ishlash ko'nikmalarini rivojlantirish texnologiyasi yoritib berilgan.*

Резюме: *В статье описана технология развития умений учителей музыкальной культуры общеобразовательных школ работать с программами караоке-исполнений из музыкальных компьютерных программ.*

Kalit so'zlar: *Karaoke, fonogrammalar, pleer, musiqiy dasturlar, musiqa darsi, musiqa metodikasi, yangi texnologiyalar, musiqa nazariyasi, kompyuter texnologiyalari.*

Ключевые слова: *Караоке, фонограммы, проигрыватель, музыкальные программы, урок музыки, музыкальная методика, новые технологии, теория музыки, компьютерные технологии.*

DEVELOPMENT OF INSTRUMENTAL GENRES – SONATAS AND SUITES IN THE HISTORY OF WORLD MUSICAL CULTURE

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Summary: *In the article, the author reflects on the features of the development of the instrumental music genre. According to the author, the first instrumental sonata was written by Giovanni Gabrieli, and the suite developed on the basis of European dance music.*

Key words: *sonata, suite, violin, piano, trio sonata, classical sonata, romantic sonata, solo, composer, bass, flute, veolanchel.*

INTRODUKTION.

Music is considered an extremely important tool for shaping the younger generation into a comprehensively developed personality. In fact, music plays its role in raising the spiritual consciousness of the rising young generation, improving their talent in all aspects. Music is of great importance in the education of a person; it creates a world of magical melodies, wonderful feelings and emotional experiences. Due to its unique nature, music has a great influence on the spiritual world of youth, helps to shape their artistic and moral culture, instills national pride and patriotism, develops creativity, sophistication and artistic taste, and serves to foster independence and initiative. Using this power meaningfully and productively is the sacred duty of every music professional.

I.A. Karimov, the first president of the Republic of Uzbekistan, said: “The love of melody, song, and art is formed among our people from childhood, in a family environment. It will not be an exaggeration to say that it is difficult to find in our country a person who does not have a dutor, doir or other musical instrument at home, living without feeling the life-giving effect of music in his life” [2.141]. There are different genres of music, and in this article we will talk about the sonata and suite, instrumental genres that belong to world musical culture.

In the first (XVI century) any instrumental work was called a sonata (Italian Sonare - to give sound) to distinguish it from vocal works. The first sonata “Piano and Forte” was created by the Italian composer, organist and teacher Giovanni Gabrieli (1554–1612). In the 17th century, the “trio sonata”, composed for two instruments, became widespread: one for high-sounding instruments (violin or flute), the other for low-sounding ones (cello or bassoon), accompanied by keyboard instruments. The first solo violin sonata was written by the Italian composer Biagio Marini (1594–1663).

A cyclic sonata, consisting of four to six contrasting movements, developed in the work of Arcangelo Corelli, then Torelli, Antonio Vivaldi, Giuseppe Tartini, and Henry Purcell. Domenico Scarlatti composed a piano sonata in one movement. In the 2nd half of the XVIII th century, the works of the Viennese classics Haydn (40 piano sonatas) and Mozart (20 piano sonatas, 35 violin and piano sonatas) formed the classical type of sonata. By this time, sonatas began to be called cyclic, three- or four-part works created for no more than two instruments.

The sonata remained one of the leading genres in the work of Ludwig van Beethoven. Beethoven composed 32 sonatas for piano (including Pathétique No. 8, Lunar No. 14, Pastoral No. 15, Aurora No. 21, Appassionata No. 23), 10 sonatas for violin and piano (including Cruise No. 9), 5 sonatas for cello and piano.

The sonata plays an important role in the work of romantic composers - Schubert (21 sonatas for piano, 3 sonatas for violin and piano), Chopin (3 piano sonatas, including B-flat minor funeral march; 1 for cello and piano), Schumann (3 for piano, 2 for violin and piano). The famous B minor piano sonata by F. Liszt (1853) presented and promoted the multi-movement sonata, popular in the West, as 1 (one) partial work.

The Sonata-Duet for solo instruments (violin, cello, clarinet) and piano was significantly developed by Haydn, Mozart, Beethoven, Schubert, Schumann and Johannes Brahms.

In Russia, the Sonata was created at the end of the XVIII th century in the works of Ivan Evstafeevich Khandoshkin (6 sonatas for violin, 3 sonatas for solo violin, 1 sonata for violin and bass) and Dmitry Stepanovich Bortansky (5 sonatas for piano, 3 sonatas for violin and piano). Tchaikovsky, Glazunov, Rachmaninov, Scriabin among the Russian composers of the late XIX th and early XX th centuries created the best piano sonatas. Among the Russian composers of this genre during the Soviet period were Myaskovsky (9 piano sonatas), Prokofiev (14 sonatas), Kabalevsky (3 piano sonatas), Shostakovich (2 piano sonatas).

Among the ensemble sonata cycles of Uzbekistan, a special place is occupied by the sonatas for flute and piano, the cello and piano sonata, and the violin and piano sonatas of G. Mushel.

Also important is N.Zakirov's one-movement violin sonata "Sonata-badikha" (1975), which combines national music and European traditions. This sonata uses some modern compositional and performance techniques.

There are many different genres of music, one of which is dance music, that is, music with a specific rhythm designed to accompany dance. Dance music must have a clear rhythm, be worthy of the specific character, rhythm and tempo of each dance, different music is created for each dance. Their rhythm is also different: but this rhythm must obey and unite with the rhythm of the dance. Most dance music is instrumental. One such piece of instrumental music is the Suite.

The suite arose on the basis of Western dance music. The suite appeared in professional art in Italy in the XVI th century. The suite appeared as a separate instrumental genre at the end of the XVI th century in the works of late Renaissance composers Andrea Gabrieli (1510-1586) and Giovanni Gabrieli (1557-1613). Their suites featured sequential allemandes and chimes, performed mostly quietly and quickly. Later, a sequence of dance tunes such as allemande, courante, sarabande and gigue in instrumental music was adopted as a suite. The creator of the French suite for harpsichord is Jacques de Chambonierre (1602-1672). The orchestral suite for the ballet was written by Jean-Baptiste Lully.

Suite (from the French suite - "row", "sequence", "alternation") is one of the main varieties of cyclic form in instrumental music; consists of several large parts, which in the ancient suite genre usually contrast with each other. In music, a sequence of folk dance tunes is called a suite.

Orchestral concert suites that appeared at the end of the XVII th century could have had a completely different structure: At that time, orchestral concert suites consisted of a larger number of parts and included marches, minuets, gavottes, rigadons, chaconnes, "arias" and other dance melodies. These were the first German orchestral suites by I. G. Fischer and G. Muffat, written under the influence of the theatrical music of J. B. Lully, a tradition that was continued in the orchestral suites of J. S. Bach and G. F. Telemann.

In the second half of the 18th century, chamber and orchestral suites were replaced by the classical sonata, which lost its original dance character, and later by the classical symphony, which emerged as an independent genre.

Allemande dance music, performed seriously and leisurely at courts, appeared in England, France and the Netherlands in the XVI th century. The Allemande appeared at this time based on the signals of trumpeters to greet high-ranking people - princes, counts and dukes. These solemn sounds are adapted to the royal steps of the courtiers, so the dance is performed as a march - in 2/4 or 4/4 meters. Later the allemande became part of the suite.

The dance music of the French, known as courante, also originated as court music and was performed quite quickly-accordingly, the name is notable for its complexity. Its time signature is basically 3/4 or 3/8.

The ancient dance music of Spain, the sarabande, was previously danced only by women.

The folk dance of the jig, performed by the ancient English sailors, is performed quickly and cheerfully in tripartite time, i.e. 3/8, 3/4, 6/8, 6/4. The Allemande, Courante, Sarabande and Jig, which we mentioned above, entered the ancient suite in the same order.

Yu.Tyulin, a major musicologist and composer of the suite genre in Uzbekistan, was one of the first to study Uzbek music in his works, make theoretical adjustments in the field of folk and professional music, and use folklore materials. In this regard, three of his symphonic works “Song without Words”, “Symphonic Piece” and “Uzbek Suite” were created. The last two works formed the basis for the creation of a four-part “Uzbek Suite” for a small symphony orchestra by composer V. Voloshinov, who creatively worked on various samples of song and dance folklore created after the war. The suite included “Prelude”, “Iranian Melody”, “Scherso” and “March”. Composer S. Yudakov created his vocal-symphonic suite “Mirzachul” in the suite genre.

In 1940, G. Mushel's trio-suite “Five Pieces” was created, the theme of which was the folk melody “Ferganacha”. “Samarkand Suite” by G. Mushel (late 1950s-early 1960s) is known for its piano duet. The suite consists of six parts, each of which has a program related to the past of old Samarkand. These are “Kadimgi Samarkand ustalariga qasida” (“Ode to the masters of ancient Samarkand”), Part II-“Afrosiyobning kimsasiz tepaliklarida” (“On the desert hills of Afrosiab”), Part III-“Zarafshonning gullaghan vodiysi” (“Blooming Valley of Zarafshan”), IV part-“Madrasa peshtoklaridagi oy shulalari” (“Moonlight on the roofs of the madrasah”), Part V - “Shohizinda dakhmalari koronguligida” (in the darkness of Shokhizindi), Part VI-“Ko‘tarilayotgan quyosh nurlari ostidagi Samarkand” (Samarkand under the rays of the rising sun) consists from parts called.

The three-part “Dance Suite” by S. Yudakov is also very intense. The first part of the suite is based on the Khorezm folk song “Norim-Norim” and was created as a symphonic score. The second part of the suite is based on the “Azerbaijani Lyrical Dance”. The third part is called “Fargonacha raks” (“Fergana dance”) and is one of the most striking parts of the suite. It is based on the famous Uzbek folk song “Kaylarga boray?”.

It is characteristic that in the post-war years interest in the suite was renewed. This is due to the fact that the younger generation of Uzbek composers began their creative path. Such a suite became a kind of laboratory of symphonic music, a school for mastering the national style for composers who began their work with the advantage of its expository stability and folk genre. There is a clear legitimacy to this genre. Uzbek composers do not directly copy folk melodies, but strive to create more melodic themes, then Russian musicians directly turned to original folk tunes.

Over the years, D. Zokirov, in his second suite, managed to create a coherent, at the same time vibrantly developing image, without resorting to quotations and copying folk tunes. This opinion is especially relevant in relation to the second part of the suite, which has a very impressive and generalized lyrical theme. The breadth of breath of the melody, the speed of its development, and the completeness of the cycle turned a small part of the suite into a “lyric poem”, which became known under this name. If D. Zakirov's suite is most interesting in the second, lyrical part, then D. Soatkulov paid special attention to the final part of his suite. The finale has the program title “Sailga namoish”.

It is noteworthy that it is widely used in the everyday direction, characteristic of the suites of the 1940-1950s, when creating program images and when depicting popular everyday scenes. For example: among them are most of A. Kozlovsky's works: “Tog‘ Syutasi” (“Mountain Suite”) (1948), “Hasil Bayram” (1950), “Uzbek Choreographic Suite” (1952), two suites on Karakalpak melodies (1956-1962). “Korakalpokcha Suite” (1956) is material of the folk genre, expressed in the form of a program work. With the exception of the first part, the remaining four parts have titles. The suite is called “Shŷr kullar oldida” (“Before the salt lakes”), “Korakalpokcha march”, “Keksa chŷpon hikoyasi” (“The story of the old shepherd”), “Bayram Tongi” (“Festive morning”).

Saifi Jalil, one of the Uzbek composers, also wrote works in the suite genre. His suite “Symphonic Landscapes of Tashkent” (1969) reflects the motive of social citizenship. In this regard, “Sketches for string instruments and piano” by B. Gienko (1972) and “Symphonic sketches” (1964) by

the young composer M. Makhmudov were also created. The musical expressions of these suites are interpreted as scenes from the landscapes of the Uzbek land. However, here the theme of nature is expressed in an unusual way for Uzbek music, in an elegant figurative manner in the musical style of impressionism. In musical practice, in addition to independent suites, ballet suites by G. Mushel were created called “Rakkosa” (“Dancer”), “Kashmir kushig‘i” (“Kashmir Song”), “Bakht Guli” (“Flower of Happiness”), which arose on the basis genres of musical theater and film music, and these works made a great contribution to the development of the suite of instrumental music.

Thus, the music of Sonata and Suite, considered instrumental genres of world musical culture, which first appeared in Italy in the XVI th century, began to occupy a strong place in the work of Uzbek composers from the 40s of the XIX th century.

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Rezyume: Musiqaning turli-tuman janrlari mavjud bo‘lib, ushbu maqolada jahon musiqa madaniyatiga mansub cholg‘u janrlaridan Sonata va Syuita haqida fikr yuritiladi.

Резюме: В статье автор размышляет об особенностях развития жанра инструментальной музыки. По мнению автора, первую инструментальную сонату написал Джованни Габриели, а сюита развивался по основе Европейской танцевальной музыки.

Kalit so‘zlar: sonata, syuita, skripka, fortepiano, trio-sonata, klassicheskaya sonata, romanticheskaya sonata, solo, kompozitor, bas, fleyta, veolanchel.

Ключевые слова: sonata, сюита, скрипка, фортепиано, трио-соната, классическая соната, романтическая соната, соло, композитор, бас, флейта, веоланчел.

IN MUSIC CULTURE LESSONS STUDY OF THE PERFORMING ART OF UZBEK FOLK INSTRUMENTS IN THE PERIOD BEFORE THE 19TH CENTURY

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Summary: *In this article, a deeper and comprehensive study of our national music culture than ever before, its wide promotion among the people, Uzbek music culture and instruments and instrumental music, which are one of its essential parts, have been rich and complex visual possibilities since ancient times. ownership They, like the music of all nations, are rich in their own history and traditions, and are excellent examples of our national musical instruments and performing arts music, which have come down to us over the centuries, and their colors are highlighted.*

Key words: *Uzbek folk instruments, orchestra, wind instrument, military music, dancers' game, artists, skilled performers, large music book, stringed instruments, sweet songs, percussion musical instruments, musical culture.*

Introduction.

Every nation can appreciate the art of other nations if it loves its national musical heritage, honors the traditions of its ancestors, appropriates and appreciates it. After all, the musical traditions that have reached us are proof of the strength of the chain of generations. In this regard, it is worth noting that classical music works belonging to status and status paths, which are the spiritual wealth of our people, have preserved their artistic and aesthetic potential at a high level. Studying, researching and passing them on to future generations is one of the urgent issues of our time.

It is known that the musical culture of the Uzbek people is rich in national instruments, such as tanbur, dutor, gijjak, flute, koshnay, trumpet, chang, ganon, oud, rubob, circle and drum. "they have found a worthy place in the practice of skilled performers with their perfection. Because each instrument has its history of formation, performance possibilities, unique, attractive sound and fans. It is the sacred duty of every coach to scientifically and theoretically research all their secrets and convey them to the younger generation.

Main part.

Musical instruments are the material and spiritual wealth of nations. For example, each nation has its own musical instruments that celebrate its national heritage, traditions that have emerged over the ages through national melodies, and are suitable for them through examples of practical art created specific to the national spirituality of the nation. It should be recognized that the world of Uzbek musical instruments is rich and colorful in terms of meaning and material. In addition, the history and heritage of any nation with high spirituality is also great.

"It is known from history that Uzbek folk instruments are colorful and unique, and musical instruments suitable for all branches of music have been formed and developed over centuries. Utmish scholars Al Farabi (9th century) in his "Big Book of Music", Safiuddin Urmavi (12th century) in his musical treatise, Abdulkhadir Maroghi (14th century) in his treatise "Jami alalkhan fil'm al-musikai", Ahmadi (14th century) Zainul al-Din Husayni (15th century) in the "discourse of words" in the treatise "Risola dar bayaniy kununiy va practical muzik", Abdurakhman Jami (15th century) in the "Musical treatise", Darvesh Ali Changi (17th century) in the "Musical treatise" who touched upon various aspects of research issues and described the classification of musical instruments of their time. In particular, it is possible to learn from the works of Alisher Navoi, a great thinker poet, that he emphasized the most sophisticated and necessary branches of music science [3].

By the 20th century, scientists such as Eikhorn, Abdurauf Fitrat, Viktor Belyaev. They have been effective in learning musical instruments. Historical manuscripts, literary works and musical treatises contain the names of all the musical instruments used by the peoples of Central Asia. Musical

brochures contain information about instruments (shape, construction, proportions of strings, preparation criteria, trees used for instruments, etc.). Among them, stringed instruments: borbad, oud, rud, kobiz, chang, rubob, tanbur, dutor. There are different levels of information about musical instruments: rukhafza, shammoma, organim, sibizi, nayi anbon, chagona, bolamon trumpet, flute, kushnay, trumpet, percussion instruments: tambourine, circle, nogora, safayil.

Usually, musical instruments have been used in various areas of performance practice. First of all, it should be noted that the simplest instruments were created and widely used in everyday life. Such instruments belong to every nation. It exists in the world of musical instruments and is still in use. Among the musical instruments used in Uzbek folk performance are chan, kobiz, and sibizgi. The preparation and performance of these instruments are also distinguished by their simplicity.

With the passage of time and the development of society, musical instruments have also developed and improved in accordance with the times. In historical sources, information such as the fact that Kolmuhammad Uddi put a fourth string on the oud instrument, or that the gijjak instrument first had two strings, then the third and fourth strings, are related to the improvement of the instruments. In the process of improvement, the enrichment of the criteria of the form and sound of musical instruments has gained great importance. These two criteria served as the basis for determining the meaning and material value of the instruments. Because a beautiful musical instrument has a beautiful sound, it should be acknowledged that it is the spiritual wealth and property of the people.

At the end of the 19th century and the beginning of the 20th century, Uzbek *ona chang* and *kashkar rubobs* were formed and started to be consumed. The words of *Ud* and *Kanun* were revived and significantly enriched the performance practice. *Afghan rubabi* and *Kurdish words* also took a worthy place in the practical process with their unique charm. A number of family examples of folk instruments, such as *chang*, *rubob*, *dutor*, *gijjak*, were created in connection with modern compositional creativity. In practice, traditional, processed, improved, restored, new modern (and electronic) types are widely used.

The science of instrumental music is known as "Organology" and provides a scientific basis for the formation, practical use, and development criteria of musical instruments. In the development of this science, along with a number of *Shark* and Western scientists, Uzbek musicologists also conducted worthy research. Ancient musical instruments were discovered through many historical monuments and later described in history, literature and music treatises.

The first images of musical instruments were carved in the places of ancient people's residences - caves, cove stones, facades of buildings, wall paintings of palaces were reflected in pictures painted on pottery and terracotta figurines.

Paintings and figurines found in the excavations of ancient places such as *Afrosiyab*, *Dalvarzin Tepa* (*Surkhandarya*), *Varakhsha* (*Bukhara*), *Ayritom*, *Zartepa*, *Kuy entered* and *Gozi entered hills* (*Kukhna Urganch*), *Panjikent* in Central Asia and Uzbekistan among them.

It is from these pictures that the passion for musical instruments can be seen, where harp, oud, flute and percussion instruments are shown in ancient pictures. Because the pictures show not only individual performers or the musical instrument itself, but the historical monuments found in the *Ayritom* excavations depict an ensemble characteristic of the ancient *Sughd* culture, that is, a number of musicians playing instruments as a group.

Information about the definition of musical instruments, their shape, structure, structural aspects, names, performers, mainly begins to be covered in literary works and musical treatises since the Middle Ages. So, by the Middle Ages, folk musical instruments, which have been formed and perfected since ancient times, have found their place in performance practice. At the same time, it won the attention of not only people, but also scientists. O. Matyokubov describes this process in detail in his book "Maqamat". "At the root of such peripheral interest in musical instruments lies the scientific concept that musical instruments are an objective reflection of performing activities. In Farabi's words, the formation of musical instruments occurs first of all in practice.

Their timbre-acoustic properties are formed and improved directly in the process of performance of pitch and sound lines. Only after that, the instruments can be the basis for the observations and generalizations of scientists." [4].

In the Middle Ages, literary figures who gave more importance to the musical process are Firdavsi, Rudaki, Hafiz, Sadi Jami and Navoi. For example: Firdavsi writes in "Shokhnoma".

An elder, a dancer with a musical instrument gathered

The king is full of joy, diamond.

Come to the peak of the flute.

A bunch of girls squealing.

Raise a glass to the honor of the great ones,

Non-stop tanbur, rubob, flute until dawn.

By the second half of the 19th century, the study of traditional Uzbek musical instruments began to be given special importance. Interest in the culture of Central Asia increases in Western countries, and specialists begin to come to study it. The information mentioned in the diaries of traveling ethnographers, historians, bandleaders, such as Marco Polo, Vambery, Ancomin, Leishek, Eichhorn, will later be published in the form of large-scale articles and books. Eichhorn himself travels all over Central Asia and achieves universal success. For the first time, he collects a collection of musical instruments and exhibits them in a number of cities.

By the 20th century, attention was paid to the study and application of popular instruments in the practice of folk performance. Abdurauf Fitrat starts this in his work and provides valuable information. After that, musicologists will present the information. Among them are V. Belyaev, F. Karomatov, T. S. Vizgo, A. Malkeeva, who made an effective contribution to the development of Central Asian musicology. In their research, it was revealed that traditional musical instruments are one of the foundations of musical culture and embody the beautiful traditions of the people's spirituality.

By the 30s and 40s of the 20th century, a new stage in the process of improving musical instruments begins. This process was connected with the development of compositional creativity in Uzbekistan in line with world standards. The executive practice is the same adapted and characterized by the introduction of the Uzbek folk instruments orchestra within the symphonic orchestra style. In practice, a number of family models of instruments were created based on the adaptation of existing instruments to the composition of the orchestra. As a result, an orchestra of folk instruments was created to replace the symphony orchestra. In order to ensure the singing of the colorful voice of the orchestra, for the master - prima, alto, tenor: for the dutor - prima, bass, contrabass; samples of gijjak - alto, kobiz bass, kobiz contrabass: chang - bass, tenor, alto were created. In the process of modern music performance, these instruments make it possible to organize groups composed of not only an orchestra, but also a chamber and various (duet, trio, quartet, quintet, octet) instruments. Kolaversa opens a big way for Uzbek music to develop and reach the world in a way typical of universal standards. O'zbek har biy zadogonlarining Yuksak ma'rifatli vakili bo'lgan Amir Temur musiqa san'atining muhim estetik ahamiyatini ma'naviy olim jangovorlik ruhiyatini oliy darajasini saqlab turuvchi katta kuch deb bilgan va uning rivojiga hamisha e'tibor berib kelgan.

He was the first in history to introduce the custom of honoring soldiers with battle flags and musical instruments. "I made an emir," he writes in his "Tuzuklar". Any emir who conquers or defeats the armies of my people should be honored with three things - a proud book, a blade and a drum, and they should call him Bahadir. It is noteworthy that in Amir Temur's armies, it was a sign of military strength, courage, badge, class and rank of warriors at every level. Amir Temur's high appreciation of the art of music. The use of musical instruments as symbols of bravery is an unprecedented event in the history of world art. Nevertheless, "Temur's rules" provides information about the widespread use of the human voice and some special intonation structures during the mobilization of warriors. "I have ordered again," he says, "to say 'Allahu Akbar' in a loud voice to the army of the horned army, so that their eyes fall, and with suran (battle call 'Ur ho-ur!') and press down on their enemy let them go."

The military orchestra of Amir Temur's army consisted of various types of wind and percussion instruments. Instruments such as drum, double drum, double drum, (naqqoi), hurricane (dukhul) and trumpet were widely used. The famous historian Ali Yazdi describes the scene of conquering a fortress as follows: 300 men were engaged in playing dukhul and trumpets in it (that is, the fortress). The owner of the military orchestra, especially the brass band, was enriched by T.S. Vizgola.

Information about the content of military music types is given in the sources, only their notes and method forms have been preserved. For example: Abduqadir Maroghiy mentions the "Zarbol-Fatkh" and "Dav SHokhi" methods created in Samarkand in his treatises.

Thus, in the period of Timur and Timurids, like many types of music, the military Amir Temur's orchestra, as well as the popular talba and copper jaros (probably plate) percussion instruments, which were named in the Muslim East, were widely used. In musical treatises, the last instrument, that is, the instrument does not provide information about the structure. However, jaros is often mentioned in A Navoi's poetry.

Chun valvala chetti kuy aro tabli basis

May I have a lot of energy

By this time, the military orchestra was enriched by another percussion instrument related to the traditions of Turkic peoples - kavarka (Navoiyda kavarga). Its image and miniatures have not been preserved, it is not mentioned in music pamphlets, but according to the information of Sharafuddin Ali Yazdi, it is a double drum.

It can be assumed that it is a type of percussion instrument belonging to the category: "The army was present, they pushed the kavar and turned away with the burgukh..."

Kavarga is mentioned a lot in "Zafarnoma" and is described as a permanent musical symbol of the battle scene.

But it is hardly mentioned in the sources of recent centuries.

The Sakhibqiran military orchestra is distinguished by the richness and diversity of its sounds, especially the brass band.

However, it can be assumed that it is a bigger version of Suran Suran, a constant participant in battles and battles, which reminds us repeatedly from the source of the last century, starting with the Holy Qur'an.

This assumption can be emphasized based on the information provided by Navoi. Suron yo'q, sur savtining safiri,

Ka bir surki, mashhar nafiri.

During the period of Timur, another new type of wind instrument - the borgu - was introduced to the traditional orchestra. Its connection with the culture of Turkish customs is also evident from its name. According to G. Dj Former, the name of the instrument was called burgu during the time of Timur.

According to Ali Yazdi, when the city of Karshi was conquered, "Sakhibkhiran gave an order to blow a drill, and then the residents of Karshi were drowsy, and the sounds of the drill hit them on the head. After the conquest of Karshi, a military musician named Darveshak Burguchi emphasized his service, and later entered Indian culture as a musical symbol of Babur's armies. "Chabig" and instruments related to the trumpet, which have been popular since ancient times, are widely used. According to the information of Khoji Abdulkadir Maroghi, In fact, if we take into account that the borgu lived in Siberia and Olgoi, the original land of the Turkic peoples, and its shah is still used as a musical instrument in the northern peoples, we can be sure that Former's statement is correct. It began to spread in Asia from the time of the Turkish khanate. A military orchestra consisting of seven drills is depicted on a 6th-7th century silver plate found in Khorezm.

The uniforms, skirts and costumes of the musicians depicted in it are very similar to the military uniforms of the Timurid era. In other words, our ancient ancestors of the drillers who served in the army of Amir Temur of the Burchilar orchestra around the Turkish commander from Khorezm added

holes for auxiliary curtains to them. Information about the tone system of military music types is given in the sources. Only their names and forms of methods have been preserved, for example, Maroghiy created in his treatises in Samarkand. He cites the methods of "Zarbolfatkh" and "Davriy SHokhi". Thus, during the period of Timur and the Timurids, military music was formed as an independent genre, and the military orchestra was enriched with new instruments.

"Shirakaif Mironshah, who was sitting right on the marble hafoz, before the end of the dancers' game, pointed to the musician and singer Maulana Mahammad Qubistan and the sharp-breathed hafiz Abdul Qadir Maroghi, ordered: "Start singing." The wail of the shrieking girl was joined by the sound of the flute, and the hearts overflowed, and Mironshah could not stop his tears, falling in love with the words of the song. The historical truth and the history of our art are evident in these verses. Indeed, according to Davlatshah Samarkandi, during the time of Temur and Timurids, art, especially music, developed. Sufi music works warning about the direction of religion and truth flourished during this period. During the time of Timur and Timurids, people of science and art were greatly appreciated. It is known from historical sources that the state's desire for world fame made it possible to gather rulers, painters and hafiz. Especially in Clavijo's "Diaries" this issue is clearly covered. Looking through the historical sources, in the correspondence between the ruler of Shiraz, Ibrahim Mirza, and the ruler of Khirot, Boysunkur Mirza, there is no question of sending Hafiz Suf Andijani to Shiraz in exchange for one hundred thousand dinars in cash, and we can see that Boysunkur Mirza did not send his favorite hafiz to Shiraz. Also, Hafiz Maroghii, who was slandered by the party organizers around Mironshah, who fell from a horse and suffered cerebral palsy, "seduced him from the path, distracted him from ruling the kingdom", Amur Temur himself was praised by his juicy voice and soft" Qur'an. Historical evidence shows that he was released after his recitation.

As we read "Boburnoma", we will learn about many types of traditional performing arts that existed in Central Asia in the 15th - 16th centuries. Maskara, taqlid, mutoiba, dance, guyandalik, muallaq, poyi Chubin (wooden leg), kushtigirs (wrestling), game of kabox, chavgon, tyrandozlik (shooting), ram, camel, elephant, stag fights, monkey games, chess and backgammon games are included. If we approach it with the concepts of our time, we should consider these different types of dances as theater - dance, circus arts and sports. During the time of the Timurid sultans, Alisher Navoi and Babur (sultans), these areas were proud, but there was no fixed border - barrier between them. Already, performers have demonstrated their skills in several types of performing arts and sports. A bright example of this is the work of Mahmoud, the wrestler who was loved by Husayn Boygaro, Alisher Navoi, all the ropes, princes of the state, he is unparalleled in his words, singing, grace, zikr, grace, especially in the science of wrestling. From this, we can include a wide range of performers - mockers of that period, mukallids, weaklings, swindlers, preachers, preachers. There are some instructive notes about them in "boburnoma".

In "Boburnoma" we come across some notes and information about the art of dance and dancers. Dancers Tahir Chaka and Maqsudali, who gained fame in Khurasan and Mavorunnahr, were in the service of Babur Mirza. For example, in 1528, Babur, while reporting on a conversation on the banks of the Ganges River, wrote that "the young men made a bit of fun and a bit of conspiracy." "Bir Pora Shokhlik" is undoubtedly an action game. We can see that the type of joint game has also developed. Also, in "Boburnoma", Sayed Bahriddin, one of the dancers, is described separately. "It was a strange winter." Gharib ul raqs is his invention."

Conclusion.

During the period of Timurids, the art of music, like other types of art, entered its advanced period. During this period, a number of treatises on music theory and performance practice were written. Dances and games of musicians and singers are performed even today.

The modern performance art of Uzbek folk instruments has inherited centuries-old traditions of its development. Their roots go back to ancient times. In 1933, the materials found in the archaeological excavations of Ayratam city, the ancient literary sources testify to the existence of

various musical instruments. It is clear to all of us that melody - love for song, art, music culture is formed in our nation from childhood, in the family environment. It is no exaggeration to say that it is difficult to find a person in our country who does not have a dutor, circle or other musical instrument at home, and who lives without feeling the life-giving effect of music in his life.

Particular attention is being paid to the issue of educating and supporting talented young people who have the ability to think nationally. The music teacher bringing samples of Uzbek musical instruments to the lesson is the most interesting part of the lesson for children. Because adult musical instruments are interesting to every child as live and real musical instruments. Musical instruments are primarily important for the development of creativity and musical learning skills in children through performance elements.

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Rezyume. Mazkur maqolada milliy musiqa madaniyatimizning har qachongidan chuqurroq va atroflicha o'rganish, uni xalq ichida keng targ'ib qilish, o'zbek musiqa madaniyati va uning assosiy qismlaridan biri bo'lgan cholg'ular va cholg'u musiqasi qadimdan boy va murakkab tasviriy imkoniyatlarga egaligi. Ular barcha xalqlar musiqasi kabi o'ziga xos tarix va an'analarga boy va asrlar osha bizgacha etib kelgan milliy cholg'ularimiz hamda ijrochilik san'ati musiqamizning ajoyib namunalari, o'zining rang-barangliklari yoritib berilgan.

Резюме: В этой статье более глубокое и всестороннее исследование нашей национальной музыкальной культуры, ее широкая пропаганда среди народа, узбекская музыкальная культура и инструменты и инструментальная музыка, являющиеся одной из ее существенных частей, с тех пор имеют богатые и сложные визуальные возможности. древние времена.владение Они, как и музыка всех народов, богаты своей историей и традициями, являются прекрасными образцами наших национальных музыкальных инструментов и исполнительского искусства, дошедшими до нас на протяжении веков, и подчеркнуты их красками.

Kalit so'zlar: o'zbek xalq cholg'ulari, orkestr, puflama cholg'u asbobi, harbiy musiqa, raqqosalar o'yini, san'at ahli, mohir ijrochilar, katta musiqa kitobi, torli cholg'ular, damli sozlar, urma cholg'ular, musiqiy madaniyat.

Ключевые слова: узбекские народные инструменты, оркестр, духовой инструмент, военная музыка, игра танцоров, артисты, искусные исполнители, большой нотный сборник, струнные инструменты, сладкие песни, ударные музыкальные инструменты, музыкальная культура.

INNOVATIVE TECHNOLOGIES IN TEACHING THE RUSSIAN LANGUAGE: TEACHING A STUDENT OR A TEACHER

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Summary: *The article is devoted to the problems of introducing innovative educational technologies into the educational process of teaching foreign languages. The authors raise a number of problematic issues, the main one of which is the lack of awareness of foreign language teachers (including Russian) in the field of innovative education. The article distinguishes between two types of technologies that are often mistaken for the same thing: information and communication technologies (ICT) and active learning technologies. If foreign language teachers are ready and want to work with ICT, then active learning, which involves live communication in the classroom, developing the cognitive, communicative and reflective skills necessary for students for cognitive activity, is very superficially familiar to them. The conclusion that the authors of the article come to is that teachers themselves must master modern innovative technologies and only then raise the question of their implementation in teaching practice.*

Keywords: *innovative technologies, methods of teaching the Russian language, ICT, student, teacher.*

Discussions about the need to introduce modern educational technologies into the practice of teaching foreign languages have been going on for quite some time. Modern education requires a transition from the “knowledge-based” model of learning to the so-called competency-based model, i.e. Instead of knowledge and skills, the teacher must develop various kinds of competencies in the student, ranging from general cultural to professional. This seriously complicated the work of teachers, since traditional teaching with its reproductive methods and long-outdated forms (lecture - seminar - practical lesson) was not conducive to active activity in the classroom. The personal-activity approach to teaching was just declared; it seemed impossible to implement it in a classroom of 50-100 people (lecture) or even (20-25).

Teaching foreign languages was in a better position - at least the number of students in groups did not exceed 10-15 people, and in the case of teaching Russian to foreigners - even less. Indeed, the methodology of teaching foreign languages, which have become very popular since the 90s, is in a better position than the methodology of teaching in higher education in general: access to advanced foreign experience, internship opportunities in the countries of the language being studied, high motivation of students, various Internet resources, etc. – all this undoubtedly contributes to improving the quality of teaching foreign languages at the university.

Despite the fact that in teaching foreign languages in general and in teaching the Russian language in particular there are no traditional lectures and seminars, since the main goal of training (according to L. V. Shcherba) is practical, and practical mastery of the language occurs in the classroom, problems associated with the formation of competencies - language, speech and communication - is more than enough.

In almost all publications on the problems of teaching foreign languages and foreigners the Russian language, the issue of introducing / using active forms of work is discussed quite actively. Unfortunately, many methodologists and practical teachers write enthusiastically about interactivity, meaning only and exclusively online learning: various forms of working with Internet resources, with authentic language material are offered, reliance is placed on watching video materials, etc. There is a feeling that teachers are looking for intermediaries between themselves and students, and they see activity and novelty not in building cognitive activity in the “teacher-student(s)” or “student-student” format, but in the interaction “student-computer”.

Indeed, the emergence of new technical means of communication has led to the emergence and active use of communication and information technologies (ICT) in all spheres of life, including education. Understanding the importance of this kind of technology for teaching methods (let us remember the now forgotten abbreviation TSO (technical teaching aids), denoting an important section of foreign language teaching methods), we consider the development and implementation of ICT in educational practice to be an important and necessary matter. All this, however, does not negate the introduction of innovative educational technologies into the educational process taking place in a regular, non-multimedia classroom. The only question is: who will implement these modern technologies? Where are these technologies taught? Will they be supported by the university leadership? Are students ready to learn in a new way? In other words, how ready are university foreign language teachers to use new active techniques and forms of educational activity?

The education that philologists and linguists receive—namely, they teach languages at universities—is focused more on the subject (“what to teach”) than on how to do it in accordance with modern requirements imposed on teachers not only by the university management and the Ministry of Education, but also the labor market into which their graduates enter.

Experience of working at the faculty of advanced training of NSTU (programs “Modern educational technologies in higher education” and “Communicative methods in teaching Russian as a foreign language”) and conducting methodological trainings and seminars in language centers and schools allows us to say that the vast majority of teachers foreign languages (including Russian) cannot explain what the specifics of using this or that method are, even if they know its name, what communicativeness in teaching is, how the stage of training and application of the studied material should be structured, what is actualization and etc. Unfortunately, teachers often do not think at all about “within what methodology they are working, because they work FROM THE TEXTBOOK, not understanding that a textbook lesson and a classroom lesson are different methodological categories, and not every textbook can be used today.” use in the classroom” [1, p. 163]. Therefore, the use of modern/innovative educational technologies should not occur in a situation where the teacher is poorly trained in methodological terms, has poor methodological knowledge, and teaches the language, which is called “without taking away from the textbook.”

The next problem that is inevitable when considering the issue of introducing any methodological innovations into the educational process: what are modern / innovative educational technologies in language teaching? If we have left ICT aside, then what remains?

An analysis of various publications on this topic has shown that, when talking about modern technologies, the authors understand by them some separate techniques and methods or forms of working with educational material, i.e. They do not take the trouble to comprehend this concept, although today this topic is quite well developed in the scientific literature. On the other hand, many practicing teachers “pass off” as innovations “methodological findings” already known in educational practice, taken from the now fashionable business trainings, courses in rhetoric and personal growth. Among other things, not everyone understands the meaning of the word “innovation,” although they use it quite actively. “Innovation” should be understood as an already implemented and proven innovation, therefore innovative technologies are educational innovations proven in world practice.

If we pose the problem more broadly and talk about active learning in general, then it is worth turning to a fairly successful list of active learning technologies that have already proven themselves in world practice (see Table 1).

Table 1. Modern educational technologies and their characteristics [2, p. 17]:

Technology	Technology content
Problem-based learning	Creation of problem situations under the guidance of a teacher and stimulation of active independent activity of students to resolve them, resulting in creative mastery of knowledge, skills, abilities and development of thinking abilities.

