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DIGITAL TRANSFORMATION IN BIOPHYSICS EDUCATION: GAMIFICATION-BASED ASSESSMENT USING KAHOOT! AND WAYGROUND

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Abstract

This study examines the use of gamification-based digital assessment in undergraduate biophysics education, with particular attention to Kahoot! and Wayground (formerly Quizizz). The study was conducted among 60 first-year medical students studying biophysics at Tashkent State Medical University. A four-week pedagogical intervention compared a control group receiving traditional instruction and assessment (n = 30) with an experimental group using gamified assessment through Kahoot! and Wayground (n = 30). The procedure included a pre-test, instructional intervention, post-test, and student questionnaire. Descriptive results showed an increase in the mean score from 56 to 68 in the control group (+12 points), whereas the experimental group increased from 55 to 82 (+27 points). Student perceptions were also favorable: 90% considered the gamified lessons interesting, 85% reported that the platforms helped them understand the material, 88% reported increased activity, and 92% wanted the approach to be used in the future. In the bioacoustics unit, 87% of students reported easier understanding of the topic and 89% indicated that interactive tests helped reinforce their knowledge. The findings suggest that gamified assessment can support active participation and formative assessment in biophysics, particularly when questions connect physical concepts with clinical contexts such as ultrasound and the Doppler effect. Because the source study did not report standard deviations, confidence intervals, effect sizes, or inferential tests, the findings are interpreted as descriptive evidence rather than statistical proof of effectiveness.

Keywords: biophysics education; gamification; formative assessment; Kahoot!; Wayground; Quizizz; bioacoustics; medical education

Introduction

Biophysics occupies an important position in medical education because it provides the physical basis for understanding processes and technologies encountered in clinical practice. Topics such as bioelectric potentials, circulation, sound, ultrasound, and the Doppler effect require students to connect abstract physical principles with biological and clinical phenomena. This combination can make assessment demanding,

particularly when conventional tests emphasize recall rather than rapid application of concepts.

Digital transformation in higher education has expanded the range of assessment formats available to teachers. Among these approaches, gamification introduces selected game elements—such as points, immediate feedback, competition, rankings, and short challenges—into non-game learning activities. Kapp (2012) describes gamification as an approach that uses game-based methods and strategies to support learning, retention, and application. In formative assessment, these elements can make feedback more immediate and can create repeated opportunities for students to check their understanding.

Interactive platforms such as Kahoot! and Quizizz, now known as Wayground, are particularly suitable for short formative assessments. Kahoot! is commonly used for live, teacher-led quizzes in which students respond in real time. Wayground provides live activities as well as assigned practice and assessment tasks, allowing greater flexibility for individual work. Current platform documentation confirms that Wayground is the new name of the platform formerly known as Quizizz (Wayground, 2025).

Previous educational research has reported positive learner engagement with Kahoot!. Mdlalose, Ramaila, and Ramnarain (2022) found that Kahoot! could support academic performance, motivation, and active engagement in science teacher education. Similarly, Mat Husin and Azmuddin (2022) reported that university learners perceived Kahoot! as enjoyable and useful for reinforcing learning. These findings provide a relevant background for examining gamified assessment in biophysics, where rapid feedback may be particularly useful for checking conceptual understanding.

The present study therefore aimed to improve the assessment of biophysics knowledge through gamification, focusing on Kahoot! and Wayground and applying them to the bioacoustics unit. The specific objectives were to (a) compare changes in student performance under traditional and gamified assessment conditions, (b) examine students' perceptions of gamified assessment, and (c) identify practical ways to use interactive questions to connect biophysical concepts with clinical applications.

Methods

The study used a comparative pedagogical design with descriptive pre-test and post-test measurements. The participants were 60 first-year students studying biophysics in the medical education program at Tashkent State Medical University. They were divided into a control group (n = 30) and an experimental group (n = 30).

The control group received conventional instruction and assessment, while the experimental group participated in gamified assessment using Kahoot! and Wayground. The intervention lasted four weeks.

The intervention incorporated short digital quizzes into biophysics lessons. Questions addressed diffusion and osmosis, bioelectric potentials, circulation biophysics, and, most extensively, bioacoustics. In bioacoustics, the activities focused on sound parameters, hearing physiology, ultrasound imaging, and the Doppler effect. Kahoot! was used primarily for live classroom competition and immediate feedback. Wayground was used for both live activities and more individualized practice or homework. The question design combined factual items with short clinical-context problems so that students were required to identify or apply a physical principle.

The procedure consisted of four stages: an initial diagnostic test (pre-test), the instructional period, a final test (post-test), and a questionnaire on student perceptions. Academic performance was summarized using mean test scores before and after the intervention. The questionnaire examined whether students found gamified lessons interesting, whether the platforms supported understanding, whether they increased activity, whether students wanted the approach to continue, and which platform they preferred.

Because the source study reports group mean scores and percentages but does not provide standard deviations, sample-level distributions, confidence intervals, or inferential statistical tests, the present article uses descriptive comparison only. Changes in mean scores were calculated as post-test minus pre-test. Questionnaire responses were summarized as percentages. No p-values or effect sizes were calculated or inferred from the available information.