Project-based learning	The goal of such training is to obtain results in solving a significant theoretical or practical problem as a result of independent activity of students with a mandatory presentation of the achieved result.
Collaborative learning	Such training involves joint educational, cognitive, creative and other activities of students in a group [3].
Business games	They are used as “recreation of the context of future work in its subject and social aspects” [2, p. 29].
case study	“Initiating independent study of any real situations by students, forming their own vision of problems and their solutions, developing the ability to debate and discuss the situation with colleagues and teachers” [2, p. 39].
Development of critical thinking	Combines various strategies and techniques of educational work to develop students' cognitive, communicative and reflective skills.
Portfolio	A constant process of recording, accumulating and authentically assessing a student's individual educational results.

All technologies presented in the table can be used – and are actively used! – in the practice of teaching foreign languages, including Russian. Many practicing teachers share their experience of applying such training in their own teaching activities (see, for example, [4; 5; 6; 7]).

A foreign language teacher at a university who wants to work with the above technologies must either specifically look for such advanced training courses or work with methodological literature independently. Both paths do not guarantee success, since the courses can be “touted” with a fashionable name, but in reality they are still the same “lectures about ...” instead of learning through the development of new technologies as students with subsequent methodological analysis (“unpacking”) and showing the possibilities of using this or that technology with your students, at your university and with your learning conditions. As for self-training, after reading even the most interesting article about modern approaches / methods / techniques / forms of teaching, it is not always possible to figure out how to transfer all this into your own teaching practice, and whether this should be done in your conditions university.

To summarize, I would like to say that before speaking, writing and thinking about how to introduce something methodologically new and modern into the educational process, the teacher himself needs to comprehend and master a new methodology, an interesting method of teaching, a new educational technology – if they really allow you to make the process of language acquisition more successful. Until this system of constant (and useful!) advanced training (and not only in the field of ICT) is established in higher education, talk about the need to introduce new technologies will remain talk.

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Rezyume: Maqola chet tillarini o'qitishning o'quv jarayoniga innovatsion ta'lim texnologiyalarini joriy etish muammolariga bag'ishlangan. Mualliflar qator muammoli masalalarni ko'taradilar, ulardan asosiysi chet tili (jumladan, rus tili) o'qituvchilarining innovatsion ta'lim sohasida yetarli darajada xabardor emasligidir. Maqolada ko'pincha bir xil narsa bilan adashib qo'yiladigan ikki turdagi texnologiyalar ajratiladi: axborot-kommunikatsiya texnologiyalari (AKT) va faol o'qitish texnologiyalari. Agar chet tili o'qituvchilari AKT bilan ishlashga tayyor va tayyor bo'lsalar, u holda sinfda jonli muloqotni o'z ichiga olgan faol ta'lim, kognitiv faoliyat uchun talabalar uchun zarur bo'lgan kognitiv, kommunikativ va reflektiv ko'nikmalarni rivojlantirish ularga juda yuzaki tanish. Maqola mualliflarining xulosasi shundan iboratki, o'qituvchilarning o'zlari zamonaviy innovatsion texnologiyalarni o'zlashtirishlari va shundan keyingina ularni o'quv amaliyotiga joriy etish masalasini ko'tarishlari kerak.

Резюме: Статья посвящена проблемам внедрения в учебный процесс по обучению иностранным языкам инновационных образовательных технологий. Авторы ставят ряд проблемных вопросов, основным из которых является недостаточная осведомленность преподавателей иностранных языков (в том числе и русского) в области инновационного образования. В статье разводятся два типа технологий, часто принимаемые за одно и то же: информационно-коммуникационные технологии (ИКТ) и технологии активного обучения. Если преподаватели иностранных языков готовы и хотят работать с ИКТ, то активное обучение, предполагающее живое общение в аудитории, развивающее необходимые студентам когнитивные, коммуникативные и рефлексивные умения для познавательной деятельности, знакомо им весьма поверхностно. Вывод, к которому приходят авторы статьи: преподаватели сами должны освоить современные инновационные технологии и уже потом ставить вопрос об их внедрении в практику обучения.

Kalit so'zlar: innovatsion texnologiyalar, rus tilini o'qitish metodikasi, AKT, talaba, o'qituvchi

Ключевые слова: инновационные технологии, методика преподавания русского языка, ИКТ, студент, преподаватель

IMPROVING THE COMPETENCES OF MUSIC CULTURE TEACHERS OF GENERAL SECONDARY SCHOOLS IN WORKING WITH "KARAOKE CREATION PROGRAMS" IN MUSIC CLASSES.

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Summary: In this article, in order to improve the competence of working with "Karaoke creation programs" in music lessons of music culture teachers of general secondary schools, the method of familiarization with the program and its effective use is highlighted.

Key words: karaoke, computer program, modern lesson, computer technology, modern teacher.

Introduction.

Karaoke is a great way to have fun with friends and family. It's great fun for those who don't know how to sing but still want to be a part of it.

However, you need special equipment to enjoy karaoke at home or anywhere else. You'll need speakers, microphones, TVs, etc., which may be expensive or difficult to find depending on where you live. Fortunately, you can do karaoke from your home computer.

The main part. Many holiday events or regular evening entertainment are not complete without karaoke. However, not everyone knows that you can create such audio files yourself using special programs. All you need is to get a suitable microphone, connect it to the computer and home karaoke is ready.

Make AV Video Karaoke.

AV Video Karaoke Maker is an environment for creating karaoke in video format with a user-friendly interface. The user selects any video, and then overlays the appropriate text and music on it. It is worth noting a great function that allows automatic synchronization of subtitles and music. The application supports the following formats: AVI, MPEG, MOV, WMV, WAV, OGG, ASF, MP3, BMP, TXT. When working in the editor, all tracks are displayed in a separate menu, where you can preview or listen.

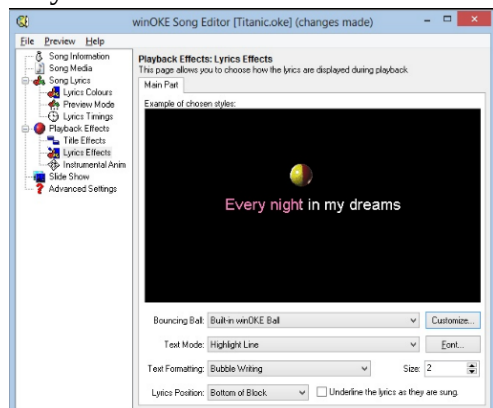
For working with subtitles, there is a small editor that supports many fonts, as well as a color palette. The developers use their own rendering engine, which allows you to create a ready-made karaoke video file without the use of additional programs. One of the disadvantages is the lack of ability to add your own fonts to the text track. AV Video Karaoke Maker is distributed for free, but the official version does not support the Russian language.

winOKE

Another convenient tool for creating karaoke yourself is winOKE. The developers have provided all the functions that can be needed to satisfy all the wishes of music lovers. The program in question can remove vocals from WAV files, create slideshows, and much more. You can check the finished project in the same program if it is in KAR, LRC, OKE, CD, WAV or MP3 format. You can export your composition to the same formats.



The main problem with WinOKE is that it is not intended for a Russian-speaking audience. Not only is there no translation of the interface, but if you create subtitles in Cyrillic, the text is also poorly supported. Therefore, this solution is not suitable for everyone. But there is a 30-day trial version on the official website.

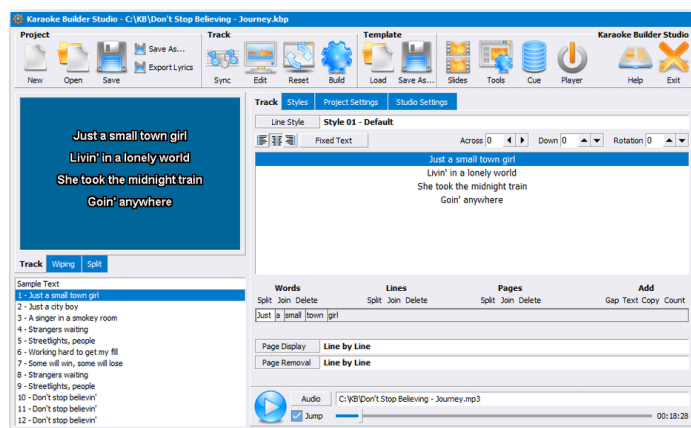


winOKE is a complete karaoke editor and player. winOKE allows you to create your own karaoke presentations in a variety of styles and using a variety of effects, including the popular bouncy ball! See what WinOKE can do

winOKE provides a simple way to sync your songs to CD, MIDI, MP3, AVI, Video or almost any file Windows plays!

winOKE also allows you to export your presentations as an AVI file for those who don't want to present on your computer.

Karaoke Builder Studio.

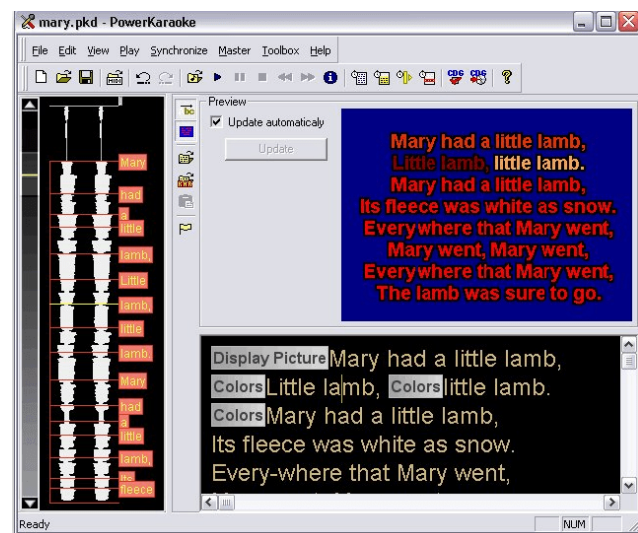


Next is a reliable solution for creating karaoke on a computer. Karaoke Builder Studio is a professional environment for synchronizing text and music files, overlaying them with video, which uses many advanced tools that are missing in simpler solutions. The program in question is used not only by amateurs, but also by music studios.

When purchasing the full version, the following functions are available: recording, importing and exporting files in WAV, MP3, KAR, MID, WMA, AVI, etc. formats, creating

blank projects, importing a text track from any file with the appropriate extension to do, as well as automatic synchronization with the possibility of further adjustment. The final project is saved not only as a media file, but also as a KBR, so you can edit it later.

PowerKaraoke.



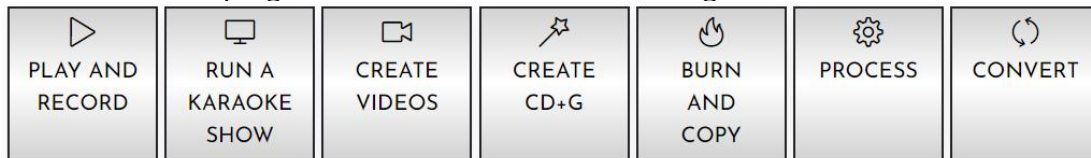
PowerKaraoke is a simple-looking program with which you can easily create simple and complex types of karaoke. The program interface is divided into four parts: a navigation menu, windows for arranging music and text tracks, as well as project preview. A plain background in different colors or user-uploaded images are used as accompanying graphics.

The finished project is exported in BIN format. It is supported by the same software, as the developers have provided their own player and other advanced players, and they can also be burned to CD. Some users claim that PowerKaraoke has not yet developed the voice recognition system needed to remove vocals, so the solution is not

suitable for all situations. In addition, the Russian language is not available in the interface

Power Karaoke offers a wide range of high-quality karaoke software for playing, creating, recording and processing karaoke songs. If you are a professional or home karaoke singer, our tools are for you.

When we visit the program site, we can see the following.



In order to make these programs easier to use, we have compiled a dstur guide as a ready-made guide for music teachers. Music teachers can use our Karaoke tutorial to teach modern lessons and keep students engaged in music lessons.

Now let's start studying the structure of the program together.

▶ Play and record Turn your computer into a CD+G player with Siglos Karaoke Player/Recorder 2. Play Karaoke CDs, BIN, CDG, MP3+G and MIDI files. Record your voice. Adjust the key and tempo of the song.

🖥️ Run a show If you are a KJ and want to use a laptop to host a professional karaoke show, Siglos Karaoke Professional is the solution for you. Take full control of the show! Siglos Karaoke Professional makes putting on a show easier than ever.

📺 Create videos Karaoke Video Creator is a program for creating karaoke videos. Easily create professional-looking songs in multiple formats to sing on your phone or computer, or share them on YouTube and other video hosting sites.

🌟 Create CD+G Our next generation CD+G software (Karaoke CD+G Creator and Karaoke CD+G Creator Pro) allows you to create your own CDG songs. You can create a track from scratch using any MP3 or WAV song as the soundtrack and a text file as the lyrics, or import and edit CD+G or MIDI (KAR).

🔥 Burn and copy Burn CD+G discs on your computer. Save tracks to hard drive. Copy discs. Power CD+G Burner 2 is a PC karaoke software for creating CD+G. Writes and reads CD+G (BIN, CDG and MP3G) tracks on most modern CD-R discs. A powerful file converter converts between different file formats.

Use Karaoke DVD Burner to burn CD+G songs to DVD discs.

And Power SCDG Ripper saves karaoke songs from SCDG discs to your computer's hard drive.

⚙️ Process Karaoke Sound Tools 3 lets you remove vocals from most CDs, change the key of a karaoke song to suit your voice, and change the tempo of a track to make it easier to sing along. You can also merge several karaoke files into one or clip songs to remove dead air.

If you want to protect your digital CD+G collection from being copied or tampered with, use our Power CD+G Stamper software.

↻️ Convert Use Ultimate CD+G to Video Karaoke Converter to convert CD+G songs (from hard drives and discs) to video (MP4, AVI or MPEG) files and play karaoke movies on your computer, phone or upload to the Internet.

Karaoke DVD Burner is a unique karaoke program for creating DVD discs from CDG songs. It allows you to play CD+G files on any DVD player and create DVDs with hundreds of songs.

User support. Customer satisfaction is our main goal. If you have any questions about our products, please visit our support pages - you'll find answers to frequently asked questions, tutorials, a user forum, and contact email addresses.

We update our karaoke software frequently - visit our website regularly to check for a new version.

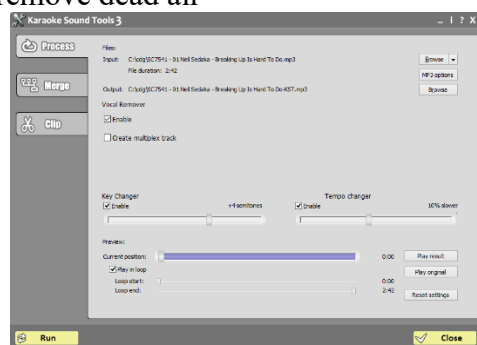
Download our karaoke software installation packages. You can try it out and see if it suits your needs.

The Karaoke software license gives you one year of technical updates. If this period expires, you will be notified during installation.

All downloads are checked for viruses and digitally signed, so you can be 100% safe, they do not contain malicious code.

We update the software regularly and only the latest version is available. Archive of old versions is not saved.

- Karaoke Sound Tools 3 allows you to:
- Remove vocals from any song
- Change the key of the song to suit your voice
- Change the tempo of a song to make it easier to sing along
- Process MP3, WAV, BIN and MP3G (MP3 and CDG) file formats
- Combine multiple tracks to create a karaoke song
- Trim karaoke tracks to remove dead air

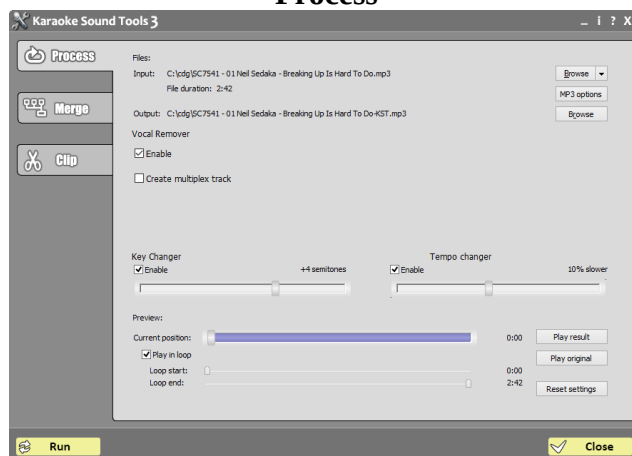


Karaoke Sound Tools 3 window

Karaoke Sound Tools 3 is an easy-to-use powerful vocal and mute software, music key and tempo changer for sound processing.

It consists of three modules:

Process



Audio cleaner to remove vocal parts from normal songs:

- Powerful new technology available in version 3!
- remove vocals from any recording
- create multiplex tracks (with vocals on the left and instrumentals on the right channel)

Music key changer to match the song to the singer's voice:

- Change pitch in a range of -12 to +12 semitones (seminote steps).

- after processing, there is no chipmunk in musical instruments or raising or lowering the tempo, the key will keep the tempo exactly as it was in the original studio recorded on your key.

- you can process karaoke songs with lyrics (BIN and MP3G)

Tempo changer to speed up or slow down the song:

- change the tempo of the song from twice as slow to twice as fast
- our tempo changer keeps the original key of the song
- you can process karaoke tracks with lyrics - they are set to sync

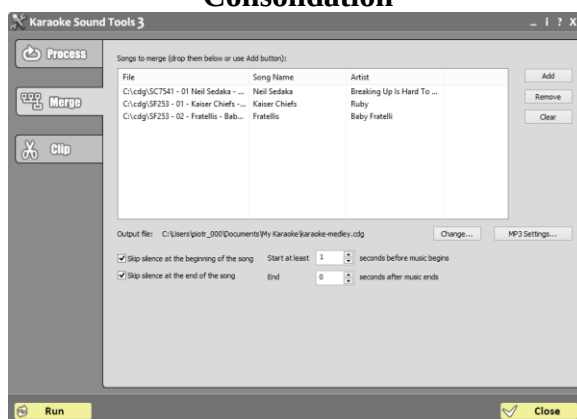
All of these karaoke sound tools are fine-tuned in real-time and can work with MP3, WAV, BIN and CDG files.

If you use a karaoke BIN or MP3G file and use our tempo changer, the graphic part of the song will be adjusted so that the lyrics match the slower or faster version of the song. No other software has this feature!

Advanced browsing gives you the following options:

- listen to the processing result in real time
- manage execution status
- play a selected part of the track in a loop for fine tuning

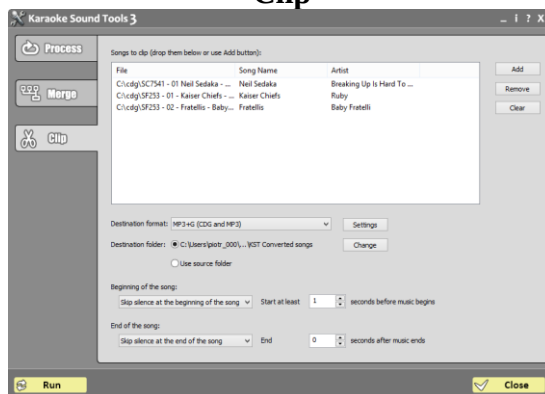
Consolidation



Merge allows you to combine multiple karaoke songs into one mix.

- Merge any number of MP3+G, ZIP or BIN files
- remove silence (dead air) between tracks

Clip



Clip allows you to remove the beginning and end of the recording.

- Process any number of MP3+G, ZIP or BIN files simultaneously
- remove silence (dead air) at the beginning or end of a song
- remove the beginning of the track and start at this point (this can be used to remove logos or images from songs)

This karaoke software includes tools that other companies sell separately at very high prices, but they do not match the quality and ease of use of Karaoke Sound Tools 3.

Don't take our word for it. Download the evaluation version now and hear the results for yourself.

System requirements. We recommend Windows 11 or Windows 10 to run our software. It runs on Windows 8. It doesn't work on Windows 7. At least 3 GB of free RAM is required. It doesn't work on Mac.

Power Karaoke is the karaoke-focused branch of DOBLON, a software development company founded in 1990.

We released our first karaoke creation tool in 2002, followed by Power CD+G Burner in 2004, a CD+G recording breakthrough. In 2012, we invented a technique to upscale CD+G graphics, and in 2013, we released the first CD+G text converter and editor.

Summary: Who, in our fast-paced age full of various demands and events, has not faced a lack of time for quality preparation? In my opinion, this question concerned every teacher.

Faced with such a problem, I thought about how, by influencing the psycho-physical characteristics of memory, I could help children quickly learn musical material. We know that the leading types of memory are visual-auditory, visual-motor, and motor-auditory. I focused on the first of those listed. And the following question arose: "With the help of what mechanism or technique can I influence the visual-auditory memory of children?"

The answer appeared immediately - the technique of singing from pictures. Since we work with modern children, I realized that we need karaoke! But, karaoke, which will help enhance the memorization process and allow you to transfer information from short-term memory to long-term memory. This means that it should be bright, colorful, logically structured (exact correspondence between pictures and text) and accessible to children (age-appropriate), creating a positive emotional mood for learning the material.

To create "Karaoke-learning a song", I used Make AV Video Karaoke, winOKE, Karaoke Builder Studio and PowerKaraoke. I divided the lyrics of the song into semantic sentences that can be illustrated. Each slide shows a picture (for children) and the corresponding song text (for teachers). I present to your attention one of my developments.

I prepared karaoke from the songs from the 5-7th grade textbook of the general secondary school.

With the further standard algorithm for learning a song, I pursued the goal of developing and consolidating singing skills in children through the following tasks:

- cultivate in children a sustainable interest in learning new songs, musical culture, and expand musical impressions;
- create a positive emotional mood
- strengthen the skills of proper vocal breathing
- work on correct sound production.

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Rezyume: *Ushbu maqolada Umumiy o'rta ta'lim maktablari musiqa madaniyati fani o'qituvchilarining musiqa darslarida "Karaoke yaratish dasturlari" bilan ishlash kompetensiyalarini takomillashtirish maqsadida dastur bilan tanishish va undan unumli foydalanish metodi yoritilgan.*

Резюме: *В данной статье в целях повышения компетентности работы с «программами создания караоке» на уроках музыки учителей музыкальной культуры общеобразовательных школ освещен метод ознакомления с программой и ее эффективного использования.*

Kalit so'zlar: *karaoke, kompyuter dasturi, zamonaviy dars, kompyuter texnologiyalari, zamonaviy o'qituvchi.*

Ключевые слова: *караоке, компьютерная программа, современный урок, компьютерные технологии, современный учитель.*

TEACHING SPEECH ETIQUETTE TO EFL LEARNERS

Serdalieva B

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Summary: *Speech etiquette is an integral part of effective EFL teaching as it helps create a safe and inclusive learning environment, models good language use, builds rapport, and enhances language learning. Theoretical frameworks related to politeness and face management, such as Brown and Levinson's politeness theory and FTA theory, provide a useful framework for teaching speech etiquette in various social contexts. EFL teachers should emphasize the importance of speech etiquette and incorporate it into their teaching strategies to help students develop essential communication skills that they can apply in various social and professional situations. By promoting speech etiquette in the EFL classroom, teachers can contribute to the holistic development of their students and help them succeed in their personal and professional lives.*

Key words: *Speech etiquette, EFL teaching, Language development, Effective communication, Interpersonal skills*

Introduction

Speech etiquette, also known as communication etiquette or conversational etiquette, refers to the rules and norms that govern appropriate communication in different social contexts. In the context of teaching English as a Foreign Language (EFL), speech etiquette is particularly important as it affects both the teacher's effectiveness in the classroom and the students' ability to learn and communicate in English.

Here are a few reasons why speech etiquette is important in EFL teaching:

Creates a safe and inclusive learning environment: Using appropriate speech etiquette, such as speaking clearly and politely, and avoiding offensive or discriminatory language, can help create a safe and inclusive learning environment where students feel comfortable expressing themselves in English.

Models language use: Teachers are role models for their students and the way they use language can have a significant impact on their students' language development. By using correct and appropriate language, teachers can model good speech etiquette for their students to emulate.

Builds rapport: Positive relationships between teachers and students can enhance the learning experience. By using appropriate speech etiquette, such as addressing students respectfully and using their names, teachers can build rapport with their students and create a positive classroom environment.

Enhances language learning: Speech etiquette also affects the quality of communication and can help enhance language learning. For example, using appropriate intonation and stress can help students understand and produce the correct pronunciation of words and phrases.

Thus, speech etiquette is an important aspect of EFL teaching as it can affect the learning experience and language development of students. Teachers who use appropriate speech etiquette can create a safe and inclusive learning environment, model good language use, build rapport with their students, and enhance language learning.

Theoretical frameworks on speech etiquette and language teaching

Speech etiquette refers to the set of social norms that dictate appropriate speech behavior in various social contexts. It encompasses a range of behaviors, including the use of formal language, proper greetings, and appropriate levels of deference and politeness. Speech etiquette plays an important role in effective communication and is therefore relevant to the teaching of English as a foreign language (EFL). In this literature review, we will examine the theoretical frameworks related to speech etiquette and their relevance to EFL teaching.

One of the most prominent theoretical frameworks related to speech etiquette is Brown and Levinson's (1987) politeness theory. According to this theory, speakers use language to manage social relationships and maintain face, or the public self-image that a person presents to others. Politeness is a fundamental aspect of face management, and speakers use various strategies, such as indirectness and hedging, to maintain face while still conveying their intended message. This theory has been applied to a variety of social contexts, including cross-cultural communication and language teaching.

In the context of EFL teaching, speech etiquette is particularly important because students need to understand the appropriate language use in various social situations. For example, students may need to learn how to use formal language in academic settings, such as writing emails to professors or presenting research papers. They may also need to learn how to use polite language when interacting with native speakers or in business contexts. By teaching speech etiquette, EFL instructors can help students become more effective communicators and succeed in various social situations.

Another theoretical framework related to speech etiquette is face-threatening acts (FTA) theory. This theory suggests that certain speech acts, such as criticism or refusals, can threaten a person's face and lead to negative social consequences. Speakers use various strategies, such as indirectness or mitigating language, to minimize the threat to face while still conveying their intended message. In the context of EFL teaching, understanding FTA theory can help students learn how to effectively communicate criticism or refusals while minimizing the potential negative social consequences. So, speech etiquette is an important aspect of effective communication and is relevant to the teaching of English as a foreign language. Theoretical frameworks related to politeness and face management, such as Brown and Levinson's politeness theory and FTA theory, can provide a useful framework for teaching speech etiquette in various social contexts. By teaching speech etiquette, EFL instructors can help students become more effective communicators and succeed in a range of social situations.

Conclusion

Speech etiquette plays a crucial role in effective EFL teaching and learning. By following appropriate speech etiquette, teachers can create a positive learning environment that encourages students to actively participate in class discussions and feel comfortable expressing their thoughts and ideas. Additionally, teaching students the importance of speech etiquette helps them develop essential communication skills that they can apply in various social and professional situations.

Some key aspects of speech etiquette that EFL teachers should emphasize include speaking clearly and using appropriate tone and volume, respecting others' opinions and perspectives, using language that is inclusive and free of discriminatory or offensive language, and avoiding interrupting or talking over others.

By incorporating speech etiquette into their EFL teaching strategies, teachers can help students develop not only language proficiency but also essential interpersonal and communication skills that will benefit them in their personal and professional lives. Therefore, it is essential to emphasize the importance of speech etiquette and promote its practice in the EFL classroom.

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Rezyume: *Til odobi EFLni samarali o'qitishning ajralmas qismidir, chunki u xayfsiz va inklyuziv ta'lim muhitini yaratishga yordam beradi, tildan to'g'ri foydalanishni modellashtiradi, o'zaro munosabatlarni mustahkamlaydi va til o'rganishga yordam beradi. Brown va Levinsonning xushmuomalalik nazariyasi va FTA nazariyasi kabi xushmuomalalik va yuzni boshqarish bilan bog'liq*

nazariy asoslar turli xil ijtimoiy kontekstlarda nutq odobini o'rgatish uchun foydali asos bo'lib xizmat qiladi. EFL o'qituvchilari nutq odob-axloq qoidalarining muhimligini ta'kidlab, o'quvchilarga turli ijtimoiy va professional vaziyatlarda qo'llashlari mumkin bo'lgan muhim muloqot qobiliyatlarini rivojlantirishga yordam berish uchun uni o'qitish strategiyalariga kiritishlari kerak. EFL sinfida nutq odob-axloq qoidalarini targ'ib qilish orqali o'qituvchilar o'z o'quvchilarining har tomonlama rivojlanishiga yordam berishi va shaxsiy va professional hayotida muvaffaqiyatga erishishiga yordam berishi mumkin.

Резюме: Речевой этикет является неотъемлемой частью эффективного преподавания EFL, поскольку он помогает создать безопасную и инклюзивную среду обучения, моделирует правильное использование языка, налаживает взаимопонимание и способствует изучению языка. Теоретические основы, связанные с вежливостью и управлением лицом, такие как теория вежливости Брауна и Левинсона и теория FTA, обеспечивают полезную основу для обучения речевому этикету в различных социальных контекстах. Преподаватели EFL должны подчеркивать важность речевого этикета и включать его в свои стратегии обучения, чтобы помочь учащимся развить необходимые коммуникативные навыки, которые они смогут применять в различных социальных и профессиональных ситуациях. Содействуя речевому этикету в классе EFL, учителя могут способствовать целостному развитию своих учеников и помочь им добиться успеха в личной и профессиональной жизни.

Kalit so'zlar: Nutq odobi, EFL o'qitish, nutqni rivojlantirish, samarali muloqot, shaxslararo munosabatlar.

Ключевые слова: Речевой этикет, преподавание EFL, развитие речи, эффективное общение, навыки межличностного общения.

THE CRITERIA FOR DEVELOPING INDEPENDENT EDUCATIONAL TASKS IN TEACHING HISTORY OF UZBEKISTAN

Ametov D.D.

Karakalpak State University name after Berdakh

Summary: *The article discusses the content, methods and means of teaching students independent learning when teaching history in higher educational institutions, criteria for the development of independent learning tasks when teaching the history of Uzbekistan, suggestions and recommendations.*

Keywords: *knowledge, skills, qualifications, independent thinking, independent education, independent study, work with additional resources.*

In teaching the subject of history the independent work of student, an important method of textbooks, manuals, literature references and internet resources are the main focus. Skills books and internet resources to work with the general human culture, the development of logic thinking to the level of the formation of the outlook, knowledge, he believed reflects the flow of information. The credit system of education in the context of high rates, large amounts of data that a comprehensive approach to the study of materials and universities in the program, the student is independent, effective and quick to act leads. In the process of reading the text of this work, the main thing to note, analysis, comparison, synthesis, evaluation of the application of the issues considered in practice skills. The results of the study should be provided in a certain form of its information. Writing on the basis of abstract review, essay, thesis in the form of oral presentations, reports, in the form of discussions. The clear organization of independent work of students in the process of their work, they also take the skills future work in the process of self-rearing issues that must constantly engage with will mean.

Various modern teaching methods of the history and also in the next years active methods are used. Summarize the traditional methods by scientists and their methods and methods is shown clearly divided into four departments [1,48-61].

Independent work of students (IWS) is one of these critical functions of the organization to solve organizational problems: determine the scope of IWS, tmi would go to the control that provide a means of independent work of students. Tmi tmi increase in the share of the professional preparation of specialists on the organization of books, training manuals and methodological developments, providing raises the issue of electronic educational publications.

According to the convenient approach in methodological manual of A. V. Merenkova, S. V. Kuntshikov, T. I. Grechuxina A. V. Usacheva, I. Yu. Vorotkova on organizing the self-study of students for credit-module system for the historian- students the independent learning assignments and assignments on their evaluation system has been developed:

I. The assignment system for self-study in teaching the history of Uzbekistan

1-assignments. Essay writing (Essay)

The purpose of independent study: independent creative thinking and submit their opinions in writing by edental skills. data “philosophical, literary-critical, historical-biografik journalistic, often paradoxical position of individual presentation is strictly colloquial speech”[2, 203]

referencess classification:

- according to the content: philosophical, critical, historical, and journalistic, and other spiritual and religious;

- a description of the story, there also is not allowed., critical and analytical essays and others.

Reference symptoms:

– Small size-page three page seven from the computer until the text; until ten pages written text consisting of written information will be given access to.

– A particular topic and to interpret it strictly subjective.

Free essay composition is an important feature.

- Convenience to the story.

- The use of paradox. The written information, those who read it, we accounted designed to be amazed this according to the opinion of many researchers, the quality of its binding.

- Internal semantic unit.

- Referral to colloquial speech.

Complete the task:

1) the word write access (for the next 2-3 sentences to serve the problem of formula).

2) the problem is important for the formation of not only the author, but for others;

3) read the comments about the problem;

4) the author form and bring proof of your opinion;

5) conclusion write (concluded aytilganlarni synthesis).

The planned results of independent work: logical true, and clear oral and written speech argumentli for convenience [3, 80].

2-assignments. The preparation of the report

Independent work purpose: to expand your scientific horizons, mastering the methods of theoretical research, the development of the student's independent thinking.

The report contains this information and the results of the research question or reflect the essence of the message or document that mass compared to the situation given.

Report types:

1. The results of the work on the basis of the oral report to be read, and its results do is an effective means to understand.

2. Written report:

- brief (page 20) - the most important data for research summed;

- more (up to 60 pages) - include not only the text, as well as the title structure, as well as diagrams, tables, drawings, photographs, applications, comments, and links.

Complete the task:

1) the exact form of the subject (e.g., report writing);

2) the study of recommended literature on the subject and select, specify the source of three separate bibliographic information:

- primary (articles, dissertations, monographs, etc.);

- secondary (library, abstrakt magazines, signal data, plans, diagram, graphic, subject index, etc.);

- uchlamchi (reviews, review works, reference books, etc.);

3) of the plan, which is fully compatible with the chosen theme and it cannot write the topic, let's open;

4) write a report to comply with the following requirements:

- report content — you should add the following: the problem is that the actual basis of a brief introduction; main text;

teach students conclusion with a brief summary on the problem;; referat are;

- the content of the report - understand the level should be supported with specific examples and general rules;

do not repeat the person, or thoughts about the content of textbooks and textbook chapters being taken of their own issues, their offers;

5) work in accordance with the requirements of regulation've.

The planned independent work results:

- ability to analyze the results of scientific students

the educational and research functions in addressing specific research and the application of them;

the original solution of the research problem willingness to use individual creative ability;

- in using information and communication technologies information-bibliographic culture on the basis of the standard functions of professional activities, taking into account the basic requirements of information security address and describe [4, 80].

3-assignments. Information search

Different types of educational activities for independent work on the basis of information the purpose of the design and the development of the ability to change.

Information search – search data not established documentary.

Modern information search tasks list:

- modeling of the issues to take off;
- classification of documents;
- filtering of documents, their classification;
- search system architecture and user interface design;
- the production of information (and abstraction of annotation of documents);
- system information in the search to search and select the language of the survey.

Search by the type of task content:

- bibliographical search-search for the data you want

about the source and determine the availability of other sources in his system. Search are conducted through bibliographic information and bibliographic guide (publications, information);

- may or may not include the sources of information containing the necessary information (documents and publications) search;

in the literature, the actual data which is available in the book search (e.g., historical facts and events, from biographical information about the life and work of writer, scientists, and others.).

Complete the task:

- 1) knowledge of the sector definition;
- 2) the selection of the type and source of information;
- 3) collecting the materials necessary to fill in the information model;
- 4) select the most useful information;
- 5) the information processing method of selection (classification, clustering, regressiya analysis, etc.);
- 6) selection algorithm to find patterns;
- 7) with patterns for official rules and the search for structural parts the relationship in the data collected;
- 8) to interpret the results obtained creative.

To determine the features you want the features of a certain model example and information engine (terms)

- Search the documentary the purpose of the search (the search of documents and publications on the main topic).

- Theme theme search search (just on the problem).

— Innovation technologies — type search (monographs, packages, references, bibliographical aids).

- Dialektik search method (available in the package all possible search methods).

- Chronological coverage-including covers (search for a certain period).

- Geographic coverage-country-specific search (sources of information, when you take into account the edition translated from foreign languages).

- The fullness of search-select search (selection of the most well-known publications).

The planned independent work results:

- considering the needs of students using information and communication technology and the information in the main information-bibliographic culture on the basis of the professional activities of the model of the task can be solved;

- modern problems of science and education on the use of knowledge in professional education prepared to solve the problems and functions.

4-assignments. Development of the methods of preparation of classes

Independent work purpose: to develop professional teaching competence.

Reveals the essence and content of the educational process of the methodological developments of the classes.

Function options:

-the formation of new knowledge (teaching practice) plan-the conclusion of the lesson to work out;

- the creation of the methodological developments of the seminar course (scientific-pedagogical practice).

Complete the task:

1) to determine the subject of the lesson calendar and thematic planning (teaching practice) or the work of science program (scientific and pedagogical practice), working with his students teach: the place to be, type (teaching practice) or form (scientific-pedagogical practice);

2) student teaching, nurturing and development (teaching practice) the purpose of education or education related to these goals and the results of the form kompetentsiyalarga (scientific-pedagogical practice);

3) the classes of the functions of planning and clarification;

4) the selection of the optimal content of the educational material of the lesson;

5) the processing of didactic education selected content, that is, determine which learning materials, size, and used in any form;

6) determine that the inner and outer tie of educational material;

7) the lesson of the selection of didactic tools (diagrams, tables, cards, drawings, fragment of film and audio, network, etc.);

8) the structure of the lesson, depending on the type of shape and determine its didactic purpose;

9) the formation of the didactic function of each stage of the lesson (teaching practice);

10) the terms and clarification of performance indicators (pedagogical and scientific-pedagogical practice);

11) to produce a technological map of the lesson;

12) lesson plan – is to establish referat.

The planned independent work results:

- students of pedagogical experience and innovative approaches can be applied in the organization of effective educational process;

- quality assurance of the educational process, the conditions for the process and analysis of results;

- art technologies and methods of organization and ability to apply various educational institutions, at different levels of education on the implementation of the educational process;

- teaching models for the development and implementation of the preparation process, technical, technology and teaching methods, analysis of results;

- ability to forecast, design, model development.

5- The commission of Uzbekistan for the subject of history for self-study control questions and assignments

1. what rating of educational institutions are applied in your academic achievement?

2. Often used as the assessment tool that is the basis for the analysis, and independent of the form of work what we should seek.

3. How many types of independent work are rare and often monitor the implementation of the form which one?

4. You will get the offer of any form of freelance work, final or intermediate certification as the procedure? We should seek based on your answer.

5. Criteria and indicators of the overall evaluation of performance of independent work in the form of the analysis, and we've only did he offer the collection of your own. We should seek your offer.

6. To assess the effectiveness build the schedule of work you previously fulfilled and determine the level of independent work and the form of their implementation.

6-assignments. Development of the project (individual or group)

The goal of independent work: development of the ability to predict, design, model, create.

The project “quality requirements specified for a particular time, the results of the targeted change to a system that has limited funds and resources and the specific organization that can spend the major boundaries ”(. V. Burskov N., D. A. Novikov).

Function options (for masters):

- the design of the academic technology assessment expert group (scientific-pedagogical practice)kuratorining;

- training sessions of technological development projects map (scientific-pedagogical practice).

Complete the task:

1) the diagnosis of the situation (muammolashtirish, goal setting, target specification, the formatting of the project);

2) design (purpose, objectives, functions and clarification work plan; theoretical modeling methods and tools to take off problems; to solve specific tasks detailed study of the stage; action planned phased implementation of the project;

Systemizing and synthesis of the results obtained, the expected result is to build step-by-step project implementation actions);

3) reflection (find the compliance of the obtained results plan; determine the quality of the product obtained; prospects to run and work it out).

Independent work expected results:

- prepared from the knowledge of the use of modern readers education and professional in addressing the challenges of education and science problems; the original solution of the research problem willingness to use individual creative ability; - ability to forecast, design, model.

7-assignments. Teaching history at scheme use

The purpose of independent study: development of bilateral relations , he source archaeologist the history ofspecific sections, or topics related concepts and reflect them using the scheme graphic ca.

Diagram – this definition was used for the image data or graphic analysis of the characters to take the issue off the screen method.

Text a link between the logical diagram graphic graphic the main subject of the image (conditional relationship constant separated) as.

Function options:

- hierarchical provided in the form of visual relationships between concepts; - the expression of the functional relations among the elements expressed in the form of any system of concepts or categories in the text (is).

Complete the task:

1) be noted that the basic concepts have been studied in this section;

(on this topic);

2) understanding-how does one determine associated with;

3) separate blocks of understanding how they interact depends on that show;

4) give examples of a graphic created based on a scheme of understanding the mutual compatibility.

The planned independent work results:

- the results of the research of the module's creative capabilities of individual students ready for use and identify the original solution of the problems associated with it;

- mastering relationships between the concepts or particular topic that is related to the base.

Anyway, the independent students can reach a quality education commission of Uzbekistan by reading the subject of history. The organization of independent work of students, independent reading is a very serious problem in the formation of the ability – motivation in the development of knowledge and the development of creative independence is to develop rational methods. The effectiveness of the organization of educational and scientific work of the students, various aspects of cognitive activity, scientific creativity, equipped with the knowledge on nutrition and rest, the rational use of allocated time for them to read independently should teach.

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Rezyume: *Maqolada oliy o'quv yurtlarida tarix fanini o'qitishda talabalarning mustaqil ta'limga o'rgatish mazmuni, metod va vositalari, O'zbekiston tarixi fanini o'qitishda mustaqil ta'lim uchun topshiriqlar ishlab chiqish mezonlari, taklif va tavsiyalar berilgan.*

Резюме: *В статье рассматриваются содержание, методы и средства обучения самостоятельному обучению студентов при преподавании истории в высших учебных заведениях, критерии разработки задач самостоятельного обучения при преподавании истории Узбекистана, предложения и рекомендации.*

Kalit so'zlar: *bilim, ko'nikma, malaka, mustaqil fikrlash, mustaqil ta'lim, mustaqil ta'lim, qo'shimcha manbalar bilan ishlash.*

Ключевые слова: *знания, умения, квалификация, самостоятельное мышление, самостоятельное образование, самостоятельное обучение, работа с дополнительными ресурсами.*

EFFECTIVE METHODS FOR TEACHING ENGLISH LISTENING COMPREHENSION SKILL IN A DIGITAL LEARNING ENVIRONMENT

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Summary: *The current study investigates how listening comprehension of EFL students in higher education can be improved by teaching in digital learning environment and highlights several proven methods that can be employed to improve English listening comprehension skill of students. Additionally, it assesses how well it works by observing students' performance while being taught.*

Key words: *listening comprehension skill, digital education, digital learning environment.*

Introduction: The advent of digital education has revolutionized the way we teach and learn various skills, including English listening comprehension. In today's fast-paced world, it is important to equip learners with effective methods to enhance their listening skills. Among four language skills, listening requires a lot of practice for language learners. Therefore, EFL teachers should try to utilize effective methods to improve students' listening comprehension. The current study investigates how listening comprehension of the students learning English as a foreign language in higher education can be improved through the use of digital learning and evaluates how well it works by observing students' performance during the learning process.

Literature review. E. Z. Genshir, a Russian researcher, said, "The mechanisms of speaking and listening are closely related to each other and sometimes coincide with each other. Learning to listen is impossible without learning to speak and learning to speak without learning to listen, listening serves as a powerful tool for teaching a foreign language. Along with listening facilitates the acquisition of speaking, reading and writing. The ability to listen is the key to success in learning a foreign language, and the formation of speech understanding by ear should continue in the natural conditions of voice speech. It is considered that the acquisition of a foreign language should be seen as step-by-step processes, the main goals of this process are the ability to speak and receive speech in a foreign language. The listening learning system includes three main levels:

- Perceptual listening base dedicated to the beginning-formation;
- Speech activity to develop listening as a developed type;

- Final - mastering oral communication, during which the student plays a practical role. The goal of the first level of education is the mechanisms of foreign speech perception is shaping; in the second, forming the ability to perceive and understand oral in nonlinguistic texts; as a result of study at the highest level/level of the system, students should have the ability to participate in oral communication in a foreign language[7]. There are several types of exercises for working with audio text: pre-text, post-text and post-text tasks. Exercises performed before listening are the most intensive control of the process of foreign language speech perception. They help motivate students, create a mood for listening to a text of a certain content, alleviate language (lexical, grammatical and phonetic) difficulties, relieve psychological stress and increase the level of speech comprehension. Post-listening tasks perform a control function. Post-listening tasks perform a control function. They usually perform two tasks: checking the understanding of the content and analyzing the language material[6].

J. Jalolov, one of the local scientists, conducted research on the methodology of teaching foreign languages. J. Jalolov developed a system of (auditory) exercises for listening comprehension and divided it into two types according to its purpose: special and non-special exercises. In non-specific exercises, listening comprehension is taught along the way. Special exercises, in turn, are divided into preparation for listening comprehension and pure speaking exercises. In case of preparation, it is divided into two to prevent linguistic and psychological difficulties. Language exercises include: lexical, grammatical and pronunciation listening exercises. The type of preparatory exercise to prevent

psychological difficulties is better for students to know the content in advance, develop memory, improve listening skills, and reduce internal speech. Speech exercises are intended for communicative tasks. Also, J. Jalolov pointed out that the following can be included in the preparatory exercises: listen and repeat the words in the column (the teacher selects difficult material and prepares an exercise. The following examples can be given for speech exercises: listen to the dialogue, expand and fill in the last sentence (replica) of one of the interlocutors; listen to the recording (film clip) and tell about the events in it[2].

One of the main points, the significance of information technologies for teaching as an application of information technologies for creating new opportunities for knowledge transfer (teacher's activity), perception of knowledge (learner's activity), evaluating the quality of instruction, and, of course, educational process, is given particular attention by the authors. The primary objective of the informatization of education has been characterized as educating students for active involvement in daily, social, and professional life in the information society [5]. Digital education is the integration of information and communication technologies and digital tools in the teaching and learning process [4].

With the usage of digital technologies, we enable mix many methods to build online actual environments and online communication, including text and visual materials, images, movies, language, and music[3].

A digital learning environment offers numerous advantages for teaching listening comprehension. It provides learners with access to authentic audio materials, interactive exercises, and personalized feedback. Additionally, it allows for flexibility in learning, as students can access materials anytime and anywhere. The integration of technology also enhances motivation and engagement, making the learning process more enjoyable and effective. Digital education for teaching listening can create many opportunities for improvement of listening comprehension for university students. Students have a great chance of using variety of audio materials[1].

From the above researches, we can offer several effective methods for teaching EFL students in higher education to maximize the effectiveness of teaching English listening comprehension in a digital learning environment. These suggested approaches for EFL teachers are the followings:

A) Utilize a variety of authentic listening materials such as podcasts, TED Talks, news clips, and interviews to expose learners to different accents, speech patterns, and topics. Ensure that the content is relevant, interesting, and appropriate for the learners' proficiency level. Because this will help develop their ability to understand various types of spoken language.

b) Chunk the audio, in simple words, break down the audio into manageable chunks and provide students with accompanying transcripts or subtitles. As, this allows learners to focus on smaller segments, understand the content more easily, and identify specific language features.

c) Promote active listening by incorporating tasks that require students to summarize the main ideas, identify key details, predicting outcomes, and recognizing specific language features like idioms or expressions or answer comprehension questions. This helps learners engage with the content on a deeper level and enhances their listening skills.

d) Integrate interactive listening exercises into the digital learning platform, such as multiple-choice questions, gap-filling activities, or dictation exercises. These activities can provide immediate feedback and help reinforce comprehension skills.

e) Foster collaborative learning: Create opportunities for students to engage in collaborative listening activities, such as group discussions or pair work. This allows them to practice listening and speaking skills simultaneously, while also promoting peer-to-peer interaction and learning.

f) Technology Integration: Use digital tools and resources to enhance the listening experience. This can include interactive listening exercises, online quizzes, audio recording and playback features, speech recognition software, or virtual conversation simulations.

g) Provide timely and constructive feedback on students' listening performance highlighting areas of improvement and providing specific suggestions for further practice. group discussions. This can be done through self-assessment checklists or reflective journaling.

h) Offer additional resources: Provide supplementary resources, such as online listening exercises, podcasts, or interactive websites, to encourage independent practice outside of the digital learning environment. This allows students to further develop their listening skills at their own pace.

i) Recognize the diverse needs and abilities of learners and provide differentiated listening tasks or materials to cater to individual learning styles and levels. This can include providing additional support for struggling learners or offering extension activities for advanced students.

j) Assess students' listening comprehension skills through a variety of formative and summative assessment methods. This can include quizzes, listening portfolios, oral presentations, or performance-based tasks that require students to demonstrate their understanding and application of listening skills. Demonstrating digital learning environment in the educational process dramatically raises student motivation and interest, as well as their level of knowledge.

Analysis and result. This study sought to investigate digital learning environment in teaching listening comprehension of EFL students of higher education. It also investigated the development of students' listening comprehension skills. From the result of the findings, it can be stated as follows: using digital technologies and tools to in teaching process is a new approach aiding listening skill is successfully applied in some ways. Using effective listening comprehension methods in digital learning environment not only provides flexible and accessible learning but also promotes active learning and student interest. EFL teachers enable to reach their pedagogical goal.

Conclusion. Teaching English listening comprehension in a digital learning environment offers a lot of opportunities for effective instruction. By utilizing pre-, during-, and post-listening activities, educators can enhance students' listening skills. The key to effective teaching of English listening comprehension in a digital learning environment is to provide engaging and interactive opportunities for students to practice and develop their skills while utilizing the benefits of technology. With these methods, learners can develop their English listening comprehension skills in an efficient and enjoyable manner.

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Rezyume: *Joriy tadqiqot oliy ta'limda talabalarining tinglab tushunish darajasini raqamli o'quv muhitida o'qitish orqali qanday yaxshilash mumkinligini o'rganadi va talabalarining ingliz tilini tinglab tushunish ko'nikmalarini yaxshilash uchun ishlatilishi mumkin bo'lgan bir qancha isbotlangan*

usullarni ta'kidlaydi. Bundan tashqari, u o'qitish jarayonida talabalarning faoliyatini kuzatish orqali qanchalik yaxshi ishlashini baholaydi.

Резюме: В настоящем исследовании изучается, как можно улучшить понимание английского языка на слух студентами EFL в высших учебных заведениях путем обучения в цифровой среде обучения, и выделяются несколько проверенных методов, которые можно использовать для улучшения навыков понимания английского языка на слух у студентов. Кроме того, он оценивает, насколько хорошо это работает, наблюдая за успеваемостью учащихся во время обучения.

Kalit so'zlar: *tinglab tushunish qobiliyati, raqamli ta'lim, raqamli ta'lim muhiti.*

Ключевые слова: *навык понимания на слух, цифровое образование, цифровая среда обучения.*

THE WORLD OF EMOTIONS IN ERKIN VAHIDOV'S LYRICS

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Summary. *This article talks about the uniqueness of Erkin Vahidov's lyrics, the world of feelings and the variety of images. The harmony of lyrical experience and social content in the poet's work is analyzed.*

Key words. *Poetry, image, lyric, feeling, mind, perception, interpretation, talent, expression, poetics.*

Aesthetic appearance and lyrical warmth are embodied in a unique image that forms a unique framework of artistic thinking that flourishes in the constantly moving thinking of the artist. Therefore, it cannot be given the status of similarity with real life. Therefore, artistic truth is not the truth of life, but is perceived poetically by relying on the text and experiencing the microcosm of the creator as the beauty created by the harmony of consciousness and feeling - the expression of the spiritual vision[1,252] - writes literary critic I. Yakubov. In fact, the originality of the world of creation is nourished by the essence of poetic perception. More precisely, the coverage of socio-spiritual, national and universal aspects is explained by the internal conflict of the requirements of the situation and the degree of character practicality, the synthesis of the scale of the image - the skill of analysis - the inevitability of interpretation. Therefore, the main concept that ensures the centralization of form, content and style in poetic translation is related to the density of worldview. At the same time, the development of the artistic form determines the creative independence of the artistic expression, which organizes both its inner and outer essence. From this point of view, every literary interpretation opens the way to both the artistic reality of the work and the nature of the creator. Subjective essence (creative worldview and realistic landscape) creates a creative bond:

У бахш этган оташда ёндим,
Ўзи бўлди менга раҳнамо,
Унга, фақат унга ишондим,
Юрак мени алдамас асло![2,38]

The priority of the realist principle in the interpretation that contrasts the conflict between the mind and the heart is that the poet does not limit himself to the poetic perception of the event, but combines creative approach and aesthetic assessment criteria in it. The current relationship confirms the completeness of the image while ensuring the harmony of emotional intensity. In fact, the tension of reality or the conflict of expression is a factor that determines the artistic goal, in which the understanding of the nature of discussion comes to the research stage. The process of emotion and consciousness are actually mutually exclusive poles, and only profound philosophy can reconcile these two points. After all, the system of poetic research is always built on the basis of integrity, the conflict and connection of poetic elements becomes its leading artistic feature. Consequently, the requirement of the poem genre and the validity of literary laws are explained precisely by the relations of transition from image to analysis, and from analysis to research:

Кўкрагимга шаффоф булоқ сувлари,
Кўларимга фируза осмон,
Юрагимга эса ишқ туйғулари
Энг яхши дармон [3,27]

The film discusses the theme of "the meaning of life, the basis of being human and the essence of life" (U. Hamdam) - love. The association (love) embodied in the psyche of the image is the main factor that unites human qualities, the usual question (what is love?) and its social, spiritual, educational, philosophical weight are analyzed in the line describing the logic of observation. In

perception free from social proof, the inter-imagination cooperation that produces reference and comparison becomes the leading aspect. A well-formed and purposeful tone centers the logic of the discussion. Rather, both affirmation and negation seem to bubble up in the internal relationship. The connected nature of emotion and experience actually teaches the reader to recognize and reevaluate the conflicts of both personality and societal structure. The clarity of expression and the vividness of the spirit of the image provide a density of imagination, experience and worldview. Therefore, in the text, the concept that occupies the poet's inner self acquires a natural essence. Although there is a romantic tone in the lyrical translation aimed at awakening the reader's imagination, it is noticeable that it is intended to express the feeling created by the relationship to reality rather than giving the ending of the details.

In the work of a poet, personal goals and aspirations, interests and interests are stabilized, the uniqueness of the direction of human will and the wholeness of healthy beliefs are centered in it, the intensity of human emotional development and the pressure of mental potential collide, in it the density of the individual's spiritual experience and the philosophical depth of the enlightenment of the idea system are combined. blends into:

Бўронларга, довулларга
Пешвоз юргим келади.
Дарёларнинг гирдобига
Кўкрак ургим келади

In the poem "No, I don't want to be happy", which represents the poet's creative program, the image of a restless heart is drawn. The desire to "take the lead against storms and hurricanes" was born out of an aesthetic inclination. Strong excitement is felt in the declaration of the lyrical hero, who is saddened by indifference, compromise and injustice. The nature of the "trouble in the heart" is capable of breaking silence! "This view was born from the idea of an active attitude to life, to stand in an active position... restlessness means creative research. Only research gives us new important results in every field.

Takes creativity to new heights. Being active requires constant research. Research is the only way to create, to achieve results. In this sense, the idea of boredom belongs to the range of advanced and unique aspirations of the people of our time" [Gafurov I. Poetry means research. -T.: Literature and Art, 1984. -B. 182-183.]. The motivation of the belief formed in the imagination of the poet, matured in his thoughts, grows out of life observations. The density between the concept and the generalization strengthens the logical emphasis, indicates the standards of understanding.

In general, in the lyrics of Erkin Vahidov, emotional perception always guides the interpretation. In it, the chain of feelings expands the power-memory of the senses, in which the exchange of images and analysis strengthens the logic, in which the depth of mental harmony becomes the leading factor in the formation of expression, in which the emotional and meaningful beginning directs clarity and abstraction to each other.

In it, the choice of social value simultaneously forms the mentality of consciousness and inter-reality image. In fact, true poetry grows out of a reservoir of emotions. In it, the spiritual-ethical, socio-philosophical essence of a person is re-evaluated in emotional perception. This aspect is the leading poetic feature indicating the complexity of expression and image in the nature of lyrics.

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Rezyume: Ushbu maqolada Erkin Vohidov lirikasining o'ziga xosligi, tuyg'ular olami va obrazlar rangbarangligi haqida so'z yuritilgan. Shoir ijodidagi lirik kechinma va ijtimoiy mazmun uyg'unligi tahlil qilingan.

Резюме: В данной статье говорится об уникальности лирики Эркина Вахидова, мире чувств и разнообразии образов. Анализируется гармония лирического переживания и социального содержания в творчестве поэта.

Kalit so'zlar: She'riyat, obraz, lirika, tuyg'u, aql, idrok, talqin, iste'dod, ifoda, poetika.

Ключевые слова: Поэзия, образ, лирика, чувство, разум, восприятие, интерпретация, талант, выражение, поэтика.

**CONSTITUTIONAL AND LEGAL FOUNDATIONS OF
PARLIAMENTARY CONTROL IN THE REPUBLIC OF UZBEKISTAN**

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Summary: *The article is devoted to constitutional and legal foundations of parliamentary control in the Republic of Uzbekistan, the development of the constitutional and legal foundations of parliamentary control. Issues of monitoring the implementation of adopted laws have always been in the center of attention of our country's parliament. Moreover, parliamentary control over execution of laws, along with lawmaking, has traditionally been considered as the main direction of activity of the Oliy Majlis.*

Key words: *state, legality, parliamentary control, constitution, Oliy Majlis, human rights, judiciary.*

State control is a necessary element public administration, the function of public authorities and designed to ensure the normal functioning of society. Control is one of the most important channels for obtaining objective information about life of society as a whole, about those political, economic and social processes that take place in the state, about the activities of government bodies and management.

Parliamentary control must be distinguished from state supervision. The concept of government control is broader than the concept of supervision has its own specific characteristics. Bodies implementing state control, are vested with broader powers that provide for checking the state of affairs of the controlled object not only with from the point of view of legality, but also the expediency of the decisions made.

The adoption of laws by parliament is not an end in itself. It is important that these laws worked, regulated specific social relations and were effective, i.e. achieved in practice the goal that was determined legislator when adopting them. It is quite obvious that even the best law turns into an empty declaration, if its provisions are only proclaimed, and their implementation is not provided in practice in everyday life. According to the French scientist M. Lesage, the laws will only be "dead" letter" if the legislature that issued them does not have the opportunity control the actions of the executive branch, designed to implement these laws.

Issues of monitoring the implementation of adopted laws have always been in the center of attention of our country's parliament. Moreover, parliamentary control over execution of laws, along with lawmaking, has traditionally been considered as the main direction of activity of the Oliy Majlis. Speaking of which, President of the Republic of Uzbekistan notes: "We attach great importance to radical change not only of the legislative system itself, but also implementation of coordinated actions of the legislative and executive authorities to implement laws already adopted... Therefore, it is always relevant for us "The question is the implementation of adopted laws in everyday life."

Parliamentary control is exercised by the Oliy Majlis of the Republic of Uzbekistan: its chambers, committees and commissions, political factions and groups of the Legislative Chamber, deputies and senators. Control carried out during the preparation and adoption of laws, resolutions of chambers, hearing information from heads of state bodies, directions parliamentary inquiries, etc. Consistent implementation of parliamentary reform in Uzbekistan, completion of the formation and start of functioning of the new bicameral Oliy Majlis sets new tasks in the field of implementation by Parliament control powers.

Formation of a bicameral parliamentary system in the Republic of Uzbekistan sets the task of in-depth study of foreign experience in control activities parliaments in conditions of bicameralism, development of an effective model parliamentary control in the Republic of Uzbekistan.

The object of parliamentary control is most often the executive power, but this control may in some cases extend to the head states, judiciary, local government, armed forces, etc. At the same time, control over the executive branch is most often political character, that is, directed towards the political activities of the government and its members (mainly in parliamentary and mixed forms of government), although, of course, it is carried out in legal forms, whereas in relation to other subjects, the nature of control is purely legal: if it fails establish violations of any legal norms for a controlled body, institution, official, no negative consequences may arise legal consequences.

Brief analysis of the constitutional and legal foundations of the control activities of the chambers of the Oliy Majlis leads to the conclusion that the main directions of parliamentary control in the Republic of Uzbekistan are:

1) parliamentary control over the implementation of the laws of the Republic Uzbekistan, resolutions of the Oliy Majlis of the Republic of Uzbekistan, its chambers and decisions of committees of the chambers of the Oliy Majlis of the Republic of Uzbekistan;

2) financial parliamentary control;

3) parliamentary control in the field of human rights;

4) parliamentary control over the formation of government bodies and appointment of officials;

5) parliamentary control upon adoption by the President of the Republic Uzbekistan important political decisions.

The above areas of parliamentary control are being implemented the following entities: chambers of parliament, their committees and commissions, factions and deputy groups of the Legislative Chamber, deputies of Legislative Chamber and senators, Commissioner of the Oliy Majlis for human rights.

Parliamentary control is exercised when four interdependent tasks of the stage of parliamentary control:

1) receiving, collecting and processing information, as well as information, necessary for making responsible decisions and developing positions;

2) analysis and evaluation of the information received;

3) adoption by the Oliy Majlis based on the information received appropriate decision based on the results of parliamentary control.

The most important area of parliamentary control is control over execution of the laws of the Republic of Uzbekistan, resolutions of the Oliy Majlis and his chambers. It is necessary to distinguish between preliminary, current and subsequent control over execution of laws. Preliminary parliamentary control is carried out when conducting an examination of the bill, as well as at the stage of its discussion in responsible committee, at meetings of factions and deputy groups of Legislative Chamber, at plenary sessions of the Legislative Chamber (at decisions on the adoption of a law) and the Senate (upon approval of a law adopted Legislative Chamber).

Current parliamentary control is carried out in accordance with plans for the control and analytical activities of the chambers and involves assessment implementation of already adopted laws. In the process of ongoing control from government bodies and officials relevant information is requested from persons, the information received is studied from non-governmental non-profit organizations, voters, as well as published in the media. An important role in ensuring ongoing control should be play parliamentary inquiry. It should also be noted that features of the legal status of a senator (being a member of the Senate, he is simultaneously is also a deputy of the Jokargy Kenes of the Republic of Karakalpakstan, regional, district or city People's Kengash deputies) allow him in the process of exercising control powers use not only parliamentary, but also deputy requests.

Parliamentary control in the field of human rights is not carried out only committees, deputy associations of the Legislative Chamber, committees Senate, and to a large extent the Commissioner for Rights of the Oliy Majlis person, as an official authorized to carry out parliamentary control over

compliance with the legislation of the Republic of Uzbekistan on rights people by all government bodies, enterprises, institutions, organizations and officials.

Parliamentary control in the field of human rights carried out by committees of the chambers and the Commissioner for Human Rights differ in both the object of control, as well as the forms and methods of its implementation, namely:

1. The work of committees in the field of monitoring compliance with human rights aimed at identifying violations of laws and other legislative acts of the Republic of Uzbekistan and decisions of the relevant chamber, and the activities the Commissioner for Human Rights is concerned generally with legislation on human rights and human freedoms, but not the decisions of the House and its committees.

2. Chamber committees, deputies, deputy associations, senators exercise control in the field of human rights by introducing parliamentary requests, hearing relevant officials at chamber meetings, committees, as well as requests from various bodies for information on the status compliance with human rights laws and parliamentary monitoring studies of the state of human rights legislation and law enforcement activities in this area.

Thus, studying foreign and national experience of parliamentary control, its role and place in the system of state control allows us to make the following conclusions and provide recommendations to improve it efficiency: state control as an integral function and leading element of public administration, means effective control for compliance with the requirements of laws, other regulations, as well as taking adequate measures to eliminate and prevent in the future deviations identified during monitoring.

One of the defining elements of the formation of a functional state control system is to ensure the authorities state control legislative framework that meets the requirements time. The adoption of the basic law “On State Control” will clearly build all levels of control and methods for its implementation, eliminate duplication and parallelism, irrational use of resources in the field state control, as well as resolve issues of coordination control activities.

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Rezyume: *Maqola O'zbekiston Respublikasida parlament nazoratining konstitutsiyaviy-huquqiy asoslari, parlament nazoratining konstitutsiyaviy-huquqiy asoslarini rivojlantirishga bag'ishlangan.*

Резюме: *Статья посвящена конституционно-правовым основам парламентского контроля в Республике Узбекистан, развитию конституционно-правовых основ парламентского контроля. Вопросы контроля исполнения принятых законов всегда находились в центре внимания парламента нашей страны.*

Ключевые слова: *государство, законность, парламентский контроль, конституция, Олий Мажлис, права человека, судебная власть.*

Kalit so'zlar: *davlat, qonuniylik, parlament nazorati, Konstitutsiya, Oliy Majlis, inson huquqlari, sud hokimiyati.*

DEVELOPING CREATIVE THINKING OF PRIMARY SCHOOL CHILDREN THROUGH MULTIMEDIA ON THE BASIS OF KARAKALPAK FOLK TALES AND CHILDREN'S SONGS

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Summary: *This article tells about the educational value of teaching Karakalpak folk tales and songs through multimedia technology for children of primary school age, and thereby teaching the child to think creatively, developing children's creative principles with folklore genres.*

Key words: *multimedia technology, karakalpak folklore, creative thinking, audio and visual thinking, scientific creativity, animational, multiliteracy, logical thinking, invent.*

Creative thinking involves the child's ability of literacy, which develops and improves the child's ideas, and understood as the ability to use one's imagination to create new knowledge and solve previously unknown problems.

The President of the Republic of Uzbekistan Sh. Mirziyoyev in his Message to the Oliy Majlis on December 29, 2020, said that "It is necessary to create meaningful and understandable textbooks for children in order to develop their analytical and creative thinking skills "[1]. From this point of view, our main goal is to raise up our future generation with a modern worldview, intellectual abilities and creative abilities by creating comprehensive and understandable textbooks for primary school students in accordance with the international standards.

Creative development is the self-expression of a pupil, i.e. it is the ability of primary school pupil to make new plans in his life based on the ideas of the genres like songs, fairy tales, epics or stories. At the same time, creative thinking helps to discover new knowledge through fairy tales, epics and stories, to create his own original ideas, to make new things, to strive for goodness, progress, perfection and, of course, beauty. According to the opinion of foreign scientist E.P. Torrens, "creative thinking is a natural process that occurs due to the strong need to relieve the stress in a person", therefore we can approach children not only in creative, but also in psychological way [2.59].

We enrich the creative thinking of children of primary school age with multimedia methods on the basis of Karakalpak folk tales and children's songs. Giving comprehensive education to children presenting fairy tales through multimedia products is a reasonable and cost-effective method. Showing and narrating fairy tales to children in their native language through multimedia is one of the original forms of teaching. This is the effective method, when a child becomes aware of the history of his nation, folk wisdom, national values and begins to appreciate them. As the Russian scientist L.S. Vygotsky noted, storytelling contributes to the development of memory and logical thinking [3.17]. Due to viewing and telling Karakalpak folk tales through multimedia, child's memory, language abilities, logical thinking, oral and written speech, creative thinking develops. When children listen to songs and see fairy tales, they are encouraged to analyze newly acquired information, to have a creative relationship with the characters in the fairy tale, to find a new, unique solution to a problem situation that no one has thought of. All in all, any new activity a child needs to do require creative thinking. Creativity gives rise to vivid fantasy and bright imagination in a child.

The creative principles of primary school children are nourished by literary genres and art, which takes the first place to awaken creative imagination of a child.

People used the forms of education of folklore like children's songs, riddles and fairy tales even in the early stages of human history to bring up a strong, skilled and clever individual in order to preserve their tribe and clan. Life experience and wisdom of adults, special methods of teaching were presented to children in simple and understandable way, which indicates the formation of children's

folklore during that period. Songs and fairy tales for children related to the child's age and mental characteristics are necessary for the artistic expression of the child's personal views on the world.

Karakalpak folk tales are divided into many types, for example, about nature, herding, farming, animals, people and fantasy tales. Fairy tales in which people ride on flying carpets, nowadays is represented by the appearance of airplanes, seeing cities deep under the ground shows the appearance of subways in modern times [4.47]. People created many fairy tales dedicated to the nature's power without understanding the secrets of nature. Even though that fairy tales were fantastic, people made up fairy tales based on ideas that make people's lives easier and wish to know the secrets of nature, for example, they dreamt about cooking food without breaking fire, of seeing far away, and flying to the sky and those ideas are currently being confirmed with the development of technology [5.31]. So, fairy tales develop not only a child's scientific creative ability, but also foresight and affect the growth of his intellect. We, the pedagogues, explain to the children the dreams of our people, how they lived, their professionalism, traditions, culture, and how they wished for our present time with multimedia tales, and we educate them to appreciate everything in their daily life. Especially, conveying age-appropriate folk tales based on national history to a child in an animated way enriches children's memory, logical and creative thinking, and imagination, and this child will have sweet memories for a lifetime. The ability of audio and visual thinking and multi-literacy increases when children are taught fairy tales in this way. As a result, the child learns most of the rules of the language, and inevitably verbal creativity and semantics: not with words or phrases but children will be able to invent the whole stories and fairy tales, which develops their creativity further.

Songs for children are one of the creations that include all the happy moments of childhood, children learn about natural phenomena with the types of seasons, get introduced to the names of animals and birds, and form the ability to learn poems by memorizing words, develop their ability to think logically and creatively.

In order to develop creativity of children of primary school age, teachers should pay attention to the following:

- 1) encourage them to ask a lot of questions and support this habit;
- 2) encourage the independence of a child and strengthen their responsibility;
- 3) provide opportunities for organizing free self-activities;
- 4) focus on children's interests.

We give the following recommendations to teachers in teaching children of junior school age to think creatively with the help of multimedia methods based on Karakalpak folk tales and songs for children outside of school hours:

- make creative ideas before the lesson, avoid monotony, all kinds of independent assignments during the lesson, colorful handouts, even the decoration of the classroom according to the theme will help the student's independent thinking, improve his mood and make the lesson not boring but interesting;

- the multimedia presentation of a story or a song using audio and video makes the lesson more meaningful;

- it is necessary to connect the lesson to life, we develop the ability of thinking explaining the ideas and goals of the fairy tales to the children and asking questions such as "how would you behave if you were in the image of this character", "did you like what this character did?";

- the use of scenes in lessons is also interesting and funny for children, and pupils learn to behave in a wide range of situations, they get rid of the feeling of shyness.

In conclusion, multimedia fairy tales are of great importance for the intellectual, moral and aesthetic development of a child's personality. Perhaps there is no child who does not love fairy tales, who does not want to see and listen to interesting stories full of bright events and wonderful adventures for a long time. Therefore, a fairy tale is not only entertainment, but also a great way to develop a child's creativity and creative thinking. In our opinion, one of the most effective means of developing

children's speech is to learn to create a multimedia story. For this, we need to approach this process from the psychological side. Another important point in the development of children of primary school is the ability to independently invent fairy tales and tell their content. This is because fairy tales are stories about fantastic characters and miracles invented by the author or people, they help to develop children's imagination, creativity and memory, and important in the formation of a child's personality.

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Rezyume: *Ushbu maqolada kichik maktab yoshi o'quvchilarini kreativ fikrlashga o'rgatishda qoraqalpoq xalq ertaklari va bolalar qo'shiqlarini multimediyali texnologiyada yaratishning tarbiyaviy ahamiyati haqida so'z etilgan.*

Резюме: *В данной статье говорится о воспитательном значении создания каракалпакских народных сказок и детских песен с использованием мультимедийных технологий в обучении детей младшего школьного возраста творческому мышлению.*

Kalit so'zlar: *Multimediya texnologiyasi, qoraqalpoq folklori, kreativ fikrlash, audio va vizual fikrlash, ilmiy ijodkorlik, animatsion, multisavodxonlik, mantiqiy fikrlash, ixtiro qilish.*

Ключевые слова: *Мультимедийные технологии, каракалпакский фольклор, творческое мышление, аудиовизуальное мышление, научное творчество, анимация, полиграмотность, логическое мышление, изобретательство.*

SEMANTICS OF THE COLOR "WHITE" IN ENGLISH AND KARAKALPAK

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Summary: In our work, we aimed to learn general meanings in the white semantics of phraseological units of the English and Karakalpak languages, the meanings used only in the studied languages, as well as the differences in the interpretation of special meanings from individual languages. We were able to show the abundance of semantic fruits in a special content, tried to define that words explaining color are widely used in both languages and have many meanings and a high degree of harmony. The results obtained in the course of the research were compared at the semantic and lexico-grammatical level, and we were able to show similarities and differences in phraseological units with color signs of the languages.

Key words: color, linguistic worldview, perception, white, phraseological units, associative content, purity, brightness, emotional-expressive effect

Color is the inseparable part of the outer world and surrounds us everywhere. Humans can distinguish colors based on the information received on the retina because the eye has a series of receptors that are sensitive to the frequencies corresponding to the colors. That is why color is considered one of the most beautiful and necessary visual senses for a person.

The ability of vision to distinguish colors gives a person the ability to fully understand, improve, manage, fully accept changes in objects and events, and distinguish information. "Color vision means the ability to receive and process a large amount of information about the external center," implies L.I. Roysenson. Understanding objects in the material world by color is one of the possibilities of human knowledge. That is why the color system is one of the most important terminological systems.

White color is a sign of things that have characteristics close to that color in visual appearance, such as snow, milk, pore, cloud. In the same sense, the "white" adjective comes together with a number of words, and at the same time, it is also possible to explain the things and events of the world around us [2:21]. A number of identifiers verbalizing the concept of "white" in the cultures of the world are related to the core nominator and the color symbol.

The word "white" in the Karakalpak language is used in a propositional sense, i.e. to explain more about the relative content of the color:

Ақ қуў қусқа әжел оғы тийди де,

Өз сүйген жубайын ерте тәрк етти (М.Нысанов «Ашық болмаған ким бар», - 4 б.).

— *Сизге ақ костюм менен қызыл галстук жарасады* (М.Нысанов «Ашық болмаған ким бар», - 14 б.).

*"Something passed her, all dressed in **white**, and vanished"...* (Ch.Bronte "Jane Eyre", - 19 p.)

*Close by Miss Temple's bed, and half covered with its **white** curtains, there stood a little crib* (Ch.Bronte "Jane Eyre", - 84 p.).

Z. Pardaev conducts research on lexical units that define color, including the color white. In his work, he notes that in the Uzbek language there are several additional occasional forms of this appearance [8:22]. That is, on the basis of stylistic features, symbolic, gradumatic, metaphorical and associative themes are presented: oq sut, oppoq, oq shazoda, oq kungil.

The meaning of the word "Aq" in the explanatory dictionary of the Karakalpak language is as follows:

1. appaq, gúmisteý, jaqsı, taza;
2. haq, hadal, jamanlıgı joq, kewlinde girbińi joq, qılmıssız;
3. aǵargan, asqatıq;

4. daq, girbiń, kir [QTTS].

In the markers of the Karakalpak language, the lexical units "gúmistey, taza, hadal, girbiń, asqatiq, daq" were distinguished. As they were not overlooked due to their content and color, we paid close attention to the "Etymological Dictionary of Turkish Languages". In it:

White (Aq).

1. white;
2. white, grey, ash grey (about animals);
3. figurative meaning: Favorable.
4. contemptible, worthy of neglect;
5. right. [EDTL 1969:48]

And, in the explanatory dictionary of the English language, the word "white" has more meanings than the meanings in Karakalpak languages: adjective, **whit-er**, **whit-est**.

1. of the color of pure snow, of the margins of this page, etc.; reflecting nearly all the rays of sunlight or a similar light.

2. light or comparatively light in color.

3. (of human beings) belonging to a group marked by slight pigmentation of the skin, often of European descent.

4. for, limited to, or predominantly made up of white people: *a white neighborhood*.

5. pallid or pale, as from fear or other strong emotion: *white with rage*.

6. silvery, gray, or hoary: *white hair*.

7. snowy: *a white Christmas*.

8. lacking color; transparent.

9. (politically) ultraconservative.

10. blank, as an unoccupied space in printed matter: *Fill in the white space below*.

11. Also called **al-wite**[awl-wahyt]. *Armor*. composed entirely of polished steel plates without fabric or other covering.

12. wearing white clothing: *a white monk*.

13. *Older Use: Offensive*. decent, honorable, or dependable: *That's mighty white of you*.

14. auspicious or fortunate.

15. morally pure; innocent.

16. without malice; harmless: *white magic*.

17. (of wines) light-colored or yellowish, as opposed to red.

18. refined or processed, as flour.

19. *British*. (of coffee) containing milk.

[<https://www.dictionary.com/browse/white>]

It was found that in the English explanatory dictionaries, the lexical unit "white" has 4 to 19 meanings in the marker corresponding to the appearance word. In addition, it is stated that the lexical unit has the characteristics of a noun and a verb. However, these terms are not defined in the explanatory dictionaries of the Karakalpak language.

In English dictionaries, the markers of the white lexical unit indicate different words, but their differences also have different content: *pure, light, slight, pale, silver, gray, blank, bright*. These differences are proven by the etymology of the lexical unit "white" (see: Table 1):

Table 1

Etymology of the lexical unit

Lexical unit	Source language	The original form in the source language	Meaning
White	Old English	Hwīt	White
Light	Slavonic	Světŭ	White or light

Bright	Sanskrit	<i>Śveta</i>	White or bright
Blank	Late Latin	<i>Blancus</i>	White

Non-European languages have many terms for the color white. For instance, there are seven different words for the color white in the Inuit language. Meanwhile, in the Sanskrit language, there are special words such as pale white color, white as white, white of sandalwood, white of autumn moon, white of silver, white of cow's milk, white of pearl, white of sunlight and white of stars. Also, in the Japanese language, color is designated by six different words depending on its inert or dynamic difference, as well as clarity and dullness [<https://en.wikipedia.org/wiki/White>].

White color is the brightest color compared to the colors of the spectrum, it shows the ability to radiate to the highest degree, and it is distinguished by the fact that there is no harmony in terms of color types. This color has a great emotional and expressive effect on the human mind, and it has other wonderful combination possibilities. Because of this, the range of associative images associated with white color is very wide. Meanings connected with it have come a long way in the history of human culture. The development of the values of white color can be completely reflected by its contrast with black color. The themes of this color explaining emotionality are verbalized in connection with mythological concepts.

When determining the meaning of words, not only their semantics, but all the conditions that cause the meaning of the word to be taken into account, i.e. the objects of the meaning of the word (*qar, duz, sūt*), the connection between phenomena (*qis, aspan, juldiz, gúmis*), the lexical meaning of the word It is necessary to take into account the meaning (*color*), the grammatical relationship (*appaq*), the degree of connection between the words in specific cases (*aq sūt bergen ana, aq pátiya, aq kiyiw*) and the scope of the word.

The phraseological units "kewli aq kisi", "aq kókirek", "kewli aq" in the Karakalpak language are connected with additional meanings of the lexeme "aq" in the old Turkic languages, according to M. Ganihodzhaeva, phraseological units such as «*ak sagıştu, ak irmu kishi*» (a person with pure intentions) mean clean and pure human expressions. The meaning of *kónli ak kishi* "white-breasted (pure hearted), halal man" is expressed by the phraseological units *aq kökröktj, yuzu ak, hadal* [6:15].

Thus, F.N. Shemyakin in his work "Language and Feeling in the Mind" notes that "all languages have white and black color nominations", and at the same time, it was determined that these binary oppositions are named by objects of associative content: *night - black, sun - white, cotton - white, coal - black etc.* In addition, it is necessary to determine the superiority of the color separation function compared to the visual bias function. The mutual nature of black and white is also expressed in language: lightness and darkness [3:48].

The biggest difference between English and Karakalpak languages is the number of binaropposite colors: black-white, red-green, yellow-blue. It was determined that the white component is dominant in the phraseological system.

The contrast between white and black, side and darkness "appeared in both art and religion, it appeared in its earliest authors, because for the first people, the rising of the sun meant joyful feelings, and the beginning of the darkness of the night was associated with fear and death" [Pimenova 2002 :11] Here we do not agree with the first appearance of color in art and religion. According to G. K. Kdirbaeva, the evolution of literary genres includes myth, fairy tale, and later epics and works of art. In those keys, each lexical unit is transformed from key to key. According to this evidence, the original Indo-European word "white" had the meanings of "brightness", "radiance" and "sidedness" [9:81.].

The values given in the absence of association of this color are also used. Later, this color symbolizes the divine principle, holiness, purity and innocence. The influence of these factors led to the predominance of meaningful meanings in the rich semantics of the white component phraseological units of the compared languages. It is not important that this color interprets negative events.

In our work, we learned the general meanings in the white semantics of the phraseological units of the English and Karakalpak languages, the meanings used only in the studied languages, as well as the differences in the interpretation of special meanings from individual languages. At the same time, the concepts of "happiness" and "joy" are learned with the help of bull color semantics. Let's define the semantics of the "white" colors: white day - (literally, "aq kún") - auspicious things in life (destiny); a happy, joyful and auspicious time [https://www.wordsense.eu/White_Day/]; aq kókirek, aq kewil, aq peyil, aq niyet [QTTS 1976:16].

It was determined that the color "white" is often found in the studied languages as a component of phraseological units. The relative component of phraseological units in the English language is used in close connection with the terms given in dictionaries. And additional terms of the lexical unit "aq" in the Karakalpak language beyond the markers in the dictionaries were determined. In addition, the "aq" component in the Karakalpak language is often used in binary opposition. Because color is used as one of the elementary and at the same time necessary visual senses for a person as a part of the inseparability of the growing world. The favorable association of the white color is so strong that in some word sequences of the compared languages, it is softened by unfavorable events: **white magic** - magic, showing miracles with the help of divine powers. «As was his wont, Poirot was at the same time delivering an impromptu lecture on witchcraft and magic in general, White Magic as opposed to Black, with various references to the Ka and the Book of the Dead throwing in».

white magic (uncountable)

1. (idiomatic) Magic derived from good or benign forces, as distinct from evil or malevolent forces; or magic performed with the intention of doing good or giving aid.

2. **1971**, Keith Thomas, *Religion and the Decline of Magic*, Folio Society 2012, p. 238: Widespread popular tolerance of **white magic** thus helped to mitigate the rigours of the law. [https://www.wordsense.eu/white_magic/]

The origin of the phraseology "White magic" is related to the English language, A.M. Babkin expresses the following opinion about it: "...the background of variation of phraseological units in the Russian language is very wide, both in terms of different forms of languages, and in terms of the type of phraseological units. Its essential part is international property" [4:217]. White lie - a lie, a "sacred" lie, a lie based on an ethnic point of view, a lie "for salvation", white envy - restlessness, malice, a desire to mark something else that is not with the white day, aq shaytan - (liter, "white animal") - aq hayal - the color of snow.

This color is used in the following phraseological word sequences of learned languages: white frost - colder than snow or snow flakes; white harvest - (literally, "aq jıyın terim") - the harvest after the dew. In the English and Karakalpak languages, "white" adjective in such phraseological units can also mean "winter": Aq Olimpiada - the winter Olympics.

Another phenomenon we have to include here is that color white is also often associated with goodness and purity. According to K.A.Djumamuratov's scientific article published in 2023, "white" is surely defined as as good and pure contradicting the color black as evilness: white as milk – белый как снег; disappear into the blue – в воду кануть; Aqtı aq, qaramı qara - black and white (it is easy to understand what is right and wrong). [10:138]

Russian and Tatar languages are compared according to the arrangement of phraseological units and the following opinion is expressed: "half translation, half adaptation, because some structural parts of Russian phraseological units were translated from Tatar words, while others were adapted" [5:31].

The conducted studies made it possible to determine the differences in the components of color signs and phraseological units of the two languages, which are genetically unrelated, typologically different from each other, and far from each other from a structural point of view.

Words explaining color are widely used in both languages, they have many meanings, have a high degree of harmony, and we see an abundance of semantic fruits in special content. Due to their semantic nature, they can depict emotional-expressive colors in phraseological units. In the semantics

of phraseological units with a color component, the dream color is explained by the objective truth given to a person, and at the same time, it is connected with the similar characteristics of artistic thoughts. The special features in the semantics of these units that distinguish languages from each other are related to subjective evaluations in the symbolism of color, differences in the associative perception of the world in the language, and differences in the ability to chain the structural composition of phraseological units. In addition, there are a number of extralinguistic factors (the existence of certain geographical, historical or other realities, customs and traditions).

We determined the following with the help of the information obtained from the learned phraseological units: the more powerful the emotional-expressive effect of a color, the richer its semantics, the wider the range of associative meanings associated with colors, the greater the ability to balance color components. It was proved that a large number of such differences are related to achromatic colors.

We determined the following with the help of the information obtained from the learned phraseological units: the more powerful the emotional-expressive effect of a color, the richer its semantics, the wider the range of associative meanings associated with colors, the greater the ability to balance color components. It was proved that a large number of such differences are related to achromatic colors.

The emotional and expressive effect is not so great, but the opposite trend is observed in shades: they do not have rich semantics and wide associative meaning, they do not have a great impact in the composition of phraseological units, and the number of such phraseological units is also not large. Yellow, brown, and gray colors are included in this group, and red, green, and blue colors are among the colors in the two centers.

In phraseology, the grammatical model is universal, but the special differences of languages affect the lexical and grammatical structure of phraseological units. Regardless of the structure of the English and Karakalpak languages, in the learned languages, groups of phraseological units are explained by substantive, verb, formative verb (adjective) and adverbial groups. In the work of these groups, the majority of the word sequences are calculated in two languages, both substantive and verb. Analysis of the lexical and grammatical structure of this type of phraseological units revealed that there are special differences. The results obtained in the course of the research were compared at the semantic and lexico-grammatical level, and similarities and differences were shown in phraseological units with color signs of the compared languages.

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century renaissance in the paradigm of science, education and technology innovations November 17-18 Nukus – 2023, 138

Rezyume: Biz o'z ishimizda ingliz va qoraqalpoq tillari frazeologik birliklarining oq semantikasidagi umumiy ma'nolarni, faqat o'rganilayotgan tillarda qo'llanadigan ma'nolarni, shuningdek, alohida tillardan olingan maxsus ma'nolarni izohlashdagi farqlarni o'rganishni maqsad qilgan edik. Semantik mevalarning ko'pligini alohida mazmunda ko'rsata oldik, rangni tushuntiruvchi so'zlarning har ikki tilda keng qo'llanilishi hamda ko'p ma'noli, uyg'unlik darajasi yuqori ekanligini aniqlashga harakat qildik. Tadqiqot jarayonida olingan natijalar semantik va leksiko-grammatik darajada solishtirilib, tillarning rang belgilari bilan frazeologik birliklardagi o'xshashlik va farqlarni ko'rsata oldik.

Резюме: В нашей работе мы ставили перед собой задачу изучить общие значения в белой семантике фразеологизмов английского и каракалпакского языков, значения, используемые только в изучаемых языках, а также различия в интерпретации специальных значений от отдельных языков. Мы смогли в специальном контенте показать обилие смысловых плодов, постарались определить, что слова, объясняющие цвет, широко употребляются в обоих языках, имеют много значений и высокую степень гармонии. Результаты, полученные в ходе исследования, были сопоставлены на семантическом и лексико-грамматическом уровне, и нам удалось показать сходство и различие фразеологизмов с цветовыми признаками языков.

Kalit so'zlar: rang, olam lisoniy manzarasi, idrok etish, oq, frazeologik birliklar, assotsiativ mazmun, soflik, yorqinlik, emotsional-ekspressiv ta'sir

Ключевые слова: цвет, языковая картина мира, восприятие, белый цвет, фразеологизмы, ассоциативное наполнение, чистота, яркость, эмоционально-выразительный эффект

PECULIARITIES OF TRANSLATING TOPONYMIC UNITS

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Summary: *The transfer of toponymic units has always been a rather controversial issue, both in theory and in the practice of translation. Until now, there is no single approach to the transfer. Thus, this article describes the features of the transfer of toponymic units from Russian to English languages and includes some recommendations about the methodology.*

Key words: *toponymic units, toponymy, transliteration, transcription, rendering, translation.*

Nowadays we can be everywhere in the world, we can find any location with the help of our phones. But what would we do if the names of streets, bays, churches or squares would sound completely different than those we are used to hearing in our everyday life? This is what foreigners sometimes face while visiting our country. It makes their ability to know their ways around too difficult. That is why we need to figure out how to render such complicated language units into Russian accurately. According to E.L. Berezovich, toponymy is «a scientific discipline, which studies geographical names, their origin, development, current state, semantic significance, their spelling and pronunciation» [1].

Toponyms are classified by five different principles. The first one is their classification by the type of designated geographical objects (e.g. hydronyms, oronyms). The second one is classifying by language (e.g. Russian, Tatar names). The third one is classifying by structure (simple, derivative, complex, compound). The fourth one deals with historical aspect (e.g. Chinese, Slavic). And the fifth one is classifying by area (microtoponyms and macrotoponyms). The former are individual names of small geographical objects and characteristic features of the relief and landscape. They are formed on the basis of the language or dialect of the people or nationality. *Microtoponyms* are very mobile and changeable but, 123 as a rule, their usage is limited by the geographic area of distribution of a dialect or language. *Macrotoponyms* are names of large natural or manmade geographical and socio-administrative units. The main features of this group are standardization and stability, as well as breadth of use [4].

There are three main generally accepted ways for rendering toponyms, as well as other proper names: transliteration, transcription and tracing [2].

Transliteration is needed when languages use various graphic systems (for example, English, Russian, Greek, Armenian, Georgian) but the letters (or graphic units) of these languages can be put in some kind of correspondence with each other, and thus there may be an interlingual transfer of proper names. For example, the Latin alphabet and the Cyrillic alphabet have a common basis; most letters of these two alphabets can be matched with each other in view of the sounds they regularly designate [2]. As for the mistakes, let us take an example - the Leningrad Oblast'. It will be appropriate to write the Leningrad Region, because people who are not familiar with our realities will not understand the meaning of the word «oblast», but they will be able to navigate with the word «region». There is the same problem with «Nikolskoe kladbishe» and «Arsenal'naya Naberezhnaya». For the ease of navigation they should be rendered into English as «St. Nicholas Cemetery» and «Arsenal'naya quay». There is also a mixed way – transliteration and transcription [2]. For example, let us take a toponym Ploshchad Iskusstv. Here we see that one part is translated with the help of transcription and another with transliteration. The preferred variant here is Arts Square, because it can show the tourist what kind of object it is. As for tracing, there are some established ways. «Black Sea», «White Sea», «Baltic Sea», and, for example, «Russia's Northwestern region» (or «district») (Северо-Западный регион). There are three elements and «Russia's» is traditional translation, and two other elements are tracing. Tracing is more common in the translation of buildings, institutions, organizations. So we have

«Constitutional Court» (Конституционный суд), it is either the name of organization and the building where it is placed. «St. Petersburg Legislative Assembly» (Заседание Законодательного собрания) also means the building and the authority. The same situation we have with «The State Russian Museum» (Государственный Русский музей). In these cases, tracing is appropriate because rendering by transcription or transliteration would confuse foreign 124 tourists. But there is one interesting case when there are two possible variants of translation, for example: (Дворцовая площадь) «Palace Square» and «Dvortsovaya Ploshchad». This happened because the translators involved decided that transliterated names would be easier for foreigners if they needed to ask for direction. But, on the other hand, there is an established English name – the Palace Square, and it will be indicated along with the transliteration – Dvortsovaya Ploshchad.

When rendering toponymic objects, you should also consider what the translation is for – for street orientation or for an information medium. The general principle is the division of objects into key and non-key ones. Key objects are objects having infrastructural or historical and cultural significance for tourists. As for non-key objects, they include all the rest. That is, the names of key objects are fully translated into English, and nonkey ones - by transliteration [2]. For example: the key object is Opera and Ballet Theatre (Оперный театр) and the non-key one is Avtokolonna (автобусная остановка «Автоколонна»). When rendering, there are some general trends that should be used.

- The proper name and the name of the toponymic object are transliterated thus allowing to identify the name. The classifier is written in accordance with the Russian tradition – with a lowercase letter. So, we have: проспект – prospekt, переулок — pereulok, проезд — proezd, улица — ulitsa, линия — liniya, набережная — naberezhnaya, площадь — ploshchad, бульвар — boulevard [3]. For example – «Nevskiy prospekt». The recommended address format is: house + [building / letter] + street. All elements are transliterated for the ease of identification: 19, Lenina ulitsa.

- Gardens, parks and squares. The proper name and the name of the toponymic object are transliterated; in brackets a translation should be given. Transliteration is necessary to determine the location of an object. So, we have: сад — garden, парк — park, сквер — public garden, поле — field [3]. For example: Марсово поле — Marsovo pole (Mars Field).

- Rivers, lakes, canals, ponds, bridges. The general rule is that the proper name is transliterated, and the name of the toponymic object is translated. So, we have: река – river, озеро – lake, канал – canal, пруд – pond, мост – bridge [3]. For example: Река Нева – the Neva River.

- Institutions and organizations, cultural institutions, historical sites, museums, sports infrastructure facilities. The general rule is that all names are translated. So, we have: почта/отделение почтовой связи – 125 Post Office, полиция – Police, музей – Museum, музей-квартира – Memorial Apartment, университет – University и т.д [3]. For example: Русский музей – Russian Museum. Also it is recommended to avoid long names of institutions, because it complicates perception and does not solve the main task – to direct the tourist to the desired facility. The index should provide visualization of information in the shortest possible way, which would help the tourist to find the desired object.

- Information about the historical belonging of the object to someone. The general rule is that the proper name is transliterated, while in the English version it is necessary to omit the initials [3]. For example: Музей-квартира М.А.Булгакова – Bulgakov Memorial Apartment.

- Names of companies, organizations that are not nominal names are, as a rule, fully transliterated. For example: Водоканал — Vodokanal.

- Names of companies, organizations that are nominal names are, as a rule, fully transliterated and the translation should be given in the brackets. The name should be placed in inverted commas. For example: Подростково-молодежный клуб Дружба – «Druzhba» («Friendship») Club for Teenagers and Young People.

- Transfer of names of religious buildings. The general rule is that they are fully transliterated and translated, the translation being given in brackets. Transliteration is necessary to determine the

location of an object. So we have: церковь – church, храм – church, собор – cathedral, часовня – chapel [3]. For example: Исаакиевский собор – Isaakievskiy sobor (St. Isaac's Cathedral).

- Transfer of names of monuments. The general rule is that «памятник чему/кому-либо» is rendered as «Monument to». If the monument is dedicated to an event or a group of people, the title is translated. For example: Монумент героическим защитникам Ленинграда – Monument to the Heroic Defenders of Leningrad.

- Objects of transport infrastructure. The general rule is that the names of the object types are translated. Proper names, station names are fully transliterated. For example: станция метро «Динамо» –Dinamo Metro Station. In conclusion, we would like to say that English does not lose its position as an international language, and with a large flow of tourists in our country, we must be ready to render toponymic units correctly in order to help people find their ways in our country without any problems. But for the translation to be good we need to study the features of toponymy and try to find universals that will be known all over the world and which translators will use.

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Rezyume:: *Toponimik birliklarning ko‘chirilishi tarjima nazariyasida ham, amaliyotida ham har doim ancha munozarali masala bo‘lib kelgan. Ushbu lug‘at qatlamini uzatishda hali ham yagona yondashuv mavjud emas. Ushbu maqolada rus tilidan ingliz tiliga toponimik birliklarni o‘tkazish xususiyatlari tasvirlangan va ushbu o‘tkazish metodologiyasi bo‘yicha ba’zi tavsiyalar berilgan.*

Резюме: *Передача топонимических единиц всегда являлась довольно спорным вопросом, как в теории, так и в практике перевода. До сих пор не существует единого подхода к передаче этого слоя лексики. В данной статье описываются особенности передачи топонимических единиц с русского на английский язык и даются некоторые рекомендации по методике этой передачи.*

Kalit so'zlar: *toponimik birliklar, toponimika, transliteratsiya, transkripsiya, uzatish, tarjima.*

Ключевые слова: *топонимические единицы, топонимика, транслитерация, транскрипция, передача, перевод.*

METHODS OF TEACHING THE SCIENCE OF HISTORY WITH THE SCIENCE OF LITERATURE

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Summary: *the article discusses the idea of an integrated approach to the teaching of historical science, that is, comparative teaching linking the disciplines of fiction and history. It presents historical facts and fiction, as well as satellite data for the development of students' scientific competencies. As a result, the issues of independent, logical thinking of future readers of history, work with historical facts and the use of historical works of art on this topic are discussed.*

Keywords: *professional training, integration, historical fact, artistic fabric, fictional information, comparison, comparison, generalization, original definition, separation*

Introduction. Teaching history in general schools based on an integrative approach with literature makes it possible to create a clear, vivid image of a specific historical figure. Educational integration, which is the basis of this approach, is manifested as a process of unification and integration of various components of content, educational fields and institutions, as well as subjects.

Pedagogical integration is well revealed in the works of V. Bezrukova. In general, integration is a general and multifaceted process of establishing connections between information, knowledge, and sciences, as well as ensuring their integrity and a single structure covering all components in a dialectical unity.

We will dwell in more detail on the meaning of the concept of integration as a general scientific phenomenon. In French, "integration", integration - join, participate, merge; from the Latin integration - restoration, filling, entered from integer - integer. In mathematics, the term "integral" and later the concept of "integration" began to be used.

It began to be used in a number of humanitarian sciences: history, philosophy, sociology, psychology, pedagogy, and others. Therefore, integration can be considered as a complex interdisciplinary scientific concept.

We can summarize different points of view and conclude from "integration". It is also understood as a developmental process associated with a philosophical perspective.

On the basis of the above-mentioned rules, it can be concluded that the formation of an integrated system represents:

- a) integral whole, which includes synthesis of procedural and result components of integration;
- b) integration-process;
- c) integration - the result reflecting the moment of fixation is a certain "product" obtained during the implementation of the integral process.

Integration in education involves the interdependence and interaction of homogeneity and goals, knowledge, skills, skills), the process of forming a whole from a previously separated set.

Homogeneous components (goals, content, methods, tools, forms, language, educational subjects, methods, ideas, etc.). According to S. Bezrukova, integration is one of the forms of interaction and interaction of objects and phenomena in theory and practice, restoration of their original natural integrity. At the same time, integration works as a principle, a process, the result of the interconnection of objects, which shows polyfunctionality [1].

Pedagogical essence of integration N. Deeply revealed in the works of K. Chapaev, he considers it the process and result of development, the formation and formation of multidimensional human integrity in the conditions of integrative pedagogical activity [2].

A. Larionova, N. K. Chapaev integrated pedagogical activity as a specific type of pedagogical activity, during which certain integrative tasks of educational theory and practice are actualized [3].

(expanding the subject of knowledge, developing the concept of thinking and scholasticism, forming individual subjectivity, organizing a flexible multi-level professional, education, etc.). Pedagogical integration as the highest form of expression of the unity of goals, principles, content, forms of organization are pedagogical units based on the interconnection of various components of the educational process.

M. Berulava in the integration of educational content means "the process and result of the interaction of its constituent elements, along with the increase in the consistency and density of students' knowledge." [4]. We can agree with M. Berulava's opinion that from a methodological point of view, the problem of integration of the educational content that we are investigating should be considered "on the basis of a general scientific systematic approach". Recently, it has gained wider rights in the study of didactic problems.

"This approach is related to the general methodological analysis of systems, many authors show the existence of integral qualities as the main characteristic of the system." The essence of the systematic approach is that the integration of educational content is understood as its integral characteristic as a system of interrelated elements.

According to M. Lopatkin, integration in the educational space is manifested in the change of all components of education. Systems by creating integrative learning complexes; development of integrative educational programs, training courses, training sessions; an opportunity to obtain integrative learning results appears, provides integrity as a means of integration of the educational system, contributes to the development of human abilities to the worldview, system.

The science of history is directly related to mathematics through numbers, as well as to geography and other sciences in terms of place, space. Instead, we would like to emphasize that it would be appropriate to integrate history teaching with literature. There are historical works on almost all stages of our history. Considering that historical works reflect the important historical information of their time, it is good to connect such works of art to history lessons and teach students to make independent observations. Students learn to distinguish historical fact from fake or fiction. This will help them become better historians in the future and make the educational process interesting and useful in all aspects. It consists in the use of educational technologies that allow organizing the educational process taking into account the professional direction of education, as well as focusing on the student's personality, interests, inclinations and abilities [5].

For example, when studying the subject of the Babur state in the history of Uzbekistan subject, taking the necessary excerpt from the historical work written about Babur with the following historical information, and comparing the two will develop the ability of independent, logical thinking in the student:

"However, in a short period of time, Babur sponsored the work of stabilizing the political environment in India, unifying the Indian lands, beautifying cities, setting trade issues in the right direction, and creating parks. The beautification of India, the construction of architectural monuments, gardens, libraries, caravanserais, which are still famous in it, spread on a large scale, especially during the period of his sons and descendants.

The penetration of the Central Asian style into Indian art and architecture began to be felt. In the presence of Babur and his ruling descendants, a perfect spiritual and spiritual environment was formed, which embodied the advanced and intelligent scientists, poets, musicians and statesmen of that time.

Jawaharlal Nehru wrote about the importance of the cultural environment in the Babur state for India: "After Babur's arrival in India, there were changes and new incentives gave fresh air to life, art, architecture, and other areas of culture were connected to each other." Babur continued his literary and artistic activities in India in addition to his large-scale government work and created the above-mentioned works. Babur's masterpiece known to the whole world is "Boburnoma". It is known that the history of Movarunnahr, Khurasan, Iran and Indian peoples was covered in it during the period when

Babur lived. The work mainly consists of three parts, the first part - the events that happened in Central Asia in the second half of the 15th century; the second part - the events that took place in Kabul, that is, Afghanistan, at the end of the 15th century and the first half of the 16th century; the third part is devoted to the history of the peoples of North India in the first quarter of the 16th century. "Baburnoma" perfectly describes the political events of that time, the political and economic situation of the Fergana region, its capital Andijan, the major cities of Central Asia: Samarkand, Bukhara, Karshi, Shahrisabz, Osh, Urgench, Oratepa, Termiz and other cities. extremely rare information is presented.

In it, you can find information about the major cities of Kabul, Ghazna, and many districts, provinces, and North India under their control." [6].

In the novel "Starry Nights" by Primkul Kadyrov, Zahiriddin Muhammad Babur is described as follows:

"In the evening, Babur was left alone in the cell. Kasimbek told the necessary people: "Hujra is the refuge of His Holiness Mirza, and they can spend the night there.". The guards, trying not to be seen by Babur, started guarding the back of the cell. Always being in the center of attention and always alert and careful, not forgetting that every word, every action of the king affects someone's fate, was very stressful for Babur. His young body longed to be free, to roam freely like his peers. Now he was lying on his back without a pillow on the blankets spread inside the room. Then he fell face down, buried his head in his palm and stared at the patterns on the wall. Even though he was tired from riding all day, he didn't want to rest. He jumped up and tapped his ear a couple of times and yawned. Then he went out to the porch and began to look around again. The four sides are full of spring elegance. Because the air is clear, the smoke from the fire below is also clearer than usual. The valley, which ends with snow-covered mountains, is full of greenery. Babur can see with the eyes of a dream that in one place Ozgan, in another Margilan, in the distance Isfara, Khojand, Kason and Akhsi - in all these places, gardens blossomed. This beautiful valley, surrounded by majestic mountains like the walls of the legendary Castle, is now more peaceful than before. It has been more than two years since the end of the war. In such quiet, blissful moments, he was drawn to pen and paper. The merchants brought a six-legged table to the room. Babur sat down and opened the notebook he called "Events". His last notes were about Konibodom and Isfara, which he had recently seen." [7].

In the process of teaching history, it is necessary to create conditions for the development of systematic thinking and creative activity of students through the use of integrated educational technology. Forms of organizing educational activities, methods and methods of developing interdisciplinary skills and skills. Education of an intellectually developed, socially active person who is able to solve life problems and freely manage the world around him in the conditions of integration into society.

Lessons based on communication give the student a very broad and bright idea of the world in which he lives, the interaction of events and things, mutual assistance, and the world of various material and artistic cultures. The main focus is not on mastering certain knowledge, but on the development of students' creative activities. This allows you to use the content of all academic subjects, to draw information from various fields of science, culture, art, referring to the surrounding life events and phenomena.

Combining students' activities, when they themselves begin to compare facts, judgments about the same events, events, establish connections and patterns between them, they use jointly developed learning skills (the deepest level of integration).

As a conclusion, it can be said that teaching history by comparison with literature, in particular, with works dedicated to historical figures and events, creates a clear and vivid image of a specific historical figure in students. Fiction, including historical novels, preserves historical truths, may be embellished, but the events are based on historical facts. Such comparative teaching helps the student to strengthen his knowledge of history and learn to think logically. In fact, history and literature cannot

be separated from each other. Students learn about national history through films. In this regard, the integration can be further extended by showing the most relevant parts of historical films in the teaching of history. In this case, the main result is teaching the student to draw one conclusion about a certain historical person by analyzing three materials.

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Rezyume: maqolada tarix fanini o'qitishga yaxlit yondashuv, ya'ni badiiy adabiyot va tarix fanlarini bog'laydigan qiyosiy o'qitish g'oyasi ko'rib chiqiladi. Unda talabalarning ilmiy kompetensiyalarini rivojlantirish uchun tarixiy faktlar va fantastika, shuningdek, sun'iy yo'ldosh ma'lumotlari taqdim etiladi. Natijada bo'lajak tarix o'quvchilarining mustaqil, mantiqiy fikrlashi, tarixiy faktlar bilan ishlash va ushbu mavzu bo'yicha tarixiy badiiy asarlardan foydalanish masalalari muhokama qilinadi.

Резюме: в статье рассматривается идея комплексного подхода к преподаванию исторической науки, то есть сравнительного преподавания, связывающего дисциплины художественной литературы и истории. В нем представлены исторические факты и художественная литература, а также спутниковые данные для развития научных компетенций студентов. В результате обсуждаются вопросы самостоятельного, логического мышления будущих читателей истории, работы с историческими фактами и использования исторических художественных произведений по этой теме.

Kalit so'zlar: kasbiy tayyorgarlik, integratsiya, tarixiy fakt, badiiy to'qima, uydirma ma'lumot, taqqoslash, yonma-yon joylashtirish, umumlashtirish, asl ta'rif, bo'lim.

Ключевые слова: профессиональная подготовка, интеграция, исторический факт, художественная ткань, вымышленная информация, сравнение, сопоставление, обобщение, исходное определение, разделение.

**ANALYSIS OF ARTICLES ON THE VERB WORD GROUP IN MAGAZINES OF THE 20S
OF THE 20TH CENTURY**

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Summary: *The article analyzes the issues of linguistics in the magazine "Maarif va okitguchi" in the 20s of the 20th century. In particular, the verb phrase is discussed. In addition, the grammatical categories of this word group are described.*

Key words: *verb, tense, mood, adjective, adverb, verb, infinitive, tense.*

Linguistic issues have been actual throughout history. In the 20s of the 20th century, articles on linguistics were published by a number of our scientists in the "Maarif va okitguchi" magazine. The issue of the alphabet, spelling and grammar are also reflected in analytical articles in the magazine. The verb was recorded in "New Uzbek Alphabet Spelling Rules" (1926, September). The article does not give a definition of the verb, but lists its tense, mood, and functional forms and Past tense verbs. It is called "mozi siga". Its definition is not given, but its 2 semantic groups are defined:

1) definite past tense (moziyi shahdi):): *keldim, keldi, keldik, keldiniz, keldilar* and other their variants.

2) the past tense verb of being heard (moziyi naqli): it also has two types: a) *kelmizman, kelmizsan, kelmiz va boshqa; hamda b) kelibman, kelibsən, kelibdir* and etc. The meaning of this form of being heard is also recorded in modern literature.

It seems that in this article, only types of past tense verbs with suffixes - di, - mish, - ib were taken into account.

Present tense verbs. It is called "present tense" and it has 2 semantic types:

a) present-future tense form (it is called "Present-future") and *keleman*, etc.;

b) present continuous verb (it is called («davomiy sig'a»): *kelmakdeman* and others. So, the main forms of present tense verbs are shown.

Future tense verbs. It is called «*kelgusi zamon sig'asi*» and it has 2 meanings:

a) future tense verb. It is defined as a term *ehtimoli muzore*: *kererman* and other, and in some literature it is referred as a verb of the historical past tense.[2] *kelgymdir, kelgyndir* (denoting the "u"-front row vowel) inflected verbs, and the clause is defined as the term *bandi muzore* summarizes them with the term *siga* [1] and defines 8 *siga* of the verb. Of course, the principles of classification are not mentioned. The Arabic naming of the internal types of future tense verbs is also according to a certain tradition. At the beginning of the 20th century, in the work "Turkish Rule" by Muhammadamin ibn Muhammad Karimkhoja, future tense verbs were given with the term *muzore*.[3] It is worth noting that the verb form called the future tense in the article is called the future tense *i*. We believe that it is necessary to give special importance to it. In our opinion, we would like to emphasize that the current term is not the norm for the Uzbek language. Because in the modern Uzbek language, the word "*kelasi*" is used only in the combination of "*kelasi yili*", and the scope of the word "*kelgusi*" is wider.

Verb moods. Such a term is not found in this article, there is no concept of inclination at all, but under the title **amr sig'asi** (imperative mood) the command-desire inclination is given: *kelaj(in), kel(in), kelsin; kelajlik, keliniz, kelsinlar* and others. In this interpretation, it is appropriate to pay attention to the affix -in in the 1st person singular, and -ing in the 2nd person singular in parentheses. So, the authors of the article considered two options in these forms.

In the article, with the term *tilak sigai - gaj/oaj*, they cite the suffixed form and *kelgajmen, kelgajsen, kelgaj, kelgajmiz, kelgajsiz, kelgajlar*: It is known that such a form is not used in modern Uzbek language, only historicity (formality) to the speech. it is used only in certain styles that give the spirit. This form is a historical form, and G. Abdurakhmanov and A. Rustamov emphasize that this

form expresses a future verb and a wish [4]. Sh.Shukurov, along with its meaning of the future tense, brings the meanings of usual action, assumption of action execution, wish, request, advice, goal, hope, command and other modal meanings.[5]

Q. Sadikov says that it directly forms a future tense verb [6]. Functional forms of the verb. Such forms are referred to as "Hol siga" and there are 5 forms of it. Of these, three are related to the adverb and two to the adjective.

Ravishdosh's - v|iv|v; - gəc|qac|kəs|qac; - gəncə|qanqa| - kəncə|qanqa - with the affix kanja|kanka; The following forms of the adjective: gən|qan|kən|qan hamda *kelə turqan*, *qava turqan* are listed. The form of Ravishdosh with the suffix - ə|aj is given separately, and although it is not called "siga", it is among the sigas, and the Russian term "Deeprichastie" is given instead of its Uzbek name. Therefore, Russian linguistics may have served as a theoretical source for the authors of the article, but it is also felt that they did not have enough knowledge to translate adverbial and adjective terms, due to which the term "deeprichastie" is directly accepted.

Action name. It is referred to as an infinitive. It is shown that it is formed with the affixes - mək/-maq, --yv/-uv, -z/-iz/-z(-sh/-ish/-ysh), -məklik/-maqlq. It is known that most of the literature does not provide information about the formation of the name of the action with the affix moqlik, but in the linguistics of the 20s, the words barmaklik and kelmaklik were considered artificial nouns [7]. And K. Meliev thinks about the formation of the name of the movement in Turkic languages. At this point, it should be noted that in Uzbek linguistics of the 20s, the name of action was not used with the infinitive term. It is known that this term actually means the present tense verb base of the word in Persian. The term "Masdar" is generally found in the works of local authors written in the languages of the Turkic peoples of that time, following the Persian manuals.[8] "Education and Teacher" No. 7-8 of 1926 (pp. 41-46).

In conclusion, it should be noted that special research on morphology was not published in the magazine, but considering spelling, which is one of the important issues of the period, allows to determine the characteristics of the period about morphology and morphological concepts on the pages of the magazine. Etymology, word root, word root, word base, nouns, quality, helpers, istifor (load), verb, sign, infinitive, adverb, suffix, etc. . So, It is evident there is very little material on the verb word group. But even so, the articles in this magazine are used as a necessary source for studying the verb-word group in the modern Uzbek literary language. Apparently , most of these terms are successfully used in modern Uzbek linguistics.

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Rezyume: *Maqolada XX asrning 20 – yillarida “Maorif va o‘qitg‘uchi” jurnalidagi tilshunoslik masalalari tahlil qilingan. Ayniqsa, fe‘l so‘z turkumi to‘g‘risida muhokama yuritiladi. Bu so‘z turkumining grammatik kategoriyalari haqida bayon qilingan.*

Резюме: В статье анализируются вопросы языкознания в журнале «Маариф ва оқитғучи» (“Просвещение и преподавание”) в 20-е годы XX века. В частности, обсуждается глагольная группа. Описаны грамматические категории этой группы слов.

Kalit so‘zlar: *fe’l, zamon, mayl, sifatdosh, ravishdosh, harakat nomi, masdar, sig’a.*

Ключевые слова: глагол, время, наклонение, прилагательное, наречие, глагол, инфинитив, время.

THEORETICAL BASIS OF USING MEDIA TECHNOLOGIES IN TEACHING THE ENGLISH LANGUAGE TO A1 LEVEL STUDENTS

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Summary: *The article provides information about the importance of using media technologies in teaching English to elementary school students.*

Keywords: *Media, media technology, media pedagogy, information tools, advanced pedagogical technologies, multimedia*

INTRODUCTION

The global socio-economic changes taking place in the world, the process of integration requires the development of the system of teaching foreign languages as a priority in general secondary education. In English classes, special attention is paid to the development of students' grammatical competence on the basis of media technologies, and the use of modern pedagogical technologies in foreign language teaching. In the studies, it is recognized that the development of linguistic competence of students in foreign languages in secondary schools, especially in English, based on an integrative approach, is of scientific and methodological importance. The experience of developed countries also proves that it is a priority to have knowledge, skills and competence about grammar listed in the educational content of English language teaching, especially for A1 levels, and to be able to use it in speech.

The 44th goal of the Presidential Decree no. 60 of the President of the Republic of Uzbekistan dated January 28, 2022 "On the development strategy of New Uzbekistan for 2022-2026" focuses on improving the quality of education in schools and bringing the knowledge and skills of pedagogues to international level [1.23]. Today, teaching foreign languages from primary school in Europe is not as popular as in our Republic, but it is an important direction of language policy. In European countries, when introducing a foreign language subject to the primary school program (children aged 5-6 to 10-11 years old), teachers follow the recommendations developed within the framework of the European Union "Language learning for European citizenship" and as a result, in teaching a foreign language European countries are making a lot of progress.

Currently, in our republic, it requires the necessity of implementation based on searching, finding and experiment with new factors to accustom elementary school students to school. In teaching English and adapting to education at school, children's mental preparation, being physically healthy, able to communicate, enriching their vocabulary (word-stock), acquiring basic elementary concepts, primary preparation for writing and knowledge of concepts about certain words play an important role. Especially 7-10 years old children have a great need for information. In this regard, the use of media technologies in teaching English is important for all children who are brought up in educational institutions. At this time, increasing the child's opportunities to get used to it, expanding his social relations, is of great importance for the formation of the child's personality. In this regard, it is written in the encyclopedic dictionary that "it is important in the upbringing, education and development of children as a means of psychologically preparing them for the future life." [5.232] These are general definitions of the use of media technologies and describe the essence of media technology.

Problems related to the methodology of teaching foreign languages in general secondary schools in our country, the development of grammatical competence, which is considered a component of linguistic competence in English, its role and importance in language learning, as well as the use of an integrative approach in teaching English, on the scientific-theoretical issues of using media technologies in the lesson have been studied by the scientists of our republic J.J. Jalolov, G.Kh.

Bakieva, L.T. Ahmedova, T.Q. Sattorov, H.T. Mustafaeva, I.M. Tokhtasinov, M.Sh. Ruzmetova, M.A. Abdullaeva, A.A. Isakov, N.M. Abdullaeva and M.Kh. Gulyamova in their scientific works.

In addition to the traditional opportunities, the advancing informational tools in our society determine the basis of social development, as well as factors such as people's ability, initiative, creative approach to work, intellectual activity, independent improvement of their knowledge and skills. The process of creating information related to the storage, transmission, and reception of large amounts of information provides for the development of computer technologies in various fields of human activity. Today, the wide possibilities of using multimedia tools in education have already been confirmed.

There are different opinions about the concept of media technology, and it is noted in the American International Encyclopedia of Society that "media technology" is the ability of a person to be active and literate, to be able to receive and create media texts, to analyze and evaluate, to understand the sociocultural and political content of modern media while feeling his responsibility as a citizen in society. [2.9494]

Media includes the system of print, press, television, cinematography, radio, sound recording and the Internet. G.A.Polichko, A.v.Fedorov, R.G.Rabinovich, Y.M.Rabinovich and others among the scientists who have studied and analyzed the direction of media education, studying the form and methods of work revealed the pedagogical and methodical importance of media technologies.

To the problems such as teaching English based on media technologies, developing students' speech, oral and grammatical competences with the help of informational tools during the lesson, developing new teaching methods, using advanced pedagogical technologies, computer technologies in classes and didactic design of lessons a serious attention is being paid.

Today, when the processes of globalization are accelerating all over the world, modern communication technologies serve as an important factor in the further improvement of the education sector in our country. Nowadays, almost all educational institutions in our country are equipped with computers. This technology performs millions of tasks every second. Among them, there are also many programs that serve for media technology. Therefore, its effective use in the further improvement of the education sector is the demand of our era. Media-related terms can be studied by conventionally dividing into 6 directions: television, film, radio, advertising, Internet, new media and press.

Media technology comes from the English word media "education" and as the Latin word media means factor. Media technology requires the use of new methods in the process of teaching students.

The main goal of media education consists of forming skills like helping to understand the basic laws, learning the language of media information in simple directions, contributing to the artistic growth and development of the student, receiving, studying and competently analyzing media texts. Globalization in the field of information is creating a basis for the formation of a new worldview.

As modern knowledge improves, the problem of correct and effective use of information is emerging. Currently, it is almost impossible to control the content of information, as well as the methods and ways of its distribution through mass media networks. So, in order to avoid any confusion and mistakes in this matter, a perfect system is necessary. This system depends on the high level of knowledge and their correct understanding of each other of the information distributor and its consumer. Now, some specialists are looking for ways to correctly form information in the mind of the student, so to speak, to organize it systematically. In the educational practices of developed countries of the world, research in this field began in the 70s of the last century. This created the basis for the emergence of a unique direction as media technology in the science of pedagogy.

Media technology requires the use of new methods in the process of teaching students.

Media pedagogy is a new pedagogical technology that allows creative thinking and education with the help of mass media. The resources of media pedagogy include information on the Internet, television, radio broadcasts, film, video, and audio materials.

In the conditions of today's globalization, the issue of using media technology in teaching a foreign language in the primary classes of general education schools is significant. Modern programs,

teaching methods, methods, telecommunication tools and mass media are developing at a rapid pace. Therefore, the methodology of teaching English such as the definition of didactic requirements for the integration to education of media information, software-pedagogical tools and multimedia training manuals in the field of all teaching methods, media technology in teaching English and analysis of usage of methods of information technology, is important.

Education based on media technology arouses lively interest of students in the primary class and allows developing the individual abilities of each child and increasing the activity of knowledge. The importance of media technology is not based on the reaction of children, but the effectiveness of the lesson increases by seeing and hearing specific tasks applied to each child. It should be noted that there is a large network of didactic games, but there is no clear classification of them. We offer broad classifications of media technologies in science, which are intended for use in the process of teaching elementary school students to communicate in English (Fig. 1).

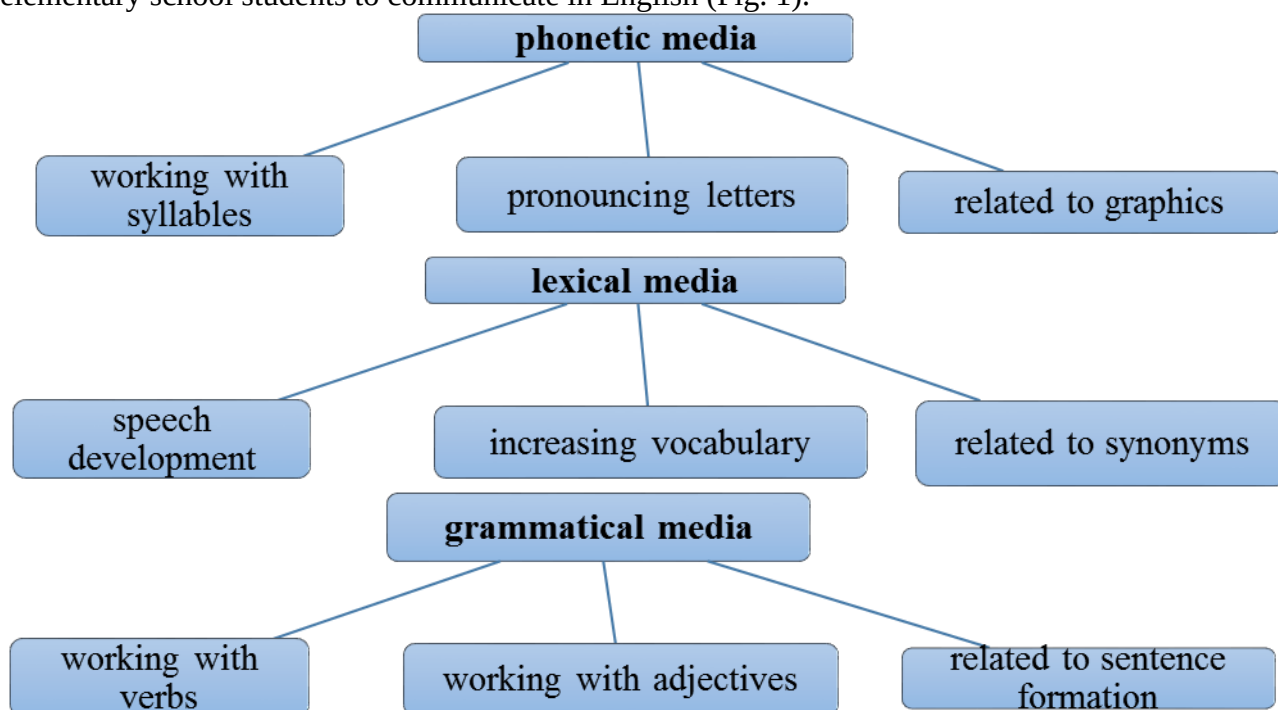


Figure 1. Classification of the use of media technologies in teaching English to A1 level students.

Organization of educational activities based on media technology using media tools and computer programs helps to present the studied materials in a more clear and understandable way and to increase the imagination of students to a great extent. It is known that in the "Guess What" textbook of the English language in the primary classes, students can have problems connected to imagination. The reason for this is that not all students have the same ability of imagination and perception. If we use special QR-coded topics in this section for who uses video electronic programs and manuals as a media tool, we will achieve an increase in the student's imagination and a more solid place in his memory. Apart from this, computer-based teaching and computer-based modeling of objects in the subject save class time and facilitate the process of teacher's preparation for the lesson.

It is possible to save up to 30% of time in acquiring knowledge on the basis of media technology tools, and the acquired knowledge is retained in the memory for a long time. If the students receive the given materials on the basis of viewing (video), the retention of information in memory increases by 25-30%. In addition to this, when learning materials are presented in the form of audio, video and graphics, the retention of the materials increases by 75%. [3.87].

The following information on media education and its importance in the educational process is given in the research:

- integrated and interdisciplinary study of media in the curriculum;
- studies that the "media topic" is analyzed within a specific discipline;
- a critical approach to the media through practical work and analysis;
- its form, technologies and methods of information transmission;
- media agencies, their social, political and cultural role;
- the impact of media on audiences through language and art. [4.97]

CONCLUSION

In conclusion, when the educational process is organized using specially prepared multimedia applications, videos and various animation materials during the lesson, it increases students' interest in the subject in the formation of practical thinking and imagination and creates an opportunity for them to quickly understand. Also, it is advisable to organize moments of musical rest during the lesson so that students do not get tired and bored. Similarly, the use of media education in English language classes in elementary grades further develops students' logical thinking and present-responsibility skills.

In the process of teaching English in the primary classes of general secondary schools providing with media materials and forming by the use of information and communication tools (setting educational issues, determining the content of practical subjects, showing samples on the implementation of each individual action, monitoring the performance of each action and evaluating whether the issue has been resolved or completed) are continuous and sequential processes.

As a conclusion, it is worth noting that media technology provides an "attractive" lesson in the formation of a favorable psychological climate for young students and diversification of the lesson. It is in foreign language classes and in extracurricular activities that the cooperative skills of students are formed in the shape of the "teacher-student" scheme by using media forms of activity. The introduction of media technologies in conducting foreign language classes in elementary grades leads to the formation of a psychological climate that develops students' interest in the lesson.

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Rezyume: *Maqolada boshlang'ich sinf o'quvchilariga ingliz tilini o'qitishda mediatexnologiyalardan foydalanish ahamiyati haqida ma'lumotlar berilgan.*

Резюме: *В статье представлена информация о важности использования медиатехнологий в обучении английскому языку учащихся начальных классов.*

Kalit so'zlar: *Media, mediatexnologiya, mediapedagogika, informatsion vositalar, ilg'or pedagogik texnologiyalar, multimedia*

Ключевые слова: *медиа, медиатехнологии, медиapedagogika, информационные средства, передовые педагогические технологии, мультимедиа*

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ARTISTIC FEATURES IN DRAMATIC WORKS

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Summary: *In the article, the language of dramatic works in Karakalpak literature, especially the difference in the use of dialogue-replicas, is discussed in the example of K. Allambergenov's drama "Amir Temir and Er Edige (Ulli Atlanis)". In the article, the role of dialogues in revealing the hero's character is proved with the help of examples.*

Key words: *drama, dialogue, replica, image, dialogue-argument, dialogue-humor, dialogue-sarcasm, aitis-dialogue, console-dialogue, character, conflict.*

In the literature of Karakalpak, although some scientists (T. Allanazarov, B. Tursinov, T. Bayandiev, F. Otemuratov, A. Seytbekov, R. Matmuratova, etc.) discussed about the language of dramatic works in their articles and works, they did not take a complex research. A number of articles and studies by S. Bahadirova, P. Nurjanov, Z. Bekbergenova, J. Kaniyazova on common language issue of monologues and dialogues in prose works have been published [1]. These works, especially Z. Bekbergenova's monograph, J. Kaniyazova's scientific articles, were a great methodical guide for us in studying and designing the language of the dramatic work.

Dialogue is one of the most important artistic actions in drama. The dialogue is a main tool that reveals the character of the heroes in stage works. One of the artistic actions that is effectively used in dramaturgy is a replica. In the dictionary of literary terms, the following definition is given to the replica in the drama. A replica is a part of a speech spoken by a speaker, it is not limited by form (it can be a voice, word, word combination, it can consist of one sentence or several sentences connected to each other), or even silence of one of the dialogue participants in response (this in writing, it is often given with a lot of dots.)

Dialogues show to what extent the dramatist's ability to make a dialogue through the speech of the characters. In addition to the fact that the dialogues are full of portable, humorous and funny elements, we also see deep, philosophical dialogues about the characters' revenge on each other, the characters' behavior, and the counter-reactions of the opposite characters.

In his research, Kazakh scientist Kh Karimov said: "When talking about the purpose of using dialogue in a literary work, it is important to keep in mind that a dialogue contains various functions. For example, any type of dialogues used to reveal the character and feelings of the hero will enliven the plot" [2:44]. In fact, the content of the dialogues used in dramatic works, in the relationship of the characters to each other, and in the realization of the conflict, is varied according to the requirements of the genre.

Therefore, dialogue-replies are different according to their content; It performs functions such as revenge, portable-dialogue, dialogue built on harmony, dialogue-argument, dialogue-humor, dialogue-sarcasm, aitis-dialogue, console-dialogue. These dialogues reveal the changes in the psychology of the characters, their relationship with the external center, and their personal character.

In K. Allambergenov's drama "Amir Temir and Er Edige (Ulliatlanis)" dialogues between Edige and the horseman, Tokhtamys and his wife Karashash, Edige and his wife Karakas, and Satemir and Edige were presented. Also, in the drama, aria-duets and aria-trios were presented, and he revealed the character of the characters in the mutual struggle of Edige and 2 wives, Tokhtamys-Kenjembai-Kosnazar, in places given the question-and-answer.

In the first picture, the replica filled with regret of Toktamis while feeling fear hearing the dialogue between Amir Taragai, whom he had never seen in his life, and his shepherd is given. In this

picture, while angry Toktamys and his wife Karashash khanim are talking, there is a replica of the console-dialogue with slow voice.

In the second picture, a replica in the content of advice of Tukli Aziz Baba to Edige, who was trembling as if he saw a ghost, is presented.

In the fifth picture, a replica of Amir Temir's joy, the ruler of Samarkand, is given in the episode of Edige's returning with victory, who freed Princess Akbilek, the daughter of Amir Temir, who was in the hands of the enemy.

Qudayga shúkirim kóp bari de aman, I thank God that everyone is safe.
Jeñimpaz kiyatır bizlerge taman, The winner is coming toward us.
Aytp bereyin-shi, xatına qarań, Let me tell you, look at his letter.
Kewilim shad áyler mına xabardan: [3: 27] I am glad of this message: [3: 27]

Therefore, this artistic action-replica serves to express the opinions and mental conditions of the heroes of the work. In this drama, the dialogue replicas of the characters are well presented. "However, in the drama, the short replicas in which the character is not addressed to anyone, that expressed the attitude to other characters and condition are not used. We support the opinion of Professor K. Jarimbetov, who says that the importance of a short replica is great in revealing the images in a wider and clearer way.

In this picture, while the angry Toktamis and his wife Karashash are talking, a replica of the console-dialogue is presented, explaining with slow voice. For example:

-Óziń de sol ret saqlıq qılmadıń - You weren't careful at that time either.
Edil menen bola turmay, shabazım, You weren't with Volga, my dear,
Tiklemekshi bolıp babańnıń dánqın, You were to restore the honor of your grandfather,
Abaylamay aytp sózińniń parqın, You speak carelessly,
Ázelden atalas Edil-Dash xalqın, Volga-Dash people relative from long ago,
Amirine qarsı qoyıp qayradıń, You turned them against Amir,
-Júriń, -deyip Samarqandqa sawashqa, Saying "Go," to fight to Samarkand."
Záwlim salıp ayaq-qolın bayladıń [3:11-12]. You tied their hands and feet with a rope.

His wife Karashash, looking at Toktamis, who is deep in thought, explains that he made a mistake by turning his people against Samarkand, as if it was not enough that he was occupied the Volga and Dash peoples. She tried to console explaining the Toktamis's actions saying that Edige, whom you called your son, for what you did in this thoughtless act, will turn the people against you without taking your life, and gather his followers and take up the sword (fight).

In the second picture, after Edige's remark, as if he had seen a ghost, Tukli Aziz baba's guiding dialogue-replica is presented.

Toqtamis – Suwpı birigip, Toktamis - Supı united,
Oyranlar elge salajaq, going to destroy the country,
Xorezm paytaxt qalasın, the capital city of Khorezm,
Temirden tartıp alajaq [3:16]. Going to take from Temir.

His father, Tukli Aziz, who explained to Edige the threats made by the rulers of the Golden Horde, Tokhtamis, showed the way to Edige telling to go to Samarkand and ask for help from Amir Temir, and he would win only if a lot of troops came with him, explaining the happening to Amir Temir and he would give his hand to Edige.

Thus, the heart of the dramatic work is the dialogue. This is because dialogues are the only tool that reveals the content of the work, the author's idea, and the character of the characters. A prose work can be presented on the basis of narratives, a lyrical work can be presented on the basis of inner monologues of a lyrical hero, and a dramatic work cannot be presented without conversation (dialogue) between the characters on the stage. That's why dialogues are the heart of drama.

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Rezyume: Maqolada qoraqalpoq adabiyoti dramatik asarlarining tili, dialog-replikalardan foydalanishdagi farqlar Q.Allambergenovning “Amir Temir va Er Edige (Ulli Atlanis)” dramasi misolida ko‘rib chiqiladi. Maqolada qahramon xarakterini ochishda dialoglarning rolini isbotlash uchun misollar keltirilgan.

Резюме: В статье язык драматических произведений каракалпакской литературы, особенности различия в использовании диалогов-реplik, рассматривается на примере драмы К. Алламбергенова «Амир Темир и Эр Едиге (Улли Атланис)». В статье на примерах доказывається роль диалогов в раскрытии характера героя.

Kalit so‘zlar: drama, dialog, remark, obraz, dialog-mulohaza, dialog-hazil, dialog-kino, itis-dialog, konsol-dialog, xarakter, konflikt.

Ключевые слова: драма, диалог, реплика, образ, диалог-рассуждение, диалог-юмор, диалог-сарказм, айтис-диалог, консоль-диалог, персонаж, конфликт.

CLASSIFICATION AND SYSTEMATIZATION OF PEDAGOGICAL VALUES

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Summary: *The concept of “Axiology”, the system of axiological principles, levels of pedagogical values, classification of values are revealed.*

Key words: *pedagogical culture, humanistic technology of pedagogical activity, system of axiological principles, values, object of pedagogical values.*

Scientists - orientalists (Kh. Sulaimanov, S. Ganieva, O. Usmonov, N. Mallaev, F. Suleymanova, Sh. Turdiev) made a great contribution to the study of issues of cultural and spiritual heritage, national values of the peoples of Central Asia. In the manuscripts they translated from Arabic, Iranian, Chinese, English, Indian and other languages, a general picture was drawn up about the axiological values of the peoples living in the territory of present-day Uzbekistan and Karakalpakstan.

The axiological component of professional pedagogical culture is formed by a set of pedagogical values created by humanity and uniquely included in the holistic pedagogical process at the present stage of development of education. In the process of educational activity, students master ideas and concepts, acquire knowledge and skills that make up the humanistic technology of pedagogical activity, and, depending on the degree of their application in real life, evaluate them as more significant. Knowledge, ideas, concepts that are currently of great importance for society and a particular pedagogical system act as pedagogical values.

Axiology (from the Greek *axia* - value and *logos* - teaching) is a philosophical doctrine about the nature of values and the structure of the value world.

The meaning of the axiological approach can be revealed through a system of axiological principles, which include:

- equality of philosophical views within the framework of a single humanistic value system while maintaining the diversity of their cultural and ethnic characteristics;
- the equivalence of traditions and creativity, recognition of the need to study and use the teachings of the past and the possibility of spiritual discovery in the present and future, mutually enriching dialogue between traditionalists and innovators;
- existential equality of people, sociocultural pragmatism instead of demagogic debates about the foundations of values; dialogue and asceticism instead of messianism and indifference.

Pedagogical values are objective, since they are formed historically in the course of the development of society, education, and secondary schools and are recorded in pedagogical science as a form of social consciousness in the form of specific images and ideas. In the process of preparing and carrying out pedagogical activities, the teacher masters pedagogical values and subjectivizes them. The level of subjectification of pedagogical values is an indicator of the personal and professional development of the teacher, his pedagogical culture as the degree of realization of the ideal value, transformation of the potential (ought) into the actual (existent).

Pedagogical values, being the condition and result of the corresponding activity, have different levels of existence: individual-personal, professional-group, social-pedagogical.

Socio-pedagogical values reflect the nature and content of values functioning in various social systems, manifesting themselves in the public consciousness in the form of morality, religion, and philosophy. This is a set of ideas, norms and rules that regulate the activities of society in the field of education.

Group pedagogical values are a set of ideas, concepts, norms that regulate and guide pedagogical activities within certain educational institutions. The set of such values is holistic in nature and acts as a cognitive-acting system with relative stability and repeatability. These values act as

guidelines for pedagogical activity in certain professional groups (school, lyceum, gymnasium teachers; college, technical school, university teachers).

Personal-pedagogical values are complex socio-psychological formations that reflect the goals, motives, ideals, attitudes and other ideological characteristics of the teacher's personality that make up the system of his value orientations. The latter, representing the axiological Self, is given to the individual not as a system of knowledge, but as a system of cognitive formations associated with emotional-volitional components, accepted by the individual as his own internal guideline, motivating and directing his activities.

The humanistic nature of modern education understands the values of pedagogical activity as "those features that allow the teacher to satisfy his material and spiritual needs and serve as a guide for his social and professional activity aimed at achieving socially significant humanistic goals" (1, p. 3). Based on the characteristic needs of the individual, the following groups of pedagogical activity are distinguished: - values associated with the establishment in society of the immediate social environment; (social significance of a teacher's work, prestige of a teacher's professional activity, recognition of relatives, friends, acquaintances, etc.); - values associated with satisfying the need for communication (constant work with children, children's love and affection, opportunities to communicate with interesting people, parents, colleagues, exchange of spiritual values, etc.); - values associated with self-improvement (the opportunity to develop creative abilities, introduction to spiritual culture, doing what you love, a subject, the opportunity to constantly expand your knowledge, etc.); - values associated with self-expression (the creative nature of a teacher's work, romance and passion for teaching activities, the ability to re-educate "difficult" children, compliance of teaching activities with the interests and abilities of the individual, etc.); - values associated with utilitarian-pragmatic needs (opportunities for self-affirmation, interpersonal communication, professional growth, promotion, long vacation, etc.) (1, p. 3).

Representatives of the scientific school V.A. Slavenin. When classifying values, Slavenin calls them professionally pedagogical and distinguishes the following groups: "values-goals; values-means; attitude values; values-knowledge; values-qualities considering them in the horizontal plane of existence and values in the vertical plane: social-pedagogical, professional-group and individual-personal." Of course, they are right in one thing: "the representation of a group of pedagogical values forms a system as a substantive basis, the core of professional pedagogical culture" (1, p.3). In their opinion, "the pedagogical values enshrined in the teacher's mind form a system of his professional value orientations on communication with children and adults, creativity in professional activities, development of the child's personality and professional cooperation, exchange of spiritual values, etc." (1, p. 3). The perestroika socio-political processes that began in the mid-80s brought to life a new stage of restoration and enrichment of the humanistic values of education and upbringing, the brightest representatives of which were creatively working teachers united on the platform of "pedagogy and cooperation" (Sh.A. Amonashvili, E.N.Ilyin, S.N.Lysenkova, V.F.Shatalov, etc.). In fact, there was a return to new foundations of the corresponding concepts and methods of those teachers of the pre-revolutionary time and the early 20s, whose ideas then represented an alternative to the dominant, orthodox system of education.

The changed situation of the late 80s - early 90s. inevitably entailed a revision of many pedagogical views, positions and provisions. The new direction in pedagogy quickly gained its supporters. A movement of innovative teachers arose everywhere: Sh. A. Amonashvili, E. I. Ilyin, V. F. Shatalov, S. L. Lysenkova, I. P. Volkov and others (1, p. 3) whose pedagogical activity proved the possibility effective interaction between teacher and student in educational activities. Pedagogical publications appeared in which the authors highlighted the essential features of the new direction. What was common in the concepts of innovative teachers was their humanistic focus on the student as a subject of the educational process, an appeal to his self-awareness, his natural desire for self-affirmation. The opportunity to attract ideas of indirect influence in order to reduce various barriers to

the pedagogical perception of future teachers lies in using the example of the personality of an outstanding teacher. For this purpose, we have introduced a special course “Current problems of education in the context of historical knowledge.” It was important that the special course revealed the most important positive trends in the development of axiological values of pedagogical science, including on the example of the scientific activities of such teachers as: S.R. Radzhabov, K.H. Khashimov, Z.F. Mirtursunov, R.Kh. Juraev, O. Musurmanova and others. Students became quite familiar with the activities of a number of Karakalpak scientists: U. Aleuov, T. Utebaev, R. Balieva, Zh. T. Berdyev, G. D. Kagan, I. V. Savitsky and others. Undoubtedly, the axiological orientation should be reflected in the modern system of teacher education. This is confirmed by the experience of teaching the course “Axiology and Innovation in Pedagogical Activities,” which highlights the leading axiological ideas of the history of education and modernity. Each topic of the special course ends with independent creative work, which involves an individual (bibliographic, informational, diagnostic, research) search for materials to complete assignments. Discussion, discussion, dialogue required “manifestation of attitude” through an assessment of a fact, phenomenon, program, model, technology from the perspective of different approaches or a new paradigm. The use of modern approaches allowed students to understand the essence of the humanistic approach to the individual, its role in their own development, providing an understanding of the importance of pedagogical diagnostics and forecasting of the student’s personality in a democratically organized pedagogical process. Regional programs for extracurricular educational work, including issues of national education of youth culture, were actively used in the content of pedagogical knowledge that develops the value priorities of students. This direction is informational and educational in nature and allows the student to gain a wealth of knowledge on the history and culture of Karakalpakstan, its role in the development of national priorities. The work carried out significantly supplemented the courses in the theory and history of pedagogy, deepened and expanded the philosophical and general pedagogical education of students. A student, armed with pedagogical knowledge, is aware of the patterns of development of the educational system, is oriented not only in historical and pedagogical theories and systems, but also in modern innovative directions of teaching and education. The formation and development of students’ pedagogical skills is a complex process that is ensured by the interaction of disciplines of the psychological and pedagogical cycle and the social sciences. Pedagogical knowledge about facts is the basis, the basis of all other knowledge, since they directly reflect reality. Without knowledge of facts, it is impossible to understand laws and theories, that is, to reflect the actual connections between facts. The laws reflect significant connections. Axiological knowledge is the necessary basis, the fundamental basis for the development of students’ value attitudes, without which the process of forming a teacher’s scientific beliefs is impossible, and it is impossible for a modern teacher to master a vast information flow, as well as personal orientation in innovation. The originality of axiological orientations (and subsequently, as the highest stage of development, the originality of beliefs in the field of pedagogical theory) lies in their dependence on the presence of scientific systemic knowledge. It seems to us that this kind of work is important specifically with students of pedagogical specialties, as future teachers, since the teacher, by raising and teaching children, thereby prepares them for life, creating the basis for the spiritual values of the future.

Over the entire period of the twentieth century, higher pedagogical education has accumulated a significant potential of ideas, concepts and values of a humanistic nature, traditionally present in domestic and world pedagogical education and constituting its axiological basis. The situation in modern education requires the transition of the holistic development of knowledge into beliefs, when scientific knowledge presupposes the development of certain axiological orientations. In this case, it is legitimate to raise the question of pedagogical knowledge as the basis for the development of students’ axiological orientation. Based on the above, it follows that the formation of a new type of teacher is impossible without introducing students not only to the system of values for the humanization and

democratization of our society, declared in legislative and legal documents, but also to specific regional features of the axiological characteristics of pedagogical science.

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Rezyume: *Maqolada “Aksiologiya” tushunchasi, aksiologik tamoyillar tizimi, pedagogik qadriyatlar darajalari, qadriyatlar tasnifi ochib berilgan.*

Резюме: *В статье раскрывается понятие «Аксиология», система аксиологических принципов, уровни педагогических ценностей, классификация ценностей.*

Kalit so‘zlar: *pedagogik madaniyat, pedagogik faoliyatning gumanistik texnologiyasi, aksiologik printsiplar tizimi, qadriyatlar, Pedagogik qadriyatlar ob'ekti.*

Ключевые слова: *Педагогическая культура, гуманистическая технология педагогической деятельности, система аксиологических принципов, ценности, объект педагогических ценностей.*

FORMATION OF LEGAL TERMS IN THE KARAKALPAK LANGUAGE WITH SOME AFFIXES

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Summary: *In the article the system of formation of legal terms in the modern Karakalpak literary language is studied. It provides a broad understanding of how modern legal terms are now formed through affixes and word addition. In the formation of legal terms in the Karakalpak language by affixes, the effective and non-effective use of affixes is given.*

Key words: *jurisprudence, term, affixes, word addition method, compound, compound (not combined), combined (joint), pair, abbreviated.*

The lexical structure of the modern Karakalpak literary language has systematic differences in the structure, composition (positive, compound), lexical layer (both lexical layer and assimilation words). The construction of legal terms in the Karakalpak language is based on both internal and external influences, and is based on the model base, language analogy, which is formed in the construction of terms. The expansion of the professional activity of the people, science and technology, economics and culture, the high level of intellectual development based to form and develop the professional terminology of the literary language fully [2.11].

In the Karakalpak language there are cases of productive and unproductive use of affixes in the formation of legal terms through affixes.

In the Karakalpak language, legal terms are used productively in the formation with the suffix –lyk/–lik. Also, some affixes that are used unproductively in the word formation can be used effectively in the formation of legal term. For example, although the suffixes –nama, –shy/–shi, –lyq/–lik are not used effectively in the formation of noun, they are used productively in the formation of document name which expresses the legal terms in comparison with other affixes. For example: sha'rtnama (contract), wa'siyatnama (will), isenimnama (credence), etc.

The legal terms in the modern Karakalpak language are mostly formed by the following word-formation affixes.

In the Karakalpak language, the suffix -liq / -lik forms the noun from noun, adjective, numeral and adverb. We can see that this affix is often added to nouns in the formation of legal term. For example: a'dillik (justice), biyzarilik (hooliganism), jarliq (poorness), qayirqomliq (generosity), qa'wenderlik (sponsorship) and so on. Also, the suffix –liq/–lik is connected to words from Russian and other languages through the Russian language to form the compound noun which related to the profession and forms the compound noun in the meaning of legal term. For example: advokatliq (advocacy), sudyalik (judiciary) and so on.

–shy/–shi is an affix which is effectively used in Karakalpak and other Turkic languages in the formation of noun. This affix is not used effectively in the formation of legal terms. We see that compound legal terms have been coined with its help jinayatshi (criminal), elshi (parliamentaire) and others.

Through the affix –shy/–shi with infinitive compound noun in the meaning of the man engaged with certain legal work [4.257]. For example: tergewshi (investigator), aqlawshy (advocate), qaralawshy (accusant) and so on.

The affix -shilik/–shilik forms compound noun by connecting basically to noun and adjective, also to some adverb and modal words. For example: nizamshilik (legality), ha'kimshilik jaza (administrative punishment, etc. In some cases, this affix is added to the infinitive and makes compound noun in the legal sense, but in some cases it is used unproductively. For example: tonawshilik (robbing) and etc.

The suffixes –liq/–lik, –shiliq/–shilik are added not only to the root nouns, but also added to the compound adjective word made by the suffixes –li, –siz and forms a compound noun in the sense of legal term. For example: nizam-li-lik (legality), ha'reket-siz-lik (immobility).

The suffixes –ker/–ger are added to some root noun words, and form the compound noun in the sense of the legal term, which means the name of the legal parties. For example: ayipker (guilty person), dawager (demandant), juwapker (responsible person) and so on.

The suffix –nama is added to the noun, and forms the compound noun in the sense of legal term which refers to a specific document name. For example: wa'siyatnama (testament), sha'rtnama (contract) etc.

The suffix –xana means the name of a place (jay) dedicated to something by adding to the noun. Through these affixes, the following nouns in the sense of legal terms are created. For example: bajixana (tax office), ka'rxana (firm) and so on.

The suffixes –sha/–she are added to nouns and mean shortening, cocker. These affixes like others do not form a new word from the words they have been added, and only give shortening and cocker meaning [5.36]. For example: qalasha (small town) and etc.

If compound words appear to express concepts that cannot be explained by a word in the language, the second type is used to express the meaning of a term, and sometimes in the result of tracing the words in other languages and due to the other reasons it may have its place in the structure of the language. We see these differences in the formulation of the legal terms used in the modern Karakalpak language. The pair and repeated types of compound words were studied specifically by A. Najimov [6.17]. In some works, this model of word formation was introduced into the synthetic method [1.170], while in other works it was considered as a morphological-syntactic method of word formation [7.16]. A. Bekbergenov points out that in his scientific work on word formation there are five types of compound words in the Karakalpak language: compound words, pair words, repetitive words, compound words, abbreviated words [3.8]. These types of compound words are also used effectively in the modern Karakalpak literary language. In the grammar published in 1994, the compound words are divided according to the external form and component type and to the addition degree: composed words, pair words, repetitive words, united words, abbreviated word [8.22], but in morphology published in 2010, compound words are classified into five groups: compound words, pair words, repeated words, joint words, abbreviated words [9.18]. In the Karakalpak language, the legal terms in the form of a compound word are more productive than the legal terms in the form of root and composed.

Through the word-combination model in the Karakalpak language, the word formation with a new meaning (legal term) differs from other word-formation methods by a number of differences. When creating legal terms using this model, a few words were connected with the help of various grammatical tools, and the components were in lexical-grammatical order [10.37].

According to the numbers of words in the structure of compound legal terms can be two, three, four and more componential.

I. Two-componential legal terms: These are made in the following ways: 1. Legal terms, the components of which come in the form of root words without affixes. Examples: anonym awir jinayat (serious crime), arza (anonymous application), korporativ ma'mleket (corporate country), intellectual mu'lk (intellectual property), municipal ken'es (municipal council), municipal mu'lk (municipal property), recediv jinayat (recidivism etc. Words that come as the first component of these two-componential compound legal terms are in the form of general case in the external form. The compound terms from the words in the general case are basically used in the attributive relation. [11.67];

2. Legal terms which components received affixes. Legal terms in this form can be divided into types in which affixes are attached to one component and affixes are attached to both components.

Compound legal terms formed by adding word formation affix to one component and a word variation to another component. These compound legal terms are divided into two groups: a) compound legal terms which word formation affix is added to the initial component, a word variation affix is added to the second component: ayipsizliq prezumpiyasi (assumption of innocence), avtorliq huqiqi (author's rights), advokatliq firmasi (advocatory office), bajixana deklaratsiyasi (customs declaration), elshilik huqiqi (envoy's right), isbilermenlik xizmeti (enterprising service) etc. b) The compound legal terms which word variation affix is added to the initial component, word combination affix is added to the second component. The compound legal terms in this form are limited by number in the modern Karakalpak language. For example: jinayatta qatnasiwshiliq (participation in a crime), erkinen ayiriwshi (free separation) and so on.

In the Karakalpak language, in addition to compound words, the pair, shortened compound words are also created using the word addition model. In the modern Karakalpak language, there are also legal terms in the form of joint, pair, abbreviated words, but they are less numerous.

1. Joint legal terms: tilxat (receipt), shegara (border) and so on. Receipt is a combination of two root words. Receipt is a specific document in civil law from a company, firm, institution, or individual, and a document confirming the receipt of valuable items or money [12.58]. The explanatory dictionary of the Karakalpak language states that the receipt is a document signed and certified about having received something [13.322]. For example, Bolys make Sherip debtor and had a receipt (K. Irmanov). Boundaries are joint legal terms that changed without preserving their roots. Border is a geographical, political, legal administrative region of the country. Example: Fifteen days went ways, when fifteen days hundred was completed, border with Kalmak (Alpamys).

2. Legal terms created by pairing words: This model has created very few legal terms. Example: A'dep- ikramliliq – ken' tu'sinik. (Politeness - is a broad concept). 1. Rules of conduct, which appeared in the primitive society and must be observed by the members of the community. 2. A complex of behavior which appears from the relation of people to each other, Motherland, society, family [14.12]. A'dep-ikramliliq is a pair word in the meaning of noun, and means shame, reverence [15.137]. For example: I was pleasant with his humanism, when he greeted with politeness. (S. Nurymbetov).

The number of legal terms used in the Karakalpak language in the form of abbreviated compound is less, but they are effectively used in legal documents, in socio-political life and in the journalistic style.

Most of the legal terms in the Karakalpak language consist of one- and two-componential words. Being a multi-componential terms in a language is not evaluated as a reliable phenomenon. The legal terms in the form of joint, pair constitute a minority in number. Abbreviated legal terms are used in abbreviated and mixed forms, and abbreviated the initial letters, according to their types of abbreviation. Each of them has its own peculiarities in terms of formation.

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Rezyume: Maqolada zamonaviy Qoraqalpoq adabiy tilida yuridik atamalarning shakillanish tizimi o'rganilgan. Bu maqolada yuridik terminlarning qo'shimchalarva so'zlarni qo'shish orqali shakillanganligi jaqida keng tushinsha berilgan. Qoraqalpoq tilida yuridik atamalarning shakillanishida affikslardan samarali va samarasiz foydalanish hususiyati nushintirilgan

Резюме: В статье исследуется система образования юридических терминов в современном каракалпакском литературном языке. Это дает широкое представление о том, как в настоящее время формируются современные юридические термины с помощью аффиксов и сложения слов. При образовании юридических терминов в каракалпакском языке с помощью аффиксов приводится эффективное и неэффективное использование аффиксов.

Kalit so'zlar: ҳуқуқиунослик, атама, аффикслар, сўз қўишии усули, қўиша, жуфтлик, қисқартирилган.

Ключевые слова: юриспруденция, термин, аффиксы, способ сложения слов, составные, парные, сокращенные.

EXPRESSIONS OF KARAKALPAK- UZBEK LITERARY TRANSLATIONS USING EQUIVALENTS

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Summary: *The article deals with the use of alternative expressions of phraseological units in Uzbek-Karakalpak translation work.*

Key words: *phraseological unit, phraseme, expression, comparative analysis, alternative, semantic association.*

Today, the growing authority of the Uzbek and Karakalpak languages as official languages, expanding functional and methodological capabilities, and the translation of works created in these languages create the need for a comparative study of expressions in both languages.

Works translated from related languages are important in linguistics for comparative analysis of languages.

The language of scientific and prose works created to this day has been sufficiently studied in Uzbek linguistics. There has been little research on the work of many poets and writers, as well as their artistic language. But no matter how numerous the works of cross-translation from related Turkic languages were, little attention was paid to their study in linguistic terms.

In related languages, there are also unique equivalents of phrasemes that have the same meaning, but a different lexical composition - made up of other words. Finding them correctly and applying them in translation will give a positive result in achieving the intended goal. From this point of view, we observed that Uzbek phraseological units when translated into the Karakalpak language are expressed by many specific phraseological units.

In *Starry Nights*, the phrase “one body is to be one soul” is used in several places, which means ‘to be in harmony, to be unanimous’ [3,37]. The writer used this phrase in the work as follows: -If we become one body and one soul and serve Babur Mirza, we will all survive, none of us will lack [8,48]. The translator translated the passage presented in the original text as follows: - If we serve Babur Mirza together, we will all survive together, inshaallah! [9,50]. The phrase "one body, one soul" correctly echoes the alternative of doing everything together and holding on to each other. Phrases have semantic commonality, although in both languages they are based on different images. In this regard, their use in the translation process gave the expected result. So, given this, there is reason to call these phrases alternative phrases. In this example, we can witness another interesting phenomenon: creative phraseology- inshaalla we will survive if we act together! in a form rotated according to the meaning it expresses with words. However, we will talk about this in the following works.

In another example, the phrase "be calm, calm down" is used in the work in the meaning of "relax" [3,162]. The writer expresses this phrase in the work in the following form: Let the citizen see the heir to the throne, be comforted [8,50]. Mutarjim also used the phrase in translation with its peculiar alternative: Let the citizen see the heir to the throne, be comforted. [9,52]. In the Karakalpak language, the soul calmed down [7,94] the phrase is used in the meaning of "calm down", as in the Uzbek language. The comparison shows that this phrase, although it differs in form, has uniformity in content. Thus, the phrase in Uzbek was reflected in the Karakalpak translation.

In particular, phrases translated using such an alternative as in the work of R. Faizi “His Majesty the Man” are original and can also be traced back to his Karakalpak translation. Even in the Karakalpak translation of phrases used in the writer's work, there are many peculiar phraseological units of the Karakalpak language. For example, when you say goodbye and walk through your door, you can say something like: "Even the whole world will be under water, he won't care-I am... what he was saying and what he was thinking. [10,15]. This phrase in Uzbek means “generally calm”, "too indifferent". [4,146]. The translator gave an Uzbek phrase with an alternative to Karakalpak, in which

he very vividly illuminated its meaning: Saying goodbye and walking through the door, “even if the whole world remains under water, the duck does not care,” he thinks so, what am I saying, my gobyz, what is he saying?! [11,11]. Although the form of phrases expressing the same meaning exactly matches, the words that form the basis of the connection will be different, or the basis of reality is the same. The internal semantics of such phrases will be the same or close to each other. Hence, it is born that instead of one, they can be used by another or given in translation. Because such phrases are alternatives that can be interchanged. In this example, the opposite can be traced to what was analyzed above: what the person said, what he thinks, the meaning that he expresses with words in the form of what I don't say, my gobyz, what the inverted phraseology says. Of course, this phenomenon is also the object of our future research.

In the Uzbek language, the phrase "look", associated with the word "eye", is used in the meaning of "gaze". In the “Explanatory phraseological dictionary of the Uzbek language” Sh.Rakhmatullayeva also notes the meaning of the phrase "watch" [4,146]. In the work of R.Faizi “His Majesty is a man” this phrase is used in a different meaning: you were looking forward to my letter, I know [10,79]. It follows from the text that the phrase is aimed at expressing the meaning of "longing and looking forward" in the text. Dictionaries note that this meaning expresses how much to look forward to. [3,142]. The translator understood the situation correctly and translated the text as follows: I know that you are looking forward to my letter. [11,67]. It was in this place that the translator's skill manifested itself. The meaning, which is difficult to understand in the original text, is fully reflected in the translation. Translating the text content into another language during the translation process, including the lexeme and correctly assigning meanings to them, requires a lot of work and skills from the translator. In particular, incorrect translation of phrases can damage the artistic value of the text. Naturally, ambiguity arises in thoughts, and misunderstanding arises in the image of the state.

In conclusion, it can be said that when translating a work of art, first of all, the translator must fully grasp the meaning of the source text in translation. Otherwise, incorrectly rotated phrases negatively affect the entire text, undermining its true essence. Therefore, the correct translation of phrases is an important factor for further increasing the cost of work.

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Rezyume: *Maqolada o'zbekcha-qoraqalpoqcha tarjimalarda frazeologizmlarni muqobil variantlarini ifodalash masalalari haqida so'z yuritiladi.*

Резюме: *В статье рассматривается использование альтернативных выражений в узбекско-каракалпакской переводческой работе.*

Tayanch so'zlar: *frazеologizm, frazema, ibora, qiyosiy tahlil, muqobil variant, semantik umumiylilik.*

Ключевые слова: *фразеологизм, фразема, выражение, сравнительный анализ, альтернативный вариант, семантическая ассоциация.*

FORMATION OF NEIGHBORHOOD RIGHT AT DIFFERENT HISTORICAL STAGES

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Summary: *The article presents the process of the birth of a neighbor's rights, as well as the necessity of appropriate legal regulation of neighborly relations on the modern stage of development of society.*

Key words: *Key words: neighbor's right, property right, restriction of property rights, history of development of the neighbor's rights.*

In the legal literature, the category of law is often found as “neighbourhood law”, the formation of which has a long historical path of development. This is explained by the fact that, in parallel with the right to individual ownership of a land plot, relations arise between the owners of land plots.

Neighborhood relations exist in any civilized society, since people live together, use common roads, communications, water sources, etc. In the modern world, in all countries, the land territories where people settle are demarcated in such a way that the land plots of neighbors border each other, neighbors often intersect when using the plots, which sometimes leads to many conflicts. Existing conflicts are resolved mainly through negotiations and agreements. But the norms of morality, traditions, and customs are not able to fully resolve these conflicts. To resolve neighboring conflicts, to suppress them, and to protect the violated rights of neighbors, a set of norms is required, which can be seen in most developed countries. The rules of neighbor law are contained in the Law on Property Rights of the People's Republic of China, the Civil Code of Germany, the Austrian, Swiss, Civil Code of Georgia, etc.

Legal regulation of neighbor law arose in ancient times. In Ancient Rome, there arose a need for government intervention in resolving neighborly conflicts, for which a system of legal norms was formed to resolve individual neighborly incidents, such as allowing a neighbor to pass, to collect fruits that fell on the neighbor's land, a neighbor cannot protest against the penetration of smoke, vapors and other emissions from the neighbor, if they penetrate in moderate quantities and are caused by the normal operation of the neighboring area, etc.

In ancient Babylon, a system was also formed to regulate relations between neighbors; disagreements and conflicts arising as a result of causing certain damage or misunderstanding of each other were resolved in the established manner. The Laws of Hammurabi are a legal code of the Old Babylonian period created under King Hammurabi in the 1750s BC. These laws belong to the most important sources on ancient Babylonian and ancient Eastern law in general; for a long time they served as the basis of Babylonian law. Many provisions of this law are still relevant today. For example, if a person cut down a tree in a person's garden without the knowledge of the owner of the garden, then he must weigh out 1/2 mina of silver; if a person gave a field to a gardener to plant a garden and the gardener planted a garden, then he must grow the garden for four years, and in the fifth year the owner of the garden and the gardener will divide the garden equally; if the builder destroyed the property, then he must compensate for everything that he destroyed, and since he did not make the house he built durable and it collapsed, he must also rebuild the house from his own funds, etc.

Neighborhood law is also considered in Muslim countries, where legal relations between citizens since the birth of Islam have been regulated by Sharia. As an additional source of law, Sharia also allowed local customs that were not directly included in Muslim law itself during the period of its formation, but did not directly contradict its principles and norms. At the same time, the legal customs that developed in the Arab society itself (urf), as well as among numerous peoples conquered as a result of the Arab conquests or later subjected to the influence of Muslim law (adat.) The very understanding

of “neighbor” according to the Islamic scriptures are divided into several categories: neighbor, relative and Muslim; the neighbor is a relative, but not a Muslim; a stranger's neighbor, not a relative; the neighbor is not Muslim.

A relative, but not a Muslim, has two rights: kinship and neighbor rights. A Muslim neighbor, but not a relative, has two rights: the rights of Muslim brotherhood and the right of neighbor. A non-Muslim neighbor has only one right: neighbor's right. Sharia and the ethics of Islam calls on all Muslims to be on good terms with their neighbors. Regardless of whether your neighbor is a Muslim or an unbeliever, you should always have good intentions towards your neighbors. When meeting a neighbor, you need to say hello, sometimes visit his house, ask about his affairs, etc.

If we consider the human rights to housing or shelter, they are characterized in Islam by three points:

Islam affirms the right of every person living in a Muslim state to have a satisfactory home and considers it the duty of the state to provide him with this home if the person himself is not able to do this; Islam provides for the provision of each citizen of an Islamic state with an appropriate home that would protect him from the vagaries of the weather and protect his private life from interference by outsiders;

2) Islam affirms the right to the inviolability of the home; it prohibits intrusion into it without the permission of the person living in it, regardless of the position occupied in society by the person who performs these actions.

3) According to Shariah, no person can enter someone else's house without the permission of its owner, even in his absence.

No society can be considered civilized, Muslim jurists believe, if values such as respect for human life, honor and property are not considered sacred and inviolable.

Speaking about the development of neighborly law in Uzbekistan, it should be noted that the issue of the moment of emergence of neighborly relations and their legal regulation can be considered in different ways. In the 15th century, land ownership took different forms. Farmers who lived in Khorasan and Transoxiana can be divided into the following categories: those who lived on state land; sitting on privately owned lands; living on their own land; following on waqf lands. And in subsequent times, feudal land ownership existed in Maveranahr in the form of state, private and waqf. In this regard, relations between neighbors were multifaceted. From 1920 to 1991, legal relations between individual owners of land plots were regulated by civil, land legislation and other regulations of the RSFSR and regional legislation.

Thus, it can be stated that on the territory of modern Uzbekistan, the rules of neighbor law have existed since ancient times, during the reign of the Arab caliphs and in the Middle Ages during the reign of the Timurids, etc., that is, at all stages of historical development.

The current Civil and Land Codes of the Republic of Uzbekistan include several norms regulating some rights of land owners, but many disputes arising between neighbors are resolved based on public legal standards, traditions, and customs. For a complete and proper civil law settlement of this area, it is necessary to develop and include in the current legislation provisions of neighbor law that will solve existing problems in neighborly legal relations.

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Rezyume: Maqolada qo'shnichilik huquqining paydo bo'lish jarayoni aks ettirilgan, shuningdek, jamiyat taraqqiyotining hozirgi bosqichida qo'shnichilik munosabatlarini to'g'ri huquqiy tartibga solish zarurligi asoslab berilgan.

Резюме: В статье отражен процесс зарождения соседского права, а также обосновывается необходимость надлежащего правового регулирования соседских отношений на современном этапе развития общества

Kalit so'zlar: qo'shnichilik huquqi, mulk huquqi, mulk huquqini cheklash, qo'shnichilik huquqi rivojlanish tarixi

Ключевые слова: соседское право, право собственности, ограничение права собственности, история развития соседского права

TEACHING STUDENTS TO INDEPENDENT REFLECTION IN THE PROCESS OF WORKING WITH THE TEXT

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Summary. *This article provides methodological recommendations on the absorption of universal ideas into the minds of readers by working with the text. It is also aimed at students to be able to freely state their personal opinion, to form skills to prove their thoughts with life examples.*

Key words. *Pedagogical technologies, text, methodology, universal, educational, story, fairy tale.*

Introduction.

In the rapidly developing age of science and technology, it is appropriate to use modern methods of teaching and the achievements of new pedagogical technology in the training of highly qualified personnel. The characteristic of new pedagogical technologies is that the educational process that guarantees the achievement of the set goals is planned and implemented. In fact, 80% of successful training depends on the correct design, organization and implementation of the educational process.

When designing educational processes, clearly defining the content of education, the purpose of education, the expected result, the correct selection of educational methods, forms and tools, realistic criteria for evaluating the knowledge, skills and qualifications of pupils and students it is necessary to pay attention to their development in advance, their effective implementation in the time allotted for training, and their coordination with each other.

Research materials and methods.

In recent years, a number of scientific and methodical studies on the methodology of mother tongue teaching have been conducted in our country. For example, Sh.Yusupova and N.Yuldasheva advocated mother tongue teaching based on new pedagogical technologies in their research. A. Gulomov, M. Saidov and N. Alavuddinova conducted research on the method of forming independent work and creative thinking skills through native language teaching. Also, a number of studies were conducted on the methodology of teaching language levels from the mother tongue in continuous education, including T. Yusupova conducted scientific research on the methodology of teaching the main parts of the sentence.

However, the issue of developing students' speaking skills in mother tongue education has not yet been fully resolved. In this article, we have developed recommendations for a systematic approach to the development of students' speaking skills by working on information and texts in native language classes.

Obtained results and their analysis

Modern pedagogical technology has its own theory related to pedagogy and other scientific achievements; it is primarily aimed at building the educational process on a scientific basis; creates a basis for the joint activity of teachers and students based on the wide use of informational means of teaching, didactic materials, and active methods. Through this article, we would like to recommend several effective ways of using interactive methods in teaching mother tongue and literature classes. The methods we offer have a recommendation character, and each teacher can creatively rework them and use them in accordance with the topic and the size of the material.

The first method. A new text is read to the students, a life story should continue this text, or the conclusion should be left to the students' judgment. They will have to complete the story by connecting it with life. For example:

Jealous people

There were many people who envied Christopher Columbus, the discoverer of the new continent. Where there is envy, there is definitely gossip. Once the sailor entered the pumpkin house, a group of almazadas were again throwing stones at Columbus's garden:

- What does it mean to swim across the sea and go to land? We can do it too!

Khristafor goes to the table where they are sitting and asks the owner of the tavern not to cook a single piece

he asks for eggs.

- Gentlemen, you are brave and wise. There is no doubt about it. Come on, that's it let the egg stand up!

No matter how hard a group of gossipers try, they can't do it. "That's it, let's do it!" they finally say.

When Columbus takes the egg, he slowly delivers it and hits it on the table. The three parts of the egg will be slightly curved and it will stand up.

The gossipers who are waiting for an emergency suddenly shout:

- Well, is that the case? We can do it too!

- That's right, the famous sailor answers.

- Only after Columbus...

Conclusion: In life, such people are busy arguing that they can do something easy, even if they are unable to do it. Every job has its own difficulties, don't rush to express your opinion!

Students should complete the text as they wish and express it orally. The teacher listens to the opinions of all students and tells them that you all have a soul in your speech and reads the continuation of the story.

Here, the teacher should talk about universal human values and inter-ethnic harmony and emphasize that human value is always above all else. After all, isn't the task of the native language and literature teacher to educate students in the spirit of respect for national and universal values?!

The second method. Students are presented with an existing or new text in the textbook. After reading the text, students should complete the corresponding task. For example, they were given a fairy tale called "Ancient condition" to read.

The difference between a wise man and a fool

There lived a wise man on the mountainside, he was very poor. One day a young man came to him. "Show me the difference between a wise man and a fool," he said to the wise man. He looked at the wise man for a while. Then, with his hand, he showed the stones that had fallen from the rock at a certain distance.

- These stones will help you in this. Carry them to the top of the cliff. The young man said "yes" and went to work. Then he got blistered and sweaty and was busy carrying these stones for a long time. When he finally finished, he came:

"I'm done," he said. - But I can't understand anything, why did I transport them? How can he answer my question?

"This is the difference between a fool and a wise man," said the wise man.

- A smart person would have thought about this before transporting the stone.

Conclusion.

All the texts presented to the students should be of educational importance and should be related to the events taking place in the society. "It is worth noting that the role of fiction is incomparable in bringing up generations to be mentally healthy on the basis of national values. But the aspects of the literary work that can have a positive effect on the personality of the reader, the life and artistic truths reflected in the text, finding those that serve to purify the soul and absorbing them into one's own nature, is a process that happens easily in the person who is being formed. it's not. Education implementation of such complex and responsible work in the system is the responsibility of a teacher who loves and knows his profession well" [1,4]. In fact, it is not to give students ready-made concepts,

but to establish spiritual views and aesthetic taste in students on the basis of artistic text. As always, the age has assigned the most responsible task to the lovers of the mother tongue and literature - the question of national spirituality, and we should fulfill this responsibility with honor.

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Rezyume: *Ushbu maqolada matn bilan ishlash orqali o'quvchilar ongiga umuminsoniy g'oyalarni singdirish bo'yicha metodik tavsiyalar berilan. Shuningdek, o'quvchlarda shaxsiy fikrini erkin bayon qila olish, o'z fikrlarini hayotiy misollar bilan dalillash ko'nikmalari shakllantirish maqsad qilingan.*

Резюме: *В данной статье даны методические рекомендации по формированию универсальных идей в сознании учащихся посредством работы с текстом. Также она направлена на формирование у студентов умения свободно выражать свое личное мнение, доказывать свое мнение примерами из реальной жизни.*

Kalit so'zlar: *pedagogik texnologiyalar, matn, metodika, umuminsoniy, tarbiyaviy, hikoya, ertak.*

Ключевые слова: *педагогические технологии, текст, методика, универсальный, образовательный, рассказ, сказка.*

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THE USE OF ORNITONYMS IN THE LANGUAGE OF KARAKALPAK FOLK PROVERBS

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Summary: *his article learns the use of ornitonyms, its importance and meaning in the Karakalpak proverbs. The language of the Karakalpak folk proverbs is very impressive, implicative, and artistic, and characterized by the fact that they have a tendency to give more and deeper meaning with a few words. The service of the ornithonyms used in the language of Karakalpak folk proverbs is special. In this, human lifestyle, human behavior, customs, character, traits are comparatively revealed by the characteristics of the behavior of the birds.*

Key words: *ornitonyms, proverbs, phraseologies, zoonyms, bird terms, the language of Karakalpak proverbs.*

The folk oral works of any people is considered to be a set of marital experiences collected during the captivity, a reflection in the language, a mirror. One small genre of folk works is proverbs. The language of the Karakalpak folk proverbs is very impressive, implicative, and artistic, and characterized by the fact that they have a tendency to give more and deeper meaning with a few words. The meanings of the words in the composition of proverbs are also different in terms of lexical and thematic description. A group of them consists of bird terms – ornitonyms.

Scientist M. Khojanov, who studied ornithonyms in the Karakalpak language, studied the peculiarities of stylistic use of bird names in phraseologies and proverbs, and wrote: «The world of birds occupied an important place in the cultural life of the Karakalpak people, and therefore many phraseologies and proverbs appeared in connection with the name of birds. The phraseologies and proverbs with ornithonyms in their composition contain the marital wisdom of our people, and strong humor, sharp meaning, and other the signs.

In this way, the phraseologies and proverbs related to bird terms provide opportunities to understand the national differences, culture, and history of the people. By studying them from a linguistic point of view, we will be able to determine the wide stylistic possibilities that these lexical units perform in the language. The scientist shows that «in the composition of bird terms, the phraseologies and proverbs explain external appearance, character traits, qualitative meaning, and human actions» [6, 52-53].

In volume 88-100 of Karakalpak folklore, which also includes proverbs, there is an explanation of a number of bird terms: «kógershin qalbíğay/qalbağay – 1. Bird of stork type; 2. Flibbertigibbet, frivolous man (qalbalag), aqsarı – a flesh-bird (hawk), aqúrpek – a chick of vulture birds (eagle, hawk, vulture, etc.), alagót – a term of bird, búldırshın – a bird similar to a quail, digildik / tigildik – bird that lives in reeds, japalak – wide-eyed, curved- beaked vulture, that flies at night only, jiyek qus – jack, iytelgi – small vulture, mıyqı – small vulture, kógershin (dove) – bird term, qamshır – vulture nesting in reeds which meat is halal, kúshigen – the name of a bird, nurqus – a mythical bird made of light, samalıq – a blue bird that first appears in spring, aspanqus (sky bird) – (bird of the year), sandıwğash – a singing bird, nightingale, turımtay – a small, hawk-like bird, uyabasar – a female vulture bird (eagle, iytelgi, falcon, etc.), shúregey – bird type» [5, 529-543].

One of the names of such birds is shaja, and it is mentioned in the proverb like this: The strongest of bird is shaja, and the strongest of pasture is khoja. In this case, «shaja is bird that lives in a hilly place, its sound is bitter; a kind of eagle» [5, 542]. The meaning of this word is also explained in the works in Kazakh language: «Shaja is a bird that settles on a high head of a mountain, and its sound is bitter». Also, the dictionary shows that in different regions, the word «shaja» means the head of a mountain, peak, and the word «shajagay» means nayzağay, najağay (lightning)» [8].

It can be seen that the bird terms take place in the proverbs of each people according to their attitude towards the world of birds. B. Juraeva emphasizes that in the translation of Uzbek folk proverbs «eagle, sparrow, hen (rooster, chicken), stork, crow, goose, quail, swan, duck, nightingale, crane, dove, blue grouse» [4, 21] and other bird terms are found.

The service of the ornithonyms used in the language of Karakalpak folk proverbs is special. In this, human lifestyle, human behavior, customs, character, traits are comparatively revealed by the characteristics of the behavior of the birds. For example:

Qustıń sumı – hákke, The sly one of the bird is magpie,

Qıtaydıń sumı – táńke. The sly of Chinese is tanke. Here, the sly quality of the bird is compared to the feature characteristic of the people of the tribe. Also, the quality of the bird is equated with an egoistic feature characteristic of the whole nation, the people:

Qarshıǵa qustıń balası, The son of hawk bird,

Qanatın jayıp jem jemes, Doesn't eat spreading its wings

Qaraqalpaq baydıń balası, The son of a rich Karakalpak man,

Birin-biri kem demes. Does not abuse each other.

Here, through the hawk bird the qualities of a rich Karakalpak man, lordship, seriousness, calmness, self-reliance, persistence and generosity are revealed to the hawk. And, the negative peculiarities of a person are shown with the equal, similar birds:

Qus jamanı – sawısqań, The bad of bird is magpie,

Adamnıń bolar jamanı, There's bad of person,

Gáptıń keynín quwısqań. Continued the sentence.

It is said that the characteristic features such as good behavior, natural superiority, judgment, bravery, and tolerance are common characteristics of swans and good men.

Aqquw qustıń tóresi, The swan is the judge of the bird,

Jalgız júrip otlamas, Don't walk and eat alone

Shın jaqsınıń belgisi, A sign of real good

Jaman sózdı xoshlamas, Do not like bad words

Aqquw qusqa oq tiyse, If a swan is shooted,

Qanatın suwǵa tiydirmes, Don't put its wings into water,

Er jigítke oq tiyse, If a guy gets shot,

Qıynalǵanın bildirmes. Don't show his suffer.

In proverbs, a person's living with people, with others, his fame, status, honor gained by the help and support of others is given through the bird term. For example:

El kórkeyer basshısı menen, With the head the country blossoms,

Basshı kórkeyer qosshısı menen, The head blossoms with the helper.

Iytelgi abıraylı bolar, Iytelgi may be honorable.

Tazılı qusshısı menen. With bird hunter with dog. Also, in this proverb, qusshı (a bird hunter) is a professional term, and it is also used with the terms «bird trapper, bird hunter, hunting lodge». This is also mentioned in the proverb below.

Belgili qusshıń bolmasa, If you don't have a specific bird

Belinńdı buw da, atqa bar. Tight your waist and go to the horse. Here you can get information about the types of occupations that the people of Karakalpak are engaged in. Through the term «Iytelgi kus», as well as the term «qustı atıw, awlaw (bird hunter)» in the proverb it means that if you don't have the necessary equipment and opportunity to achieve something, find another way, there is another solution.

Qarshıǵanıń qıranı bar, The raven has an eagle,

Babın tappay ań alalmas, It can't hunt without finding way.

Qálpeniń de jamanı bar, There is also bad of bird hunter.

Babın tawıp qus alalmas. He can't hunt without finding way. Here, through the characteristics of bird it is revealed that there is the nature, time, and path of every kind of work, the need to work carefully, the ability of a person through the bird hunter to be suitable for any profession, and the signs of disability. Also, every person's opinion on some issue, the relationship of that opinion to the truth, and the personal habits and qualities of expressing it are reflected in the proverb «Qusshınıń qurı ángimesi (The Bird hunter's simple Tale)».

A. Berdimuratov divides into 9 groups according to the signs and peculiarities of the bird terms in the Karakalpak language: color, external differences of body parts, body structure, place that they live, movement, similarity, general external appearance, sign of feeding, sounds made by birds [1, 50-53]. Many of these ornithonyms are used in the language of proverbs. Here the phenomenon of variance is often met.

Kógershin degen qus bolar,	There is bird called Kogershin.
Buǵıp barsań attırmas,	If you overhead, you can't shoot.
Adamzattıń jamanı,	The worst of humanity
Pisken astan tattırmas.	Don't let you to taste the ready meal.

The following version of this proverb is used in Karakalpak girls' and boys' aitys (debate): «A young man, tired from traveling, entered a house and saw a girl boiling a pot with meal. Even though the girl received the guy's greetings, she did not invite him to the table. Then the guy said to the girl:

Buldırıq degen qus boladı,	There is bird called Kogershin.
Buǵıp barsań attırmaydı,	If you overhead, you can't shoot.
Adamzattıń kápiri,	The worst of humanity
Pisken astan tattırmaydı.	Don't let you to taste the ready meal.

Hearing this, the eloquent girl did not miss the chance:

– Kúygelek degen qus boladı,	– There is a bird called Kuygelek,
Iynelikti jem qıladı,	Feeds on dragonflies,
Adamıyzattıń jamanı,	The bad of humanity,

Pispegen astan dáme qıladı. Wants to taste the unripe food, she said. When the young man, defeated by the words, leaves the house, the girl stops him and invited to the table» [5, 285-286]. Here, instead of the ornithonym of the pigeon, the bird term «buldirik» is used.

In Karakalpak folk proverbs, the problem of good and bad, goodness and badness is one of the eternal themes. In proverbs, when dealing with this problem, many different methods and terms are used. One of them is the names of birds and through the good and bad bird, good and bad habits, qualities, and characteristics of people are revealed.

Jaqsı qusqa jaman qus,	To a good bird a bad bird,
Taplaw menen teń bolar,	It may be equal to heating.
Jaqsı qızǵa jaman qız,	A bad girl for a good girl
Baǵı menen teń bolar.	It may be equal to garden.

With the distinctiveness of each bird, its sign it is explained its existence, and through it the shortness of human life. For example:

Hákkeden saq qus joq,	There is no bird safe as magpie.
Waqtı jetse gór bolar,	When its life ends it turns corpse,
Adamnan mıqlı zat joq,	There is nothing stronger than man.
Waqtı menen qum bolar.	Turns into sand when his time ends.

«Saq ǵarǵa saǵaǵınan ilinedi (careful crow hangs is caught from its mouth)» – A bird of crow is a cautious, watchful bird, looks around for its lure, and eats it when it clearly feels that it is not in danger. Even if he is extra careful, he may fall into a trap and get into an unpleasant situation. This is due to the insatiability of some people, their lack of respect for others, no matter how careful they are, they sometimes get into troubles in unexpected place» [2, 30-31].

The bird of wealth and happiness is a popular concept in the understanding of the people since ancient times, in the language of fairy tales a king dies, a bird of wealth is flown to elect a new king in his place and whoever it lands on, and then that king will be elected. The meaning of this tradition proverb moves to the phraseology of *basina baxit qusi qonıw* (a bird of happiness land on someone's head) [7, 124-125], and it means achieving good, happiness, wealth, good intentions. These meanings are preserved in the following proverbs related to the terms of this bird.

Dáwlet qusi qonsa kimniń basına, Whose head will the bird of wealth fall on?

Suymırıq kórmege keler qasına. Comes close to see Suymyruk.

Patshadan dáwlet ketse, If the wealth leaves the king,

Dáwlet qus tuǵırdan keter. The bird of wealth leave the stand.

«...In the legend « Jerdiń jaratılıwı (Creation of the Earth)» (K.F.77-87), it is predicted that the creation of man and the world is connected with the suymurik, the lack of land in ancient times, the suymurik gets the mud out of underwater with its beak and builds a nest, the earth was formed from its nest. In the mythic views of our people, the bird suymurik is considered to be miraculous and special, and even its feathers have the power to heal the sick and open blind eyes. «Suymurik (Semurg)» - in the mythology of the Iranian-Sudanese people, it is depicted as a magical, all-powerful bird and equated with Ahuramazda. It is depicted as a bird with a beak similar to an eagle, large wings, and magical feathers. The word «suymurik» means «king of birds», and the word *si+murg* – thirty birds is formed from it, through the Persian word game» [3, 17].

In general, the ornithonyms in the language of Karakalpak folk proverbs serve as an artistic method of illuminating people's views and attitudes towards life, marriage, existence, the surrounding world. Bird terms in proverbs give an opportunity to compare and describe human life very skillfully. It is of particular importance to study the peculiarities of their use in folklore works, including, proverbs, and their artistic services.

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Rezyume: *Ushbu maqolada qoraqalpoq maqollarida ornitonimlarning qo'llanilishi, ahamiyati va ma'nosi o'rganiladi. Qoraqalpoq xalq maqollarining tili juda ta'sirli, mazmunli, badiiy bo'lib, bir necha so'z bilan ko'proq va chuqur ma'no berishga moyilligi bilan ajralib turadi. Qoraqalpoq xalq maqollari tilida qo'llanilgan ornitonimlarning xizmati alohida. Bunda qushlarning xulq-atvor xususiyatlari bilan insonning turmush tarzi, inson xulq-atvori, urf-odatları, xarakteri, xususiyatlari qiyosiy ochib beriladi.*

Резюме: *В данной статье изучается употребление орнитонимов, их значение и содержание в каракалпакских пословицах. Язык каракалпакских народных пословиц очень*

впечатляющий, имплицативный и художественный и характеризуется тем, что они имеют тенденцию придавать больше и более глубокий смысл с помощью нескольких слов. Особой является функции орнитонимов, используемых в языке каракалпакских народных пословиц. При этом образ жизни человека, поведение человека, обычаи, характер, черты сравнительно раскрываются особенностями поведения птиц.

Kalit so`zlar: *ornitonimlar, maqollar, frazeologizmlar, zoonimlar, qush atamalari, qoraqalpoq maqollari tili.*

Ключевые слова: *орнитонимы, пословицы, фразеологизмы, зоонимы, название птиц, язык каракалпакских пословиц.*

ACTIVITIES THAT PROMOTE SPEAKING IN THE CLASSROOM.

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Summary: *This article aims how to teach speaking skill by using variety methods and techniques.*

Keywords: *speaking, skill, activities, method, techniques.*

Speaking is known as oral skill that processes in conveying one feeling or ideas to other with verbal language. Berutu and Sumarsih states that speaking is the process of building and sharing meaning through the use of verbal and non-verbal symbols, in a variety of context.[2;2014] It means that effective speaking need to be able to process languages in their own heads and involves a good deal of listening and understanding. Many people also use speaking in some different purpose, some people speak in conversation for instance to make social contact with people or built social relationship with other people. In this case, speaking use to improve the students speaking skill effectively, known from the fluency and accuracy.

To develop speaking skills students definitely need intensive practice. As an [ESL teacher](#), I absolutely think that the students achieve the speaking skill by interacting on topics of real-life situations. The answer is definitely the engagement of activities that promote speaking in the classroom.

After all, the final aim of learning a second language is for students to be able to communicate in the target language in a variety of contexts and express themselves without being strained. To teach speaking is to teach students to organize their thoughts. How? In a meaningful and logical sequence instead of leading them to pure memorization of patterns.

Here, students take part in authentic activities that promote speaking in the classroom. Among the numerous activities, some successful ones that develop students' speaking skills are:

Role play activities

Through role-plays, students are assigned roles and put into situations that they may eventually encounter outside the classroom (e.g. a patient to a doctor's office, a customer in a shop, a salesperson, a clerk, etc.)

As role plays are an imitation of real life, the range of language functions that students use through them varies considerably. Also, role plays and simulations make students, especially hesitant ones, more motivated and self-confident. They play their parts and use language meaningfully and with appropriate intonation. Harmer suggests, they increase the self-confidence of hesitant students, because in role play and simulation activities, they will have a different role and do not have to speak for themselves, which means they do not have to take the same responsibility[1;1984].

Discussion activities

Discussion activities ask for setting a purpose. Teachers usually do this, so that students don't just waste time chatting about irrelevant things. Discussions evolve around actual real-life topics such as environment, technology, health issues, lifestyles, cultures, etc. Through discussion activities students aim to conclude, share opinions, give solutions, or agree or disagree on a certain issue. In pairs or groups of three or four students organize discussions. They boost students' critical thinking and make them ask questions, clarify and support ideas and respect others' opinions.

Debates

Debates are persuasive speaking activities. Here students keep an attitude, give opinions, and justify them giving arguments to support ideas. Students debate in a polite way on challenging topics. These topics are prompted by the teacher or found in the course book. The topic of a debate should be related to students' preferences and level of language knowledge. Pick a topic together where students

will agree or disagree. For example, most people these days prefer getting news online to reading newspapers or watching TV? English and Math important than Art and Music? Have students state their opinions and back them up with reasons. Then have students who disagree explain their opinions.

Picture describing

Another way to make students speak is by showing them one or two pictures. Then, and ask them to describe what is in them. Students discuss the picture in detail: the people, the setting, the weather, feelings, etc. It can be conducted in pairs or individually. This activity fosters the creativity and imagination of the learners. It also develops their public speaking skills.

Storytelling

Students can briefly summarize a tale or story they have listened to or read. They may create their own stories to tell to the class. Storytelling fosters creative thinking and boosts students' imagination. Students express ideas in chronological order making use of appropriate linking words. They describe characters and their feelings as well as events spread in time and space.

Picture Strip Story

Picture strip story is a split information ordering technique that provides a large amount of speaking practice. Each student is given part of a story or other text, which they have to memorize. They then talk together until they have reconstructed the complete text, in the correct order, from memory. To do this, they have to repeat each sentence many times .

Interviews

Students can conduct interviews on selected topics with various people. It is a good idea to prepare interviews on real-life topics. This way, students feel free to ask and answer questions. Students take roles and then swap them to have a diverse share of opinions. Conducting interviews with each other allows students to practice their speaking ability not only in class. It also helps them become more socialized outside the classroom.

Fluency Games

Another extremely important factor to consider is making students feel very comfortable with using this practical sentence. Use fluency games to build their familiarity and speed in recalling the sentence. One way to achieve this goal is to do a hot potato game. Have students stand in a circle and toss a small object around the circle. When a student receives the object, they should say a sentence related to the topic within three seconds. If they stall or take longer than three seconds, they have to leave the circle. To make it more challenging, students also must leave the circle if they repeat a word already said by a different student. Feel free to adapt this activity to the level of your students, such as using words that start with the same letter or words that are related to each other.

Sentence extension activities

Someone says a basic sentence with the target language like “He ran quickly” for adverbs of manner. The next person then repeats the sentence but with extra words, as in “He ran quickly up the hill”. Students take turns making it longer and longer until someone can't remember the sentence, gives up, or makes it into two sentences instead of one. Words can go at the beginning, in the middle and/or at the end of the previous sentence. You can allow them to change word order, parts of speech, etc, so that new words can more easily fit, or only allow adding and no other changes.

Questionnaires with pictures:

This is an ESL speaking activity for practicing language useful for talking. Using pictures with the questions gives context. The vocabulary at the bottom of the page can be matched to the pictures as an icebreaker. Students can discuss and answer the questions in groups or in pairs.

These activities make students more active in the learning process. At the same time, it makes their learning of the English language more meaningful and entertaining for them.

In order to make the teaching learning process more interesting and motivating the teacher should pay careful attention to his/her teaching method. He/she must be able to make a better atmosphere in the class, for example by using the activities mentioned above. By implementing the

activities listed above, the learners will be more motivated in learning English and the class will be more interesting.

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Rezyume: *Maqola har xil usul va metodlardan foydalangan holda ingliss og'zaki so'zlash ko'nikmasini rivojlantirish.*

Резюме: *В этой статье рассказывается о том, как научить навыкам разговорной речи, используя различные методы и приемы.*

Kalit so'zlar: *nutq, malaka, faoliyat, usul, texnika.*

Ключевые слова: *говорение, умение, деятельность, метод, приемы.*

HISTORY OF THE HEADS OF THE INTERNAL AFFAIRS DEPARTMENT OF CHIMBAY DISTRICT, THE REPUBLIC OF KARAKALPAKSTAN DURING THE INDEPENDENCE YEARS

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Summary: *There is given some information about the heads of the internal affairs department of Chimbay district, the Republic of Karakalpakstan during the independence years, about the bosses who led in the history of the department, their activities, the tasks they performed and significant achievements achieved during their leadership in this article.*

Key words: *Internal Affairs Department in Chimboy district, lieutenant colonel, major, Avezov Xojabek, Utambetov Sabit.*

Colonel Avezov Xojabek Boltabekovich was born in Chimboy district. He grew up in accordance with the national customs and traditions during his childhood. Avezov made it his daily routine to work with people. During his studies at school and higher education, he fully understood the advantages of the profession of maintaining public peace and order. A citizen of the country, who devoted his life to protect rights, is quickly noticed by his work and good organization. Avezov, who started working as an ordinary human rights defender, worked twice (in 1991-1992 and 1994-1998) as the head of the Internal Affairs Department in Chimbay District. The life experiences of Avezov, who gained respect and reputation through honest work, is an example for young personnel and young people in the field, and today his name is mentioned with respect in the field of internal affairs. [1., 4.p.]

He was born on January 14, 1939 in Shimbay district. In 1957, he entered the Nukus State Pedagogical Institute and he started working as a teacher at secondary school #36 in Shimbay district in 1961. Until 1974, he worked in this school as a teacher, then as a deputy director of the school. Since 1974, he has worked as the deputy head of the Internal Affairs Department in Shimbay district, and in 1979-1984 he graduated the Tashkent Higher Police School. In 1987-1992, he worked as the head of the Internal Affairs Department of Kegeyli district, in 1992-1994, as the head of the Internal Affairs Department of Shimbay district, and in 1994-1996, as the head of the joint-stock company "Shimbay Peasant Market". From 2000 until the end of his life, he worked as the head of the Citizens' Council of District #5 in Shimbay district.

No matter what position Yusup Ismailov worked in, he was an educated, skilled organizer and highly responsible. He made a great contribution to maintaining the peace of the people and strengthening the public order. His selfless work was highly appreciated, he was awarded with several orders and medals of our people, and he was given the honorary title of "Lawyer whose work has contributed to the Republic of Karakalpakstan". Yu. Ismaylov died on November 5, 2003 at the age of 65.

He was born in 1957 in Taxtakopir district. After graduating from high school, he graduated Tashkent State University at the law faculty in 1980.

Intending to continue his father's career experience, Baymurza started a job he loved in order to implement theoretical knowledge. Jolamanov, who actively entered the field of law as if he had "become perfect" as a veteran of his field, studied his work in depth and gradually rose in his position at work. No matter what position he held, he stood out for his work and excellent organization. Having passed a difficult and arduous path, he headed the Internal Affairs Department of Shimbay District in 1998-2001.

He was born on May 15, 1960 in Qaraozek district. After graduating from high school, he voluntarily enlists in the military. In 1981, he entered the law faculty of Nukus State University and

graduated in 1986. Since that year, he worked as a police inspector of the Internal Affairs Department of the Ministry of Internal Affairs of the Republic of Karakalpakstan in Nukus, later, Inspector of Inquiry in the Investigation Team of the Internal Affairs Department of Nukus, investigator of the investigation department, senior investigator of the investigation department of the Ministry of Internal Affairs of the Republic of Karakalpakstan, Senior investigator of the anti-corruption and terrorism department of the Ministry of Internal Affairs of the Republic of Karakalpakstan, deputy head of the Investigation Department of the Ministry of Internal Affairs of the Republic of Karakalpakstan, deputy head of the Department of Internal Affairs of the Republic of Karakalpakstan, Ministry of Internal Affairs of the city of Nukus, Head of the Investigation Department, worked as a temporary deputy of the Ministry of Internal Affairs of the Republic of Karakalpakstan, worked as the head of the Internal Affairs Department of Shimbay district. He has been in honorable retirement since 2010.

He was born on August 13, 1965 in Shimbay district. He started his career in 1982 as an employee of mobile mechanized convoy number 28 belonging to “Karakalpakstan Agricultural and Economic Water Construction”. He served in the military in 1983-1985. In 1985-1987, he worked as an employee of the mobile mechanized column #28 belonging to the “Agricultural and Water Management Construction of Karakalpakstan”, in 1987, he was a locksmith at the Shimbay production enterprise, an employee of the Shimbay trade processing center. In 1987-1991, was a trainee at the Tashkent Higher Police School. In 1991-1993, he worked as an investigator in the investigative department of the Internal Affairs Council of the Republic of Karakalpakstan, in 1993-1997, he worked as an investigator, head of the investigation department at the Internal Affairs Department of Shimbay district. in 1997-2002, the first deputy of the head of the Internal Affairs Department of the Shimbay district, the head of the crime fighting department, in 2002-2005, he was an employee of the Internal Affairs Council of the Republic of Karakalpakstan, a representative of the department for combating crime and combating terrorism, head of the department, in 2005, he temporarily held the post of the head of the Internal Affairs Department of Shimbay district. In 2005-2008, he worked as the head of the Internal Affairs Department of Shimbay district.

He was born on May 18, 1972 in Shimbay district. In 1997, he became a trainee at the study center of the Ministry of Internal Affairs of the Republic of Karakalpakstan. He started his career in 1998 as a militiaman of the patrol-post service company of the Department of Internal Affairs of the city of Nukus. He is working as Commander of the Combat Guard Group of the Ministry of Internal Affairs, the representative of the criminal investigation department of the Xojeli District Internal Affairs Department to combat terrorism and extremism, first Deputy Head of the Department of Internal Affairs of Nukus District, Head of the Department of Criminal Investigation and Combating Organized Crime, was a student of the higher academic course of the Academy of the Ministry of Internal Affairs, Chief representative of the Ministry of Internal Affairs of the Department of Criminal Investigation and Combating Terrorism, Combating Terrorism and Its Various Manifestations, Department of Correctional Services, Head of the Internal Affairs Department of Shimbay District, Head of the Internal Affairs Department of Nukus City, included in the active reserve of the Ministry of Internal Affairs of the Republic of Uzbekistan, Deputy of the Ministry of Internal Affairs of the Republic of Karakalpakstan - Head of the Department of Economy and Technical Supply, Head of the Department of Internal Affairs of Tortkul district, Head of the Department of Internal Affairs of the Nukus town.

He was born on August 29, 1963 in Ellikkala district. In 1981, he graduated the pedagogic-law faculty of Nukus State University. In 1986, he worked as a teacher at secondary school #49 in Ellikkala district, and in the same year he was in military service in military unit #10823. Since 1988, He worked as a duty officer at the centralized guarding station of the Security Department under the Department Internal Affairs Department in Beruniy district, a police inspector at the Internal Affairs Department in Beruniy district, a representative of the criminal investigation department, representative of the member of the criminal investigation team, a head of the criminal investigation department, a first Deputy Head

of the Department of Internal Affairs of Kegeyli District, a head of the First Department of the Criminal Investigation Department of the Internal Affairs Department of the Republic of Karakalpakstan, a representative at the Internal Affairs Department of the Republic of Karakalpakstan, the Department of Criminal Investigation and Combating Terrorism, the Department of Combating Crimes Against the Life and Health of Citizens, a deputy head of the Department of Internal Affairs in Beruniy district, first deputy head of the Department of Internal Affairs of Takhtakopir district, a head of the department of criminal investigation and fight against organized crime, first Deputy Head of the Department of Internal Affairs in Ellikkala District - a head of the Department of Criminal Investigation and Combating Organized Crime, first Deputy Head of the Department of Internal Affairs of Beruniy District - a head of the Department of Criminal Investigation and Combating Organized Crime, a head of the Internal Affairs Department in Ellikkala District, Head of the Internal Affairs Department in Shimbay District. Since 2012, he has voluntarily retired. [1, p. 10]

He was born on December 7, 1974 in Kanlikol district. He started his career as a policeman in the Internal Affairs Department in Kanlikol district in 1994. He is working as an assistant on duty at the duty department of the Internal Affairs Department in Kanlikol district, a preventive inspector of the police base of the police base at the Internal Affairs Department in the same district, a representative of the Criminal Investigation and Organized Crime Team of the Department of Internal Affairs, an assistant to the head of the Department of Internal Affairs, first deputy head of the Department of Internal Affairs, head of the department for combating criminal investigation and organized crime, a head of the Internal Affairs Department in Shimbay District, a head of the Internal Affairs Department of Qonirat district, Movement Reserve of the Internal Affairs Department, a representative of the Anti-Terrorism and Extremism Group of the Internal Affairs Department in Kanlikol District, a chief inspector of the Department of Internal Affairs of the Republic of Karakalpakstan.

He was born on October 15, 1976 in Taxtakopir district. He started his career in 2001 at the Nukus City Internal Affairs Department, Crime Prevention Department, Police Base Prevention Inspector. He is working as an investigator of the investigation department of the Department of Internal Affairs in Nukus town, a chief investigator, a head of the department, an investigator of the investigation department of the Internal Affairs Department, a senior investigator, a head of the department, a representative of the Criminal Investigation and Counter-Terrorism Department of the Department of Internal Affairs, head of the department, Xojeli District Internal Affairs Department, a head of the Police Department in Taqiyatas District, a head of the Internal Affairs Department in Shimbay District, a head of the Internal Affairs Department in Qaraozek District.

He was born on March 8, 1970 in Qaraozek district. He started his career in 1995 as an investigator of the Investigation Department of the Department of Internal Affairs of Nukus, Republic of Karakalpakstan. He is working as a teacher of the training center of the Internal Affairs Department of the Republic of Karakalpakstan, a representative of the 2nd department of the Criminal Investigation Department of the Internal Affairs Department of the Republic of Karakalpakstan, a representative of the Department of Combating Aggression and Other Types of Theft of Other People's Property of the Department of Internal Affairs and the Department of Combating Organized Crime, first Deputy Head of the Internal Affairs Department of Qaraozek District, Head of the Anti-Criminal and Organized Crime Department, a representative of the criminal investigation and organized crime fighting group of the second city police department of the Internal Affairs Department of Nukus, a head of the police department of the second and third city of the Internal Affairs Department of Nukus, a deputy Head of the Anti-Trafficking Department of the Department of Criminal Investigation and Combating Terrorism of the Internal Affairs Department of the Republic of Karakalpakstan, a senior inspector-on-duty of the duty department of the Department of Internal Affairs of the Beruniy District Organizational Inspector, a head of the Department of Temporary Detention of Detained Persons of Taqiyatas District Police Department of Khojeli District Internal Affairs Department, a chief Representative of the Anti-Crime and Anti-Terrorism Department of the Department of Internal Affairs

of the Republic of Karakalpakstan, Department of Combating Organized Crime, a head of Department of Internal Affairs # 2, 3 of the Department of Internal Affairs in Nukus city, a first Deputy Head of the Department for Coordination of the Activities of Business Bodies, a head of the Department of Internal Affairs of Qaraozek District, a head of the Department of Internal Affairs of Shimbay district.

By the decision of the President of the Republic of Uzbekistan dated April 18, 2017 "On measures to fundamentally improve the activities of crime prevention units of the internal affairs bodies" # PD-2896, the number of existing prevention inspectors was optimized;

- Attached to prevention inspectors by the decision of the President of the Republic of Uzbekistan dated April 20, 2017 "On additional measures to provide service housing for prevention inspectors of internal affairs bodies" No. PQ-2906 a system of allocating personal cars to them on the basis of service houses and preferential loans was established in the service areas;

- In order to ensure high-quality and short-term investigation of criminal cases, the decision of the President of the Republic of Uzbekistan dated April 18, 2017 "On measures to fundamentally improve the activity of internal affairs bodies in the field of crime investigation" No. PQ-2898 a relatively new institution of inquiry was introduced in the legal system of the Republic of Uzbekistan;

- No. PQ-2940 of the President of the Republic of Uzbekistan dated May 1, 2017 "On measures to fundamentally improve the activities of internal affairs bodies in the field of maintaining public order and ensuring public safety"

and with the decisions PQ-3127 dated July 11, 2017 "On measures to further improve the road safety system", the effectiveness of maintaining public order and ensuring road safety has been further increased, patrol-post and road patrol services were exempted from a number of tasks not related to the sector.

- Patrol-post and road patrol services were exempted from a number of tasks not related to the sector with the Decision # PD-2940 of the President of the Republic of Uzbekistan dated May 1, 2017 "On measures to fundamentally improve the activities of internal affairs bodies in the field of maintaining public order and ensuring public safety" and with the decisions PD-3127 dated July 11, 2017 "On measures to further improve the road safety system", the effectiveness of maintaining public order and ensuring road safety has been further increased.

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Rezyume: *Ushbu maqolada mustaqillik yillarida Qoraqalpog'iston Respublikasi Chimboy tumani Ichki Ishlar bo'limi va bo'lim tarixida rahbarlik qilgan boshliqlari haqida, rahbarlarning faoliyati hamda o'z davrida amalga oshirgan ilg'or ishlari haqida malumot beriladi.*

Резюме: *В данной статье рассказывается о руководителях отдела внутренних дел Чимбойского района Республики Каракалпакстан в период независимости, их деятельности и выполненных ими задачах. Также предоставляется информация о значимых достижениях, осуществленных во время их руководства.*

Kalit so'zlar: *Chimboy tumani Ichki Ishlar bo'limi, podpolkovnik, mayor, Avezov Hojabek, Utambetov Sabit*

Ключевые слова: *Отдел внутренних дел Чимбойского района, подполковник, майор, Аvezов Хожабек, Утамбетов Сабит*

SCIENTIFIC METHODOLOGICAL ASPECTS OF CRITICAL THINKING IN STUDENTS

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Summary: *Critical thinking is an active process that requires us to act consciously. Using the methods of critical thinking, we can analyze complex economic, social, ethical, legal or other various problems, understand their causes, consequences or impact on other events and look for solutions to solve the problem. The point is that a proper understanding of words and phrases in terms of usage provides a valuable opportunity to use these words in different contexts and at different times.*

Key words: *Critical thinking, egocentrism, student, upbringing, education, experimental work, pedagogical process, improvement path, consistency, continuity, excellence, effectiveness, behaviour, social conditions, education level, social activity.*

Introduction. In accordance with Presidential Decree No.PF-6260 dated July 13, 2021, the program of the Government, as well as the Council of Ministers of Karakalpakstan, regions and individual khokims of Tashkent city, district and city, on the eve of Youth Day, regional programs are being adopted in connection with proposals and initiatives, problems and solutions raised by youth.[1]

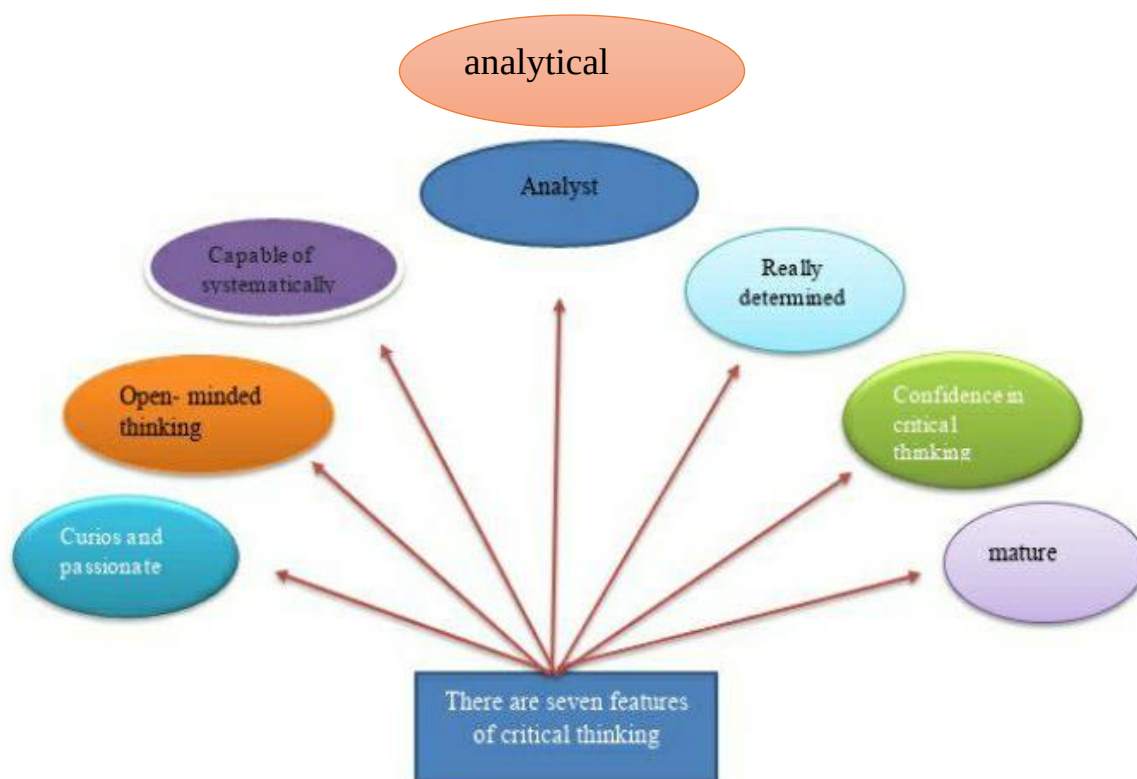
These programs consist of comprehensive activities aimed at acquiring knowledge and skills of young people, creating decent working and living conditions for them, and meaningful organization of free time. Therefore, in order for the youth who are our future to be educated, knowledgeable, healthy and fluent in speech, students are currently taught in higher educational institutions in the form of lectures, practical classes and seminars. Students consolidate the information received in lectures by explaining topics in practical and seminar classes. Students' free thinking becomes clear and lucid when they complete a task by outlining topics. We are witnessing the extent to which students can think freely and express their opinions in practical classes and seminars. Some students have a low level of self-confidence, are shy to speak, and cannot express their thoughts clearly and fully. In order to reduce these disadvantages, it became clear that we need to develop critical thinking.

Critical thinking is a special type of thinking that draws conclusions by analyzing facts. [2] This concept is complex and has various definitions, including rationality, skepticism, objective analysis and fact checking. Critical thinking is a form of thinking that is self-directed, self-learning, self-controlled and self-correcting. Its prerequisite is to agree with strict standards of mental improvement and vigilant observance of them. Critical thinking requires effective communication and problem-solving skills, as well as overcoming our inherent self-centeredness.

Egocentrism in Latin means "I" and "center" — a person's attachment to his own sphere of interests, the inability to look at other people in accordance with his prejudices or change his mind, even adapt to information that contradicts his own experience. knowing. On the basis of egocentrism, a person cannot recognize and understand that there may be views that are opposite to his own point of view.

In addition, it is not as easy as it seems to train the mind and follow the planned way. But by setting life goals and developing a plan for their implementation with the help of critical thinking, a person can succeed.

Critical thinking is not "hard thinking", and it is not aimed at solving problems (other than "improving" one's own thinking). Critical thinking is internally aimed at maximizing the rationality of the thinker. A person does not solve problems with the help of critical thinking, he improves his thought process with the help of critical



thinking.

Figure 1 Facione, Peter A.; Facione, Noreen C. (March 1993). "Profiling critical thinking dispositions". Assessment

Although critical thinking can be defined in several ways, there is a general idea that its main component is a strong desire to achieve a satisfactory result, which must be achieved through rational thinking and a result-oriented approach.

According to Halpern, critical thinking primarily involves learning skills such as problem solving, calculation, and the effective use of probabilities. This includes the tendency to participate in the thinking process. [3]

Contemporary critical thinking scholars have attempted to expand these traditional definitions to include quality, understanding, and process, including definitions of creativity, imagination, exploration, excitement, empathy, knowledge linking, phenomenological theory, subjectivity, uncertainty, and futility. Some definitions of critical thinking exclude these subjective experiences. According to Ennis, critical thinking is the conceptualization, application, analysis, synthesis, and/or evaluation of information gathered or generated through observation, experience, reasoning, learning, or association that guides belief and action, considered an intellectual and disciplined process. This description of Ennis was advanced by Harvey Siegel, Peter Fazione and Deanna Kuhn. According to Ennis, critical thinking requires focus and brain activity. [4] If critical thinking is introduced into the field of education, this method increases the brain activity of students and helps them to understand the texts in a different way.

Critical thinking can be broken down into different parts, and a student in a different field will need a different model of critical thinking. Critical thinking reveals many different angles and perspectives from similar material. Learning logical argumentation is related to learning critical thinking. Logic is concerned with analyzing arguments and evaluating whether they are true or false. In areas of epistemology, critical thinking emphasizes logical thinking, which allows us to distinguish between logically correct and logically incorrect conclusions.

Critical thinking is considered by many scientists (M. Veksler, A. I. Lipkina, L. A. Rybak, U. M. Mungal, A. S. Bayramov) in relation to other types of thinking (effective, logical, creative,

problematic). How personality reflects a person's mentality. "Thinking is a process of cognitive activity of a person, which is inextricably linked with speech, aimed at purposeful, generalized and mediated reflection of the surrounding reality, finding and discovering something new." [5]

The authors of the second wave of critical thinking consciously moved away from the logo centric model of critical thinking characteristic of the "first wave". Although many scholars have begun to adopt a less exclusive view of what constitutes critical thinking, rationality and logic have been accepted as the main foundations of critical thinking. According to Walters, the exclusive logo centrism of the "first wave" is good thinking is governed by the unfounded assumption that thinking is simplistic for logical thinking. [6]

The concept of "critical thinking" entered the science of pedagogy in the middle of the 20th century. K. Popper was the first to use the term critical thinking. According to him, every living organism acts as a "solver" of problems. The surrounding information is considered as confirmation or rejection of the meaning of the world living organism, which gives a preview of this phenomenon. In such a situation, critical thinking works as a way to search for truth and eliminate error. E. De Bono, J. Daniya, M. Lipman, D. Halpern, D. Clowes are among the foreign experts who worked on the issue of critical thinking. According to A. E. Petrov, critical thinking has a reflexive nature, in which a person studies his own thinking and its correctness. A. Veretennikova, defining critical thinking, presents it as a system of mental states, characteristics and processes aimed at forming an assessment.

As V. A. Shamis and L. A. Maltz pointed out, critical thinking involves finding mistakes and correcting them. In the works of I. A. Pshonkovskaya, critical thinking is a complex process of reflection and evaluation, and creative thinking is considered as a basis for it. In his opinion, creative and critical thinking processes are considered interrelated.

The most complete description of critical thinking was given by the well-known monograph author D. Halpern, according to which: "Critical thinking is the use of cognitive techniques that increase the probability of achieving the desired final result." In this definition, critical thinking is defined as a type of thinking characterized by control, justification, and purposefulness of thinking and used in problem solving, inference, probabilistic evaluation, and decision making. At the same time, the thinker uses skills that are reasonable and effective for the specific situation and the type of task to be solved. Critical thinking is a point of reference, a way of interacting with natural ideas and information. We are faced with the problem of data selection. [7]

Main part. Critical thinking is an active process that requires us to act consciously. Using critical thinking methods, we are able to analyze complex economic, social, ethical, legal or other various problems, understand their causes, consequences or effects on other events and search for solutions to solve the problem. The real reason for bringing critical thinking to languages is that the correct understanding of words and phrases in terms of their use is as valuable as the use of these words according to their meaning at other times and in other sentences. That is, during the period of communication, our brain receives information, synthesizes, analyzes and reflects in response to these processes and presents its analysis using vocabulary. In order to develop this vocabulary, a three-stage function has been developed.

Questions in the science of yunogogy.

1. How can we use student youth to further improve the education system in the world?
2. What benefits did the science of yunogogy bring to our society?
3. When and how did the science of yunogogy play an important role in the history of the whole world?
4. Is it possible to use yunogogy as a communication tool? How?
5. In what situations in life do young people take advantage of opportunities?
6. When is the answer "correct" not the best solution?
7. How can young people make their own decisions when solving problems in life?
8. How is yunogogy used to evaluate or compare situations and events?

9. How is the possibility of an incident among students identified and reported?

10. How to determine the best strategy for solving a specific youth problem?

Results:

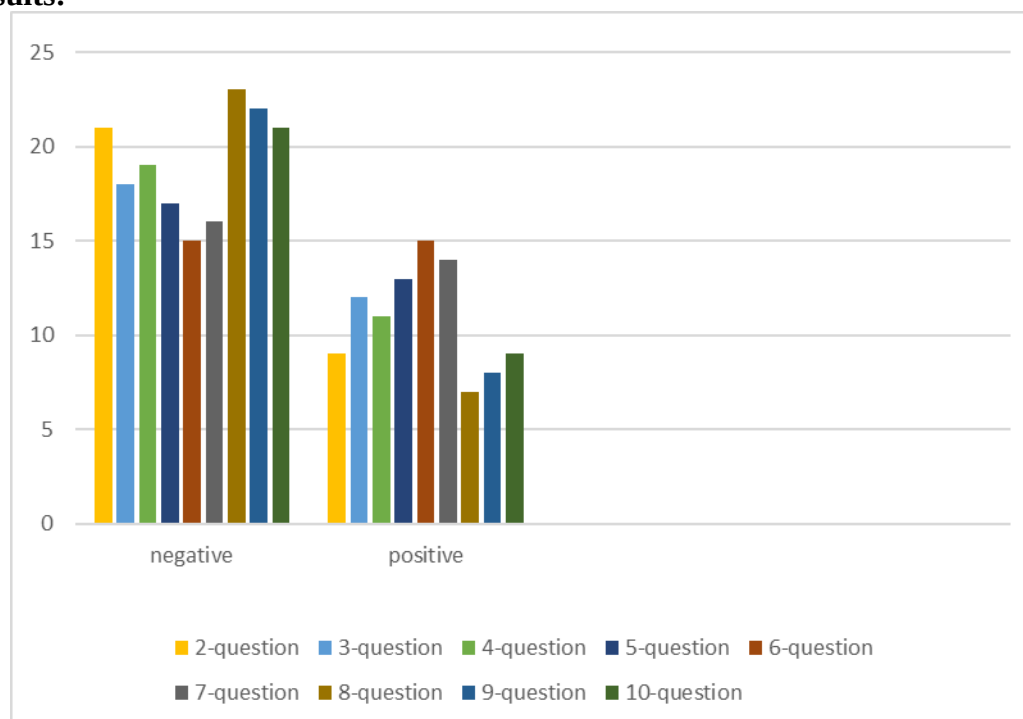


Figure 2. End of inquiries

Discussions. Critical-creative thinking means thoughts and language come directly to a person's imagination. In order to understand the thoughts correctly, it is necessary to first analyze the thoughts conveyed through the language and always express the opinions correctly. Because sometimes people can't even analyze their thoughts. William Hughes and Jonathan Lavery says that "In order to understand thoughts, you need to pay careful attention to the relationship between thinking and language, because the relationship seems simple, but, in many cases people do not understand the meaning of their words." [8] The reason is that we use words not to express thoughts, but to form them.

Conclusion. In sum up, it is not just about using words to speak in foreign languages, but first of all, we need to analyze and then express our thoughts. A learner who begins to think critically uses the written method of expressing thoughts while learning foreign languages. John Beans research is about thinking in the language being studied and expressing it in writing, thoughts related to a certain topic written in foreign languages: we see with, we emphasize writing and critical thinking, and in many cases, the writing struggle, where the education of thinking is connected with the growth of human intellectual power, usually becomes a real feature of the students' education.

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- Figure 1
Facione, Peter A.; Facione, Noreen C. (March 1993). "Profiling critical thinking dispositions". Assessment
Figure 2. End of inquiries

Rezyume: Tanqidiy fikrlash - bu bizning ongli tarzda harakat qilishimizni nazarda tutadigan faol jarayondir. Tanqidiy fikrlash usullarini qóllagan holda biz murakkab iqtisodiy, ijtimoiy, axloqiy, qonuniy yoki boshqa turli muammolarni tahlil qilishga, ularning kelib chiqish sabablarini, oqibati yoki boshqa hodisalarga ta'sirini tushunishga va muammoni hal qilish uchun yechim izlashga muvaffaq bólamiz", degan fikrlarni kórishimiz mumkin. Tillarga tanqidiy fikrlashni olib kirishning asl sababi shundan iborat-ki, sózlar va iboralarning ishlatilish jihatidan tógri tushunilganligi bu sózlarni mánosiga kóra boshqa bir vaqtda va boshqa gaplarda ham ishlatishdek qimmatli imkoniyatni beradi.

Резюме: Критическое мышление — это активный процесс, который требует от нас действовать осознанно. Используя методы критического мышления, мы можем анализировать сложные экономические, социальные, этические, правовые или другие различные проблемы, понимать их причины, последствия или влияние на другие события и искать решения для решения проблемы. заключается в том, что правильное понимание слов и словосочетаний с точки зрения употребления дает ценную возможность использовать эти слова в разных контекстах и в разное время.

Kalit so'zlar: Tanqidiy fikrlash, egosentrizm, talaba, tarbiya, ta'lim, tajriba-sinov ishlari, pedagogik jarayon, takomillashtirish yo'li, izchillik, uzluksizlik, ustunlik, samaradorlik, xulq-atvor, ijtimoiy sharoit, ta'lim darajasi, ijtimoiy faollik.

Ключевые слова: Критическое мышление, эгоцентризм, ученик, воспитание, образование, экспериментальная работа, педагогический процесс, путь совершенствования, системность, преемственность, превосходство, результативность, поведение, социальные условия, уровень образования, социальная активность.

METHODOLOGY OF DEVELOPMENT OF CREATIVITY COMPETENCE OF STUDENTS

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Summary: *The article presents methods aimed at developing the creative abilities of students of higher education institutions.*

Key words: *creative, contemplative, motivational, cognitive, praxiological.*

Today, when the world community is undergoing integration, the level of creative activity of society members is recognized as the main factors of development, and in the concept of international education defined by international organizations and most countries of the world until 2030, "having a solid foundation of knowledge and developing creative thinking, cooperation strengthening their abilities and interests" [1] is noted as an urgent task.

The current educational process requires updating the means of activity of subjects. Such an update is related to the activity of the teacher, student, and subjects managing school education. These tools include textbooks, educational literature, computer technologies, and innovative teaching methods. This means ensuring the student's creative activity, freeing him from frontal tasks, opening a wide path for his independent thinking, giving him the opportunity to create innovations, and opening the way for him to choose an individual educational direction for himself. One of the important factors that develop human creative abilities is the development of society. Creative self-expression of a person, its uniqueness has humanitarian significance. It is related to the essence of a person's life, the manifestation of his inner powers. Philosophers say that a person's life is directly related to his activity.

A person achieves the fulfillment of the tasks set before him due to activity. Creative, that is, creative activity, is a broad concept that ensures the development of society as well as the individual. Creative activity of a person is manifested in his daily life. Creativity in the life of society ensures the creation of new discoveries and inventions in science and art. As a result, new social programs will be created.

Creativity (creativity) (lat. creation - creativity, creativity) - the ability to create something new, unique, create an artistic form, a mental process that leads to thinking, ideas and solutions; creative ability, which describes a person's readiness to create and accept new ideas [2].

The term "creative competence" was first used by the American scientist Joseph Chilton Pearsom, and it means the creative development of the surrounding world. R.Epstein interpreted the concept of "Creative competence" as a willingness to flexibly apply the knowledge obtained as a desire to independently complete the knowledge system and improve oneself [3].

From the pedagogical and psychological point of view, F.Ehsonova interprets the concept of creativity as "creativity is a person's readiness for constructive and original thinking in solving tasks related to changing socio-cultural conditions in connection with the interests of the individual and society [4]."

Creative activity requires consumption of new things, finding solutions to conflicting problems, eliminating conflicting situations, abandoning existing patterns of behavior, thinking and perception, being ready to change and improve oneself. Creative activism means bringing something into the world. Its main criterion is the uniqueness of individual creations. It shows the student's originality and creative abilities [5].

A.R.Arirdzhanova, V.R.Adizov, Sh.T.Voltaeva, O.Jamoliddinova, V.Karimova, E.Goziyev, V.R.Kodirov on the development of creativity and creativity in students of higher educational institutions [6].

Factors of creative abilities and creativity formation in education, conceptual foundations of pedagogical creativity, issues of development of professional and cultural relations were studied by

G.N.Ibragimova, D.D.Muradova, D.M.Makhmudova, K.J.Mirazimov, Ch.T.Shakirova, Sh.S.Sharipov and others [7].

A.A.Adaskina, V.I.Andreyev, I.Kishtimova, S.Krippner, Yu.G.Kruglova, L.G.Puzep, Y.Y.Tunik from the countries of the CIS will discuss the issues of organizing creative works of students; G.S.Altshuller, A.Leontiev, M.I.Makhmutov, P.I.Pidkasistiy, O.Yu.Aparina, D.B.Bogoyavlenskaya, N.A.Malinnikova, N.Rodgers, N.V.Sobko, I.A.Fomina, S.G.Yudakov, A.S.Kosogova, M.I.Meyerovich, L.I.Shragina, G.V.Uradovskikh, Yu.R.Varlakova, A.A.Verbisky researched the issues of developing creativity skills of future teachers [8].

Researcher D.Baratov [9] distinguishes the following main parameters of students' creativity: 1) originality, ability to produce long associations, unique ideas, ability to respond to anger in a non-standard way; 2) problematic ability to identify and formulate problems; 3) productivity, the ability to generate many ideas; 4) flexibility, sensitivity to contradictions, production of various comprehensive ideas, ability to quickly switch from one idea to another; 5) creativity - the ability to improve the object by adding details; 6) theoretical - the ability to solve problems through analysis and synthesis; 7) metaphor - tendency to imagination.

Based on the analysis, it is known that not only the volume of knowledge, but also their systematicity, accuracy, mobility plays a leading role in knowledge of sciences. To date, there is a sufficient amount of research that shows the close relationship between creativity and knowledge. The more knowledge a person has, the more diverse his approaches to solving new, non-standard tasks and problems.

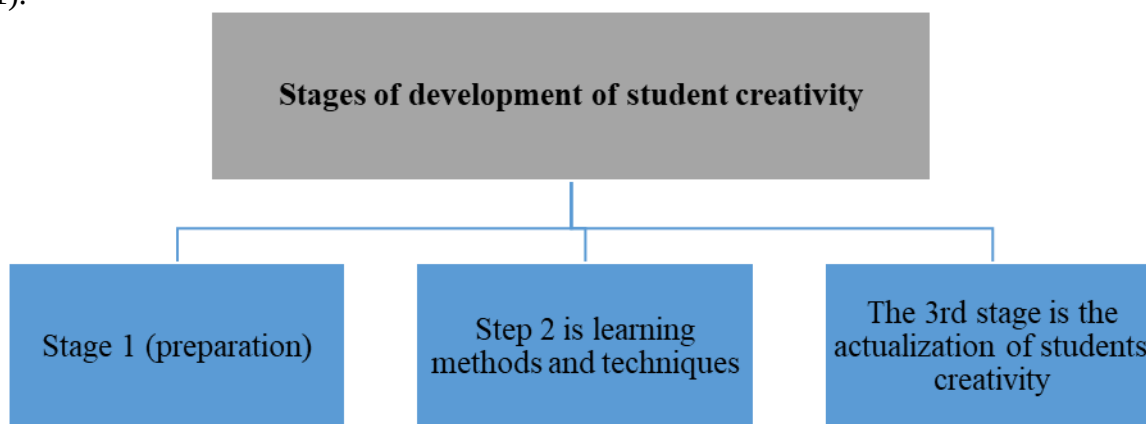
For students, the need for self-awareness in the future profession, as well as high or sufficient motivation to study at the university, interest in the chosen profession, and creative mastering of knowledge are of particular importance. Personal creativity is characterized by the ability of students to quickly create objects of non-standard and functional use, as the ability of transformational activity, assimilating knowledge in the field of pedagogy, needs for self-realization.

It is known that pedagogical activity includes a high level of creativity, in which it is distinguished by the fact that it is aimed at creating objects that have their own individuality and require special perception. In this place, students of preschool education in their professional activities solve problems of creativity in addition to pedagogy. Analyzing the state standards, we came to the conclusion that creativity is established in the standards as a mandatory and important characteristic of pedagogical education students. Students of this specialty, of course, must have knowledge of pedagogical sciences, but this is not enough. This knowledge should be used as a basis for creative self-expression, along with motivation, originality, and fluency of thought.

In addition to the professional potential of the teacher, his ability to solve non-standard, creative tasks is of particular importance. This requires students to develop their creativity in professional training. To develop students' creativity, it is necessary to make corrections to the studied material, update the content of the lesson, and activate students. In the process of individual or joint analysis of professional tasks, the student develops as a specialist, mastering the technique of competent objective actions. This is the process of professional training of students, which is the consistent transformation of educational activities into professional activities aimed at developing creativity.

The educational process should be structured in such a way that there should be situations in which actualization of the life experience of students should exist. The educational content of students should include a system of educational situations, problems and tasks that gradually approach the professional level by involving them in professional activities corresponding to their future professional direction, that is, students should acquire knowledge in context. A contextual approach, in which students are also exposed to various pedagogical tasks, helps to transition to professional activities. This requires actualization of certain knowledge, life experience and non-standard solutions.

According to the structure of this process, the pedagogical conditions for the development of creativity are expressed as a structure represented by components, stages, forms, tools, and methods (Fig. 1).



The process of developing students' creativity is carried out step by step. (Scheme 1)

Stage 1	the main goal of this stage is to form a motivational and valuable attitude of students to general education and professional activity in particular, to acquire basic knowledge about creativity, and to form creative abilities. In the context of the research problem, we consider motivation as the conscious motivation of students to work based on the "inner experience" that is the basis of work. Solving the problem of creativity development should be carried out as specific motives of educational activity (students' desire to learn new facts, professional activity as a symbol of students' desire to acquire a profession).
Stage 2	students study the theoretical foundations of creative activity, various methods and methods for the development of pedagogical creativity, learn methods and methods of solving educational problems. The educational content is aimed at the formation of personally significant methods of educational and professional activity, taking into account the life experience of students. It also develops the originality and fluency of thinking with the help of various pedagogical situations aimed at developing students' verbal creativity.
Stage 3	students face real pedagogical situations that require making non-standard original decisions based on the actualization of creativity. At this stage, the level of verbal and non-verbal creativity is diagnosed according to the established criteria and indicators. To develop students' creativity, we need to turn to pedagogical modeling. Pedagogical modeling is the study of pedagogical objects by modeling the conceptual, procedural, structural and conceptual features and individual aspects of the educational process within a certain socio-cultural space.

Analyzing the research, it can be concluded that the general idea of special importance for scientific work - creativity unites the components of pedagogical education. Thus, development of students' creativity is an integral part of the educational process. Education should be carried out through methodical preparation, which has become the main and system-forming link of the whole process. Based on this, it is permissible to emphasize the features of education of preschool students. These features are manifested in the development of creativity of students of preschool education and it is considered necessary to develop verbal and non-verbal creativity of students.

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Rezyume: *Maqolada oliy ta'lim muassasi talabalarining kreativ qobiliyatlarini rivojlantirishga qaratilgan metodikalar mavjud.*

Резюме: *В статье представлены методики, направленные на развитие творческих способностей студентов высшего учебного заведения.*

Kalit so'zlar: *kreativlik, tafakkur, motivatsiyon, kognitiv, prakseologik.*

Ключевые слова: *творческий, созерцательный, мотивационный, познавательный, праксиологический.*

THE EFFECT AND ROLE OF ROWING TRAINING ON YOUTH SOCIALIZATION

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Summary: *Scientists say that the higher education system is the main institution of socialization, in which education and training is the only process aimed at preparing a highly educated, knowledgeable, physically and spiritually developed person. Socialization of students of higher education is fundamentally different from a similar process in a general education school . . Most of them face serious difficulties during the adaptation period. Therefore, it is considered the most appropriate solution to direct them to some kind of sport . In this, rowers feel part of a team, feel team spirit, work together to win and overcome failures. increases interest in rowing.*

Keywords: *higher education, sports, spiritually developed , students, socialization , questionnaire, rowing.*

Enter. Each era brings its own type of worldview, new knowledge, new life experience, constantly changes our worldview of man and his place in life. During the past century , civilization has gained amazing power, and we need the various skills and rational issues that have created modern science to use for the benefit of mankind. The spheres of social life directly related to education, upbringing and the formation of a person as a person gain special importance due to their socialization.[1,3,4,5,6]

The problem of their socialization has always been relevant for the successful social adaptation and all-round development of growing young people. Socialization is a method necessary for society to maintain social balance and manage social roles. In the process of socialization, the internal evaluation criteria, system of relationships, life activities and other objects of the social sphere are formed to which the person belongs, conducts his behavior and activities. A person's internal relationship system is formed based on their concepts, which defines the coordinate system in which the person places all his important events. This system includes internal and external instances, is dynamic in time, and forms a whole that can be compared, contrasted, or matched. Family, education and training systems, cultural objects, personal and collective communication, mass media, public associations, labor teams, business environment, official bodies, local communities and their self-government institutions, and other institutions of civil society are considered the main ones . agents of socialization.[1,4,5,7]

In other words, in the conditions of modern social development, the socialization of a person affects the life activity of a person, determines his direction, values and system of relations..[3:68]

The purpose of the study was to determine the effect of rowing lessons on the socialization of the student's personality.

Scientists say that the higher education system is the main institution of socialization, in which education and training is the only process aimed at preparing a highly educated, knowledgeable, physically and culturally developed person. The socialization of students of higher education is fundamentally different from a similar process in a general education school. High school students find themselves in a new learning environment. Most of them face serious difficulties during the adaptation period. These difficulties have a negative impact on the successful acquisition of educational programs, interactions with students and teachers, and in general, do not cause any inconvenience in higher school activities. With the transition to higher indicators, the aimless difficulties in the socialization of students will not be eliminated; but has various negative consequences (psychological disturbance, dropout studies, etc.). On the other hand, without strong moral references, in the absence of skills, it is difficult to plan your life and professional life, to clearly confirm personal views, for which the socialization process at the university is responsible, its graduates are almost not oriented. socio-

economic environment and are more likely to join a marginal and possibly criminal environment.[3,4,6,8]

The process of socialization is historically and culturally defined as the active development of a person. In the age of science and technology, it acquires its own characteristics: the criteria of social maturity change and become more complicated, it is accompanied by a change in the complexity of social institutions, the form of education, relations between generations, etc. Increasing the value of life, education, culture, health, human individuality is increasingly being considered as criteria of social development of the society. In this regard, the importance of culture, including physical culture, is increasing in the 21st century..[3:45]

Physical culture is a special phenomenon in higher education. Physical culture, while working for the biological nature of a person, helps to form the spiritual sphere. Therefore, like other types of culture, physical culture plays an important role in the development of the individual. It is known that three main components of personality structure - functional mechanisms of mentality, individual experience and personal characteristics can be successfully developed when a person acquires physical culture.

In the modern world, physical education is an increasingly important fact as part of the general culture of the individual and society. However, along with the phenomenon of physical culture, which is generally accepted and understandable to many, the phenomenon of sports appears and develops with an independent status. Based on the experience of socio-historical development, physical education and sports developed almost simultaneously and enriched each other. However, at first, each of them had its own characteristics and gradually took its place in the social life of the society.

Sport, as an important social phenomenon, penetrates all levels of modern society and has a wide influence on the main spheres of social life. It affects ethnic relations, business life, social status, fashion, moral values and lifestyle of people..[2,5]

Sociological surveys conducted among the population, especially young people involved in sports, show that sports form the initial understanding of life and the world. In sports, important values for modern society, such as achievement motivation, success, striving to be the first, to win not only the opponent, but also oneself, are most vividly manifested.

Sports training is purposeful, organized and usually conducted in a team. Sports help people gain interpersonal experience, build relationships and interactions with each other and with coaches, other athletes, and sports referees. Mutual support, demanding each other, high discipline, the ability to focus on the interests of the team, high-quality sports work - all can be trained in sports. A true leader and organizer can be born in sports, because sports model life situations.[5,7,8]

The value potential of sports allows solving many educational tasks. Thanks to sports activities, the athlete can cope with the difficulties that the adolescent often faces in high school, in the family and in other situations.

Interest in new types of sports in young people is formed in connection with the desire to develop new types of sports activities, to try their strength in something new, unexplored and unusual. Therefore, there are mass, more emotional types of sports training, where not only practical training is emphasized, but also the development of personal qualities, where great attention is paid to forms of aesthetic education.

Rowing is a wonderful and rapidly developing sport in 152 countries of the world, member states of international and continental federations. Long-term loads used in boat races develop a stable nervous system of the athlete and increase resistance to fatigue. Boat racing builds voluntary mechanisms, facilitates emotional well-being and mental balance. In addition, mental modeling of the technique of movements performed in boat races is used. Boat racing is a special type of practical activity that is carried out in two environments - air and water, natural waters and changing weather conditions, which makes it a way to relax, increase stamina and endurance, and an active recreation. Overcoming air and water resistance and performing a repeated cycle of muscle tension, the rower

improves his strength endurance, develops respiratory muscles, which stimulates an increase in blood flow in the capillaries and improves tissue respiration. Rowing is a universal type of aerobics and has a great effect due to its effect on all mechanisms of oxygen supply to the body. Rhythmic movements and breathing, exposure to sunlight and water-air aerosols stimulate reflex thermoregulatory mechanisms, activate immune processes and increase the body's resistance to stress.

According to the International Rowing Federation, about 50 million people in the world now take part in various professional and amateur competitions due to the convenience and democratic nature of this team sport, in which rowers in the same boat are of different ages, genders and sports. can be The feeling of being part of a team, the feeling of team spirit, the opportunity to work together to win and survive setbacks will undoubtedly increase the interest in rowing.

Research methodology . We developed a questionnaire consisting of 21 questions in order to determine what changes have occurred in the social development of rowing athletes. 20 members of the rowing team of the Nukus branch of the Uzbekistan State University of Physical Education and Sports participated in the survey.

Research results .

The results of the survey were as follows Table 1

No	What qualities did you develop during your studies? What changes can you notice?	Totally agree	Partially agree	Incompatibility
1 .	I am not afraid of defeat, I learn to win	18	2	-
2.	Their confidence increased	20	-	-
3.	Enjoy sports activities	20	-	-
4.	Increased responsibility in studies and work	16	2	2
5 .	Compete according to the principles of fair play	18	1	1
6.	Has developed leadership qualities	15	3	2
7.	I give my energy, my time, my friendship to others	17	2	1
8 .	I am ready to help someone	16	4	-
9 .	I don't trust others. I pay attention to my strength	18	2	-
10.	I learned to enjoy the victory of the team I supported	19	-	1
11 .	I lead a healthy lifestyle	20	-	-
12.	I learned how to train properly	20	-	-
13.	I rarely try to say "I can't" and "never".	19	1	-

14 .	I am persistent in solving my problems	18	1	1
15 .	I became more purposeful	19	1	-
16.	I try to respect the feelings of others	20	-	-
17.	My body is healthy, my mind is healthy	18	2	-
18 .	I learned to work in a team	18	2	-
19 .	I felt like a leader, an extraordinary person	5	14	1
20 .	I am an " open " person	17	3	-
21.	I give up bad habits	20	-	-

Summary. According to the results of the questionnaire, the inclusion of rowing lessons in the educational process improves the socialization of students. Performing development exercises in pairs, team participation in psychological training and discussing competitions will help improve their skills, prevent self-restraint, help to be ready for mutual help, support, cooperation gives, reduces the fear of criticism, relieves a high emotional state. well-being makes them more optimistic, determined, responsible and able to be leaders of the youth group .

Thus, if sports activities are properly organized, sports can become a serious and effective way of forming the social activity of the growing generation.

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Rezyume: Olimlarning ta'kidlashicha, oliy ta'lim tizimi sotsializatsiyaning asosiy instituti bo'lib, unda ta'lim va tarbiya oliy ma'lumotli, bilimdon, jismoniy va ma'naviy rivojlangan shaxsni tayyorlashga qaratilgan yagona jarayondir. Oliy o'quv yurtlarining ijtimoiylashuvi umumiy ta'lim maktabidagi shunga o'xshash jarayondan tubdan farq qiladi. . Ularning aksariyati moslashish davrida jiddiy qiyinchiliklarga duch kelishadi. Shuning uchun ularni qandaydir sport turiga yo'naltirish eng to'g'ri yechim hisoblanadi. Bunda gullar jamoaning bir qismini his qiladi, jamoaviy ruhni his qiladi, g'alaba qozonish va muvaffaqiyatsizliklarni engish uchun birgalikda ishlaydi. eshkak eshishga qiziqishni oshiradi.

Резюме: Ученые утверждают, что система высшего образования является основным институтом социализации, в котором воспитание и тренировка - единственный процесс, направленный на подготовку высокообразованного, знающего, физически и духовно развитого человека. Социализация учащихся высших учебных заведений принципиально отличается от аналогичного процесса в общеобразовательной школе. . Большинство из них сталкиваются с серьезными трудностями в период адаптации. Поэтому считается наиболее подходящим решением направить их в какой-нибудь вид спорта. Благодаря этому гребцы чувствуют себя частью команды, ощущают командный дух, работают сообща для победы и преодоления неудач. повышает интерес к гребле.

Kalit so'zlar: oliy ma'lumot, sport, ma'naviy rivojlangan, talabalar, sotsializatsiya, so'rovnom, akademik eshkak eshish.

Ключевые слова: высшее образование, спорт,духовно развитые, студенты, социализация, анкетирование, академическая гребля.

CRITERIA FOR THE DEVELOPMENT OF CREATIVITY IN STUDENTS

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Summary: *The article presents methods aimed at developing the creative abilities of students of higher education institutions.*

Key words: *creative, contemplative, motivational, cognitive, praxiological.*

The future English language will be based on raising the quality level of education to a new level on the basis of differential education in the world's leading educational and scientific research institutions, mathematical modeling of production processes, integration of mathematical natural-scientific, general professional and specialized sciences, as well as pedagogical and technical sciences. Scientific research works are being carried out on the improvement of the mechanisms of preparation of students for their activities by building the competencies such as personnel design, construction and research, creativity, individual educational trajectory, and the application of competency-based approaches in education. This requires the improvement of the structural, conceptual and methodical model of the formation of creative competences of future personnel, the wide application of modern information and communication technologies in the educational process, the creation of methodical works that can be individually adapted to each student, taking into account the individual characteristics of students.

Creativity (creativity) (lat. creation - creativity, creativity) - the ability to create something new, unique, create an artistic form, a mental process that leads to thinking, ideas and solutions; creative ability, which describes a person's readiness to create and accept new ideas [1].

The term "creative competence" was first used by the American scientist Joseph Chilton Pearsom, and it means the creative development of the surrounding world. R. Epstein interpreted the concept of "Creative competence" as a willingness to flexibly apply the knowledge obtained as a desire to independently complete the knowledge system and improve oneself [2].

A.R.Arirdzhanova, V.R.Adizov, Sh.T.Voltaeva, O.Jamoliddinova, V.Karimova, E.Goziyev, V.R.Kodirov on the development of creativity and creativity in students of higher educational institutions [3].

Creative activity requires consumption of new things, finding solutions to conflicting problems, eliminating conflicting situations, abandoning existing patterns of behavior, thinking and perception, being ready to change and improve oneself. Creative activism means bringing something into the world. Its main criterion is the uniqueness of individual creations. It shows the student's originality and creative abilities [4].

The educational content of students should include a system of educational situations, problems and tasks that gradually approach the professional level by involving them in professional activities corresponding to their future professional direction, that is, students should acquire knowledge in context. A contextual approach, in which students are also exposed to various pedagogical tasks, helps to transition to professional activities.

In the process of our research, we also determined the criteria aimed at developing the creativity of students. (Figure 2)

Criteria	Indicators
Motivation [5]	Intrinsic motivation is a set of goals offered by an interest in creative tasks, self-actualization needs, motivation to study in higher education, awareness of positive competition, and inner self-determination.

	Extrinsic motivation is more related to the attainment of intrinsic rewards or the avoidance of punishment.
Cognitive [6]	memory, attention, perception and performance skills, knowledge of pedagogy and psychology, performance of test tasks, meaningfulness of acquired knowledge
Praxeological [7]	the ability to produce unusual responses, verbal (speech) and non-verbal (artistic) creativity, creating distant associations in professional activities.

Several studies have been conducted on motivational skills, cognitive skills and praxeological skills in the development of students' creative abilities. For example, there are two functional relationships in human behavior: motivation and regulation.

Mental processes, phenomena and intuition, perception, memory, imagination, attention, thinking, abilities, temperament, character, emotions - all these mainly provide regulation of behavior. As for its stimulation or motivation, it is related to the concepts of motivation and motivation. These concepts include a person's needs, interests, goals, intentions, aspirations, motivations, external factors that cause him to behave in a certain way, and ideas about managing any activity during its implementation.

M.Jorayeva [8], from the point of view of cognitive development in the development of creativity in students, students learn when there is a conflict between what they think and the new information they receive. This often leads the student to adapt or change their cognitive schema based on new information.

A cognitive schema is a cognitive structure that organizes information and represents experience. Students develop schemes in various areas: motor, language, thinking, social, etc. Students interpret the world and experiences in terms of cognitive schemas developed from previous experiences.

Part of the idea that all actions performed by students have a purpose and are carried out to achieve it is praxeological skill [9], which is a methodological approach that studies the logic within human action, that is, unlike natural science, praxeology is not based on observation, but on logical inference based on.

The development of creativity competence in students allows to increase creativity, to form the need for self-development and to increase the motivation of activity. A creative learning environment leads to the development of critical and creative thinking skills in students, which are of great importance in the educational process.

We have come to the following conclusions regarding the improvement of the methodology of developing students' creativity competence:

1. Regularly improving educational programs for the development of creative competence in preparing students for innovative professional activities at the level of modern requirements;

2. due to the insufficient amount of time allocated for their study in higher education institutions, to increase attention to the implementation of educational subjects based on a mutually integrative approach in order to provide them;

3. Effective use of textbooks, training manuals, electronic training manuals, electronic multimedia tools, educational-methodological complex designed to develop students' creativity competencies during the educational process;

4. We believe that it is appropriate to widely introduce independent education into practice and create mechanisms for effective use of its opportunities in the development of students' creativity competencies.

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Rezyume: *Maqolada oliy ta'lim muassasi talabalarining kreativ qobiliyatlarini rivojlantirishga qaratilgan metodikalar mavjud.*

Резюме: *В статье представлены методики, направленные на развитие творческих способностей студентов высшего учебного заведения.*

Kalit so'zlar: *kreativlik, tafakkur, motivatsiyon, kognitiv, prakseologik.*

Ключевые слова: *творческий, созерцательный, мотивационный, познавательный, праксиологический.*

**MONITORING OF BIOGENIC ELEMENTS OF WATER BODIES IN
CURRENT CONDITIONS**

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Summary: *The article presents the results of the analysis of the distribution of biogenic elements in the aquatic ecosystems of the Aral Sea region by the method of principal components. The analysis performed shows that, in general, the studied system of characteristics of the state and distribution of biogenic elements in the studied water body does not differ in the stability of correlations; in certain periods of observation, correlations between the studied indicators weaken or even are absent.*

Key words: *Aral Sea Area, monitoring, biogenous elements, water ecosystems, eutrophication.*

In the world's leading scientific centers, large-scale research is being carried out on the development of methods for predicting changes in the state of water ecosystems under the influence of human economic activities, with the integrated use of water management and water management.

Degradation processes in the hydrosphere lead to a decrease in the recreational potential of water resources and water bodies. Solving priority tasks in the field of protection of water resources and their rational use is gaining urgent importance. In this regard, conducting research on the development of new innovative methods of monitoring and bioindication of water ecosystems is becoming an important priority.

A large number of studies conducted by biologists, microbiologists, and hydrochemical scientists made it possible to establish that the main source of biogenic elements entering water bodies is the collector-drainage flow from irrigated agricultural fields. It is known that the main factor of active pollution of the natural environment of the Republic of Karakalpakstan is the intensification of agriculture, its main directions are chemicalization of plant science and chemicalization of land reclamation.

The transition of agriculture of the Republic of Karakalpakstan to an industrial basis is connected with the maximum use of mineral fertilizers and chemical means of plant protection. Only in 1997. the amount of mineral fertilizers used is 124,5 thousand tons. seven, of which 66,3 thousand t. - nitrogen; 38,2 thousand tons. - phosphorus; 20,0 thousand t. - the main part of potassium and mineral fertilizers is given to cotton (80,8 thousand tons) and rice (43,0 thousand tons).

Intensive chemicalization of agriculture has a negative impact on the quality of the republic's water resources.

As we have mentioned, the main source of sediments entering the surface water is the collector-drainage flow from the irrigated areas. For example, in the studies carried out in our research, the concentration of fertilizers in collector-drainage water due to leaching reaches 10mg/l and more, which exceeds the background values by tens and even hundreds of times.

In this work, ecological monitoring is understood as an informational system for monitoring the quality of surface water, which was evaluated in terms of its impact on the condition of hydrobionts and human health.

Based on the obtained materials, an evaluation of water quality changes related to anthropogenic influence was carried out and, if necessary, a forecast was given to it. In 1974, the foundation of the global system of environmental monitoring was established, the world community participated in the development of this system and continues to participate.

Organic matter present in a water body can be a part of living organisms or can be a product of their decomposition.

The organic substances that flow into the water bodies are mainly composed of humic compounds that are washed out of the soil. Humic substances living organisms perform an accumulative function, which consists in collecting the most important elements of living organisms.

The source of the formation of organic matter in the water body is the photosynthetic activity of green plant organisms, including phytoplankton. In this process, which produces organic matter from mineral matter, as it is known, carbon dioxide is digested and carbon is released.

Substances that have entered the water body, as well as those that have appeared in them, undergo further decomposition under the influence of bacteria, which mainly convert complex organic substances into simple, inorganic substances. In this case, the released energy serves as a source of their life, and the biogenic elements released during the decomposition of organic matter are repeatedly added to the general circulation of nutrients.

The amount of organic matter in lakes naturally undergoes significant seasonal changes. Their largest amount is observed during the death of plankton after the bloom.

Particles dissolved in natural water: microcolloid (particle diameter 0,003–0,01 μm); colloidal (diameter 0,01–1 μm) and sedimentary (sedentary) particles with a size of 1–3 μm , as well as gas microbubbles, is considered an inhomogeneous medium. Sedimentary particles, as a rule, consist of an organo-mineral complex. In most cases, SiO_2 and CaCO_3 particles are involved in the formation of mixed dissolved substances in natural waters.

In addition to solid particles and gas microbubbles, the water layer contains many microorganisms, which form a separate phase of biota and are equal in weight to the abiotic environment.

In the state programs, 7 priority aspects of pollution of global, continental and subcontinental importance were distinguished, among which there is the following aspect:

- eutrophication of storm waters as a result of local and global precipitation of biogenic substances and organic matter.

In this work, nitrogen in the form of ammonium ion - , nitrate - ions - and nitrite - ions -; - type of phosphorus has been studied.

also, indicators describing the composition of organic substances in water were determined: biochemical consumption of oxygen (KsBI), oxidation of permanganate (PO), composition of dissolved oxygen - O_2 and relationship of yield (A) to destruction (D) - A/D in 5 days.

When carrying out hydroecological monitoring in this area, it is necessary to include in the research program the determination of mineralization and major ions, as well as the determination of the composition of biogenic elements in the erudite waters. This makes it possible to analyze production-destructive processes in the considered objects.

Current monitoring of surface waters of the Amudarya basin is carried out under specific conditions, which include:

- the territory is turning into a desert, which is reflected in the change of the geographical network and existing water bodies, as well as in the general silting up of the Amudarya and irrigation canals;

Compared to the upstream of the Amudarya, a significant increase in the mineralization of river water is observed, which leads to the arrival of a large amount of easily soluble salts in the irrigated areas and the salinization of the irrigated lands;

- the increase in mineralization of river water, as well as the deterioration of its chemical composition, significantly affects the quality of water, and the health of the people who consume it deteriorates.

In recent years, due to a sharp increase in nitrogen and phosphorus input to water bodies, as well as as a result of the management of river flow, a specific violation of the hydrochemical regime of water bodies has occurred. The formation of organic substances has increased during the intensive development of phytoplankton, and as a result, the trophicity of water bodies has increased. Therefore,

the results of the regime of biogenic elements in the studied lakes, their changes depending on the depth of water bodies were summarized, the composition of these substances in the sediments of the water bottom was described, the regime of dissolved oxygen was shown, and the values of various ecological indices of water quality were calculated.

In the studied water bodies (Mejdureche, Davutkol, Jyltyrbas lakes) in 2018-2020. information about the seasonal and multi-year dynamics of the composition of biogens is presented in the table below.

Seasonal biolimnological indicators of the studied water bodies

Seasons of the year	Total mineralization g/l.	The average temperature is S ⁰	pH	O ₂ mg/l.	Biogenic elements, mg/l			
					PO ₄	NH ₄	NO ₃	NO ₂
Davutkol								
Spring	1,2-3,1	16	7,3	11,8	0,036	0,082	0,66	0,039
Summer		34	7,7	8,3	0,11	0,071	1,24	0,01
Autumn		16	8,1	12,4	0,22	0,194	2,26	0,05
Winter		3	7,6	6,6	0,072	0,027	1,11	0,037
Lake Jyltyrbas								
Spring	1,8-4,5	12	6,4	11,7	0,119	0,277	0,59	0,030
Summer		33	7,2	7,9	0,115	0,064	0,83	0,018
Autumn		18	7,8	8,7	0,256	0,615	2,62	0,089
Winter		2	6,8	8,3	0,217	0,149	1,80	0,049
Lake Mejdureche								
Spring	1,2-2,1	14	6,9	9,6	0,062	0,041	0,74	0,020
Summer		37	7,1	7,2	0,022	0,032	0,32	0,015
Autumn		20	7,2	9,4	0,088	0,378	1,25	0,048
Winter		4	7,4	8,1	0,065	0,022	1,08	0,041

When we look at biogenic elements in limnic ecosystems and their influence on the internal processes of water bodies in the seasonal aspect, the largest accumulation of biogenic elements for Davutkol, which is fed mainly by collector-drainage water, is observed in autumn. For example, the content of phosphorus (RO₄) was 0,22 mg/l, NH₄ – 1,194 and NO₃ – 2,26 mg/l.

The composition of some forms of nitrogen in water bodies varies greatly depending on the season and depends on the development of plankton and the intensity of biochemical processes that control the dissolution of nitrogen in the water bodies themselves. It was also found that the composition of biogenic elements also depends on the source that supplies the water bodies: the composition of biogenic elements is lower in the lakes that receive the water of the river than in the lakes that receive the collector-drainage water.

Changes in the composition of biogenic elements according to the depth of water bodies were studied mainly in Mejdureche, Davutkol, Jyltyrbas lakes. Water samples at different depths 0-30; 50-70; 80-110; 140-160 (in cm) and was taken from the bottom of the water. It was found that with the

increase in water depth, the content of phosphorus and ammonium nitrogen increases, nitrate nitrogen is more in the water horizon (0-70 cm) than in the lower horizon.

It was found that the content of biogenic elements in the bottom sediments of the lakes fed by collector-drainage waters is higher than that of the lakes fed by river water. For example, its content reaches 24,2 mg/kg in Davutkol, 16,7 mg/kg in Lake Mejdureche. The mode of dissolved oxygen - O_2 mg O_2 /l was studied in all water bodies under consideration. The optimal content of oxygen (6,6-11,8 mg O_2 /l) is observed in all identified water bodies. Due to the movement of water masses under the influence of wind in spring and autumn, the content of dissolved oxygen reaches maximum values - up to 12 mg O_2 /l. In winter, the minimum content of oxygen is observed under the ice.

The value of primary production and destruction is highly dynamic, depends on internal processes of water bodies and many other factors. The correctness of this rule has been well demonstrated by us in the research conducted in water bodies of different trophic levels.

Comparative analysis of the level of eutrophication of water bodies

Names of water bodies	Years	Field (hectares)	Clarity (m)	O_2 mg/l	BOC ₅ mg O_2 /l	A	D	A:D	Three reservoirs in terms of trophic level
Mejdureche	1982*	150	0,7	6,8	2,2	1,7	2,5	0,86	oligotrophic
	1995**	230	0,7	8,7	4,2	1,2	1,2	1,0	mesotroph
	2020#	200	0,6	7,2	4,0	1,2	1,2	1,0	mesotroph
Davutkol	1982*	650	0,8	7,7	3,4	5,6	4,8	1,10	eutroph
	1995**	3500	0,6	7,6	4,7	4,2	3,2	1,31	eutroph
	2020#	760	0,5	6,8	3,0	5,2	4,5	1,0	eutroph
Jyltyrbas	1982*	2300	1,2	7,3	4,0	5,2	3,9	1,40	eutroph
	1995**	2400	0,8	7,4	3,1	1,3	1,4	0,92	mesotroph
	2020#	2100	0,9	6,8	3,4	1,3	1,5	0,9	eutroph

Note: *- Data from O.V.Babanazarov (1982), **- K.M. Data of Atanazarov (1995), # -our data

Studies show that the intensity of formation of organic matter in different types of water bodies is quite high and varies from 0,7 to 4,2 g s/m². The maximum values were recorded only in the lakes where collector-drainage waters are discharged (Dovutkol – 4,2 g s/m² and Lake Kuktosh 1,6 g s/m²). Although Mejdureche Lake and Muynoq, Sarybas Bay are supplied from the same source, the formation of organic matter is different and the clarity is not the same.

The destruction of organic matter takes place in different intensity (from 3,2 to 1,1 g s/m). But, in general, its value is much greater, especially considering that the destruction occurs throughout the entire depth of the lakes. The maximum loss of organic matter was recorded in the Dovutkul lake, where the waste water of irrigation networks falls (3,2 g s/m²).

The relationship of the primary crop to the destruction of organic matter is inextricably linked with the nutritional character of water bodies. Togyztore and Davutkol lakes have an excess of biogenic elements with collector-drainage waters, so they are well supplied with primary crop producers and the ratio A/D >1.

The study of various types of water reservoirs conducted during several years of the regime and its shortage showed that there are large fluctuations: daily and seasonal.

There is a very significant difference in the composition of oxygen in the trophic layer and water bottom layers. Due to the high content of biogenic elements in the water mass, it is possible to think about the strongly expressed anthropogenic influence on the water bodies. The accumulation of

biogenic elements brought to water ecosystems by agricultural runoff serves the accumulation of biogenic elements, which leads to the formation of a certain regime characteristic of eutrophic lakes.

The assessment of lake water quality according to the self-purification index makes it possible to state that, despite the significant biogenic load, active destructive processes are taking place in the water bodies. In most lakes, the values of $A/D > 1$, which are not too high, testify to the intensity of self-purification processes. However, polar variants of $A/D=1$ (Mejdureche Lake) have also been reported, where organic matter accumulates in a self-purifying system and water quality deteriorates, and $A/D > 1$ (Muynoq and Sarbas Bays).

It was found that changes in environmental conditions can affect the proportions of BE fractions in water bodies. External flows (inflow and outflow, exchange between water and ash bottom) are important in forming the annual balance of BE, and internal flows are important in forming the balance of phosphorus and nitrogen in living components of ecosystems. The distribution of biogenic elements in water bodies does not differ in the stability of correlation relations, where even stochastic relationships between variables are observed.

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Rezyume: Maqolada biogen elementlarining Orol dengizining suvi ekosistemalarida asosiy komponent metodi sifatida joylashgan analiz natijalari keltirilgan. Utkarilgan analiz natijasi kursatgichi buyicha umumiy urganilaetgan xarakteristik vaziyat sistemasi va biogen elementlarining joylashishi urganilaetgan suv ob'ekti korreliyatsion aloqalar barqarorligi bilan ajralmaydi, ayrim muddat kuzatuvlarida korreliyatsion aloqalar urganilaetgan kursatgichlar orasida kuchsizlanadi eki utuman yo 'q bo 'lib ketadi.

Резюме: В статье приведены результаты анализа распределения биогенных элементов в водных экосистемах Приаралья методом главных компонент. Проведенный анализ показывает, что в целом изучаемая система характеристик состояния и распределения биогенных элементов в исследуемом водном объекте не отличается стабильностью корреляционных связей, в отдельные сроки наблюдений корреляционные связи между изучаемыми показателями ослабевают или даже отсутствуют.

Kalit so'zlar: Orolbuyi, kuzatish, biogen elementlar, suv ekosistemasi, evtrofikatsiya jarayoni.

Ключевые слова: Приаралье, мониторинг, биогенные элементы, водные экосистемы, эвтрофикация.

**PAREMIA AS AN OBJECT OF COMPARATIVE LINGUOCULTUROLOGY
(BASED ON THE MATERIAL OF THE RUSSIAN AND KARAKALPAK LANGUAGES)**

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Summary: *The article considers the problem of the formation of a new linguistic direction of comparative linguoculturology and its object – paremiology. The necessity of comparative study of the concepts of the Russian and Karakalpak languages from the linguoculturological aspect is noted. It is also pointed out that due to the cultural significance the paremia is considered the main subject of the research. By comparing the concept «Родина» – 'Motherland' in the Russian and Karakalpak languages, the cultural significance of the paremias is confirmed.*

Keywords: *comparative linguoculturology, paremia, concept, culture-bearing, Russian and Karakalpak languages.*

The end of the 20th and the beginning of the 21st century in the development of linguistic sciences was marked by a new period – an anthropocentric approach to the study of languages. At the center of the new paradigm is the man with all his manifestations. Linguoculturology as one of the aspects of the anthropocentric paradigm considers the manifestation of linguistic units through the prism of culture and 'the main object of linguoculturology is the relationship and interaction of culture and language in the process of its functioning and the study of the interpretation of this interaction as a whole system of integrity' [4:32].

On the basis of linguoculturology as a discipline at the intersection of linguistics and culture, a new direction was formed; it is comparative linguoculturology, which appeared as a continuation of comparative linguistics from another aspect. The foundation of comparative linguistics in Uzbekistan is associated with the name of E.D. Polivanov, who applied the comparative method to teach Russian to native Uzbek speakers [9:182].

Comparative study of the Russian and Karakalpak languages is reflected in the works of N.A. Urumbaev, A. Dzhaksybaev, A. Umarov, and A. Bekbergenov. But all these works were carried out within the framework of the system-structural paradigm, which studies language as an integral system consisting of interrelated elements, including phonemes, words, parts of speech, phrases, sentences, and etc. But the appeals to the facts of culture, the peculiarities of thinking, the perception of objective reality have become the object of comparative linguoculturology.

'The growth of interest in comparative research has recently been associated with the following reasons:

- the need to identify universal features of linguistic material;
- the desire to describe the national picture of the world of speakers of different languages;
- the need to improve bilingual dictionaries, which indicate the national-specific features of the semantics of translated correspondences; the interest in the study of national specifics of semantics and the study of national specifics of linguistic thinking;
- the expansion of areas of teaching foreign languages' [11:4].

One of the manifestations of the national-specific features of the language are paremias, since it is in them that the vision, the life experience of the people, their attitude to reality, formed over a long time, is imprinted. According to V.I. Dahl, a proverb is a 'short parable', a judgment, a verdict, an edification, expressed obliquely and put into circulation, under the stamp of nationality', and a proverb is 'a roundabout expression, figurative speech, a simple allegory, obliquely, a way of expression, but without a parable, without judgment, conclusion... this is one first half of the proverb' [5:13-14].

In linguistic dictionaries, paremiology is considered as a philological direction: 'Paremiology [Greek: proverb +...logia] is a field of philology that studies proverbs, sayings, utterances, dictums, and etc.' [6:192].

Paremiology, being a component part of the linguistic worldview of a certain nation, an ethnos, contributes to the preservation of cultural values, the definition of the worldview of a particular ethnos, since it is closely related to its national consciousness, which researchers in this field point out '... the paremiological fund of the Russian language is an area of reflection, retention and transmission of cultural properties of the nation' [2: 245].

O.V. Lomakina pointed out that paremiology of linguistics is rich in cultural potential 'The Paremiological Fund of a language acts as a repository of information about traditions, customs, lifestyle, value system characteristic of a certain ethnic group. The combination of such information in the paremias allows us to speak about the presence of linguistic and cultural potential in their content plan' [7:6-16].

Sh. Abdinazimov points out that paremiological units, along with the symbol, mythologeme, standard, metaphor, lacunae, stereotypes, precedent units, etiquette words, are the main linguistic and cultural unit [1:40].

'The stereotype of traditions turns into proverbs and sayings, into stable phrases'[1: 49].

Taking into account the above points of view of scientists on the cultural value of paremias, the question arises:

Can all paremias be the subject of linguoculturology research?

The answer to this question is found in V.A. Maslova, who notes that 'not all proverbs, however, are the subject of research in linguoculturology. Only those proverbs and sayings whose origin and functioning are inextricably linked with the history of a particular nation or ethnic group, its culture, way of life, morality, and etc. should be studied here' [8:46].

In our opinion, the level of culture-bearing of the paremia depends on which concept is implemented in them. The fact is that in the representation of universal concepts such as homeland, father, mother, child, etc., one can observe more universality than differences. Our research in the field of comparing the representation of the concept of 'Homeland' in the paroemias of the Russian and Karakalpak languages allows us to identify the following universal characteristics:

- **the Native Land is the most precious for a person, therefore in Russian paremias it is identified with the Mother:**

Родина – мать, умей за неё постоять

Your Homeland is your Mother; know how to protect it

Родная сторона – мать, чужая – мачеха

'The Native Land is the Mother; the Strange Land is the Stepmother

- **in Karakalpak paremias, therefore it is valued more than the gold:**

Ўатан кўннен сулуў, алтыннан қымбат

The Motherland is more beautiful than the Sun, more expensive than the Gold

- **to be in unity with your people, with your land:**

Не ищи обетованные края - они там, где родина твоя

Do not look for the Promised Lands – they are where your Homeland is

Бақа – көлинде, ҳәр ким туўған елинде,

The frog is the mistress in his swamp, each master on his own land

Жақсы перзент елине бас болады, жаман перзент елине қас болады;

A good son will be the head of the Motherland; a bad son will be the enemy of the Homeland

- **service to the Motherland:**

Жить – Родине служить,

To live is to serve the Motherland

Киси елинде патша болганиша, өз елиңде шопан бол;

Be a shepherd in your own country, rather than a King in an alien country

• **safeguarding and ensuring the security of the Motherland:**

Береги землю родимую, как мать любимую,

Take care of your Native land like your dear and cherished Mother

Кто за Родину дерётся, тому сила двойная даётся

He who struggles for his Motherland he is given double strength

Ер жигит ел ушын туўылады, ел ушын өледи

A real good fellow is born for the country, dies for the country

Ер жигит ел шетинде, елге шапқан жаў бетинде

A good fellow at the outpost is protection from enemies

Despite the expression of common semantics in the paremias of the compared languages, the ways of representing the concept of 'Родина' – 'Motherland' may be different; these are both metaphors and lexemes expressing this concept. For example, in the Karakalpak language, the concept of 'Родина' – 'Motherland' can be expressed by the lexeme 'ел', which is perceived by native speakers both as a 'country' and as a 'people' or 'nation'

'Родина' – 'Motherland' → 'ел' – 'country', 'people', 'nation'

This feature was considered in our previous article '[Country/el] as a component of a concept [Motherland/Watan] in Russian and Karakalpak paremiology' as a component of the concept 'Родина'/ 'Ўатан' – 'Motherland'

in Russian and Karakalpak paremiology' [12:1701-1705].

The originality of the representations is often manifested precisely in metaphors and comparisons. So in Russian paremias, the 'Родина' – 'Motherland' is assimilated to the word 'mother', and this comparison is based on functional similarity of lexeme 'Родина' – the 'Motherland', just like a 'mother', who gives life to her child, and the morphemic structure of the word 'Родина' – 'Motherland', which is of the same root as the word 'give birth', is also important.

Родина → **родить**

Motherland → give birth

Unlike the Russian language, in the Karakalpak paremias, the metaphorization of the word 'ана', i.e. 'mother'

in relation to the word 'Motherland', is not observed, despite the fact that in the Karakalpak language there are combinations

'Ана Ўатан' – 'Родина-мать' – 'Motherland'

'Ата журт' – 'Отчизна' – 'Fatherland'

In our opinion, the combination of words 'Ана Ўатан' – 'Ana Watan' – 'Motherland' is the result of calculus from the Russian language and requires more careful research.

Thus, paremias provide rich material for comparative linguoculturology, since they accumulate the mental and cultural values of a certain nation. The study of the Russian language in comparison with the Karakalpak language from the linguistic and cultural aspect point of view requires a more systematic and precise study.

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Rezyume: Maqolada qiyosiy lingvokulturologiyaning yangi lingvistik yo'nalishi va uning ob'ekti - paremiologiyaning shakllanishi masalasi ko'rib chiqiladi. Rus va qoraqalpoq tillari konseptlarini lingvokulturologiya nuqtai nazaridan qiyosiy o'rganish zarurligi qayd etilib, maqollar o'zlarining madaniy qimmatiga ko'ra asosiy tadqiqot predmeti ekanligi ham ta'kidlanadi. "Vatan" konseptining rus va qoraqalpoq tillarida ifodalanishini qiyoslash asosida maqollarning madaniy mazmuni tasdiqlanadi.

Резюме. В статье рассматривается вопрос о становлении нового лингвистического направления сопоставительной лингвокультурологии и его объекте – паремии. Отмечается необходимость сопоставительного изучения концептов русского и каракалпакского языков с лингвокультурологического аспекта, также утверждается, что в силу культураносности паремии являются основным предметом исследования. На базе сопоставления репрезентации концепта «Родина» в русском и каракалпакском языках подтверждается культураносность паремий.

Kalit so'zlar so'zlar: qiyosiy lingvokulturologiya, paremiyalar, konsept, madaniy yo'nalish, rus va qoraqalpoq tillari.

Ключевые слова: сопоставительная лингвокультурология, паремии, концепт, культураносность, русский и каракалпакские языки.