Results

The academic performance results showed improvement in both groups, with a larger absolute increase in the experimental group. The control group increased from a mean pre-test score of 56 to a post-test score of 68, representing a 12-point gain. The experimental group increased from 55 to 82, representing a 27-point gain.

Table 1

Pre-test and post-test mean scores

Group	Pre-test	Post-test	Gain
Control group (n = 30)	56	68	+12
Experimental group (n = 30)	55	82	+27

The questionnaire results were also favorable. Ninety percent of students considered the gamified lessons interesting, 85% reported that Kahoot! and Wayground helped them understand the material, 88% reported increased activity, and 92% wanted the approach to be used in future lessons. Platform preference was relatively balanced, with 45% preferring Kahoot! and 55% preferring Wayground.

Table 2

Student perceptions of gamified assessment

Question / indicator	Yes (%)	No (%)
Gamified lessons were interesting	90	10
Platforms supported understanding	85	15
Activities increased engagement	88	12
Students wanted future use	92	8

In the bioacoustics component, 87% of students reported that the topic became easier to understand, while 89% reported that the interactive tests reinforced their knowledge. The activities included questions on sound-wave parameters, hearing physiology, ultrasound diagnostics, and the Doppler effect. Thus, the digital assessment was not limited to factual recall; it also provided a structure for linking physical concepts to clinical examples.

Discussion

The descriptive results indicate a stronger increase in mean test performance in the gamified group than in the control group. The difference in gain was 15 points (+27 versus +12). This pattern is consistent with the intended function of formative gamification: students receive immediate feedback, encounter questions repeatedly, and are encouraged to remain active during the assessment process. However, the available data do not permit a formal statistical conclusion about the size or significance of the intervention effect.

The student questionnaire provides complementary evidence. High proportions of students reported that the activities were interesting, supported understanding, and increased activity. These findings are broadly consistent with previous research on Kahoot! in higher education. Mdlalose et al. (2022) reported positive effects of Kahoot! on engagement and motivation in science teacher education, while Mat Husin and Azmuddin (2022) found that university learners considered Kahoot! enjoyable and useful for reinforcing academic learning. The present study extends this line of work to biophysics within medical education and, specifically, to bioacoustics.

The pedagogical value of the approach may be particularly relevant to bioacoustics because many concepts become more accessible when represented

through short, focused questions. For example, asking students to distinguish frequency from amplitude can reinforce the physical meaning of sound parameters, while questions about ultrasound or Doppler flow measurement can connect the same principles with clinical practice. Such tasks are compatible with the interdisciplinary character of medical biophysics and can be integrated into formative assessment without replacing conventional teaching.

The two platforms also serve somewhat different instructional purposes. Kahoot! is well suited to synchronous classroom competition, where all students respond at approximately the same time and the teacher can immediately discuss misconceptions. Wayground offers greater flexibility for independent practice and assigned work. The current platform documentation identifies Wayground as the renamed Quizizz platform and describes support for live sessions, assigned activities, differentiated instruction, and performance reporting (Wayground, 2025). The choice between the platforms can therefore be aligned with the pedagogical objective rather than treated as a question of one platform universally replacing the other.

Several limitations should be noted. The study involved 60 students from one medical university and covered a four-week period. The source document does not report randomization, standard deviations, reliability coefficients for the tests, confidence intervals, effect sizes, or inferential statistical tests. The questionnaire results are self-reported and may therefore reflect students' perceptions rather than independently measured learning outcomes. Future research should use larger and more diverse samples, standardized assessment instruments, longer follow-up periods, and appropriate inferential statistics.

Conclusion

The study indicates that gamification-based assessment using Kahoot! and Wayground can be incorporated into biophysics education as a practical formative assessment strategy. In the four-week comparison, the experimental group showed a larger descriptive increase in mean test scores than the control group, and most students reported positive perceptions of the approach. The bioacoustics activities demonstrated how short interactive questions can connect physical principles with clinical contexts such as ultrasound and the Doppler effect.

The findings support the use of gamified assessment as a complement to, rather than a replacement for, established teaching and assessment methods. For medical biophysics, the most useful implementation appears to be a structured combination of conceptual questions, immediate feedback, clinical scenarios, and opportunities for both live and individual practice. Further controlled research with complete statistical

reporting is needed to determine the magnitude and generalizability of the observed learning gains.

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SURXONDARYO SHAROITIDA YETISHTIRILGAN LOCAL KANOP (CANNABIS SATIVA L.) POYASIDAN TEXNIK TOLA OLISH TEXNOLOGIYASINI ISHLAB CHIQISHNING ILMIY-AMALIY ASOSLARI

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Annotatsiya Ushbu maqola-tezisda Surxondaryo viloyatining tuproq-iqlim sharoitida yetishtirilayotgan mahalliy kanop (Cannabis sativa L.) poyasining agrobiologik xususiyatlari hamda undan texnik tola ajratib olish texnologiyasini ishlab chiqishning ilmiy va amaliy asoslari atroflicha tahlil qilingan. Tadqiqotda Surxondaryoda olib borilgan amaliy tajriba kuzatuvlari (2025-yil holatiga) hamda xalqaro ilmiy manbalar (Turkiya, Rossiya, AQSh) kompleks qiyoslanib, poya va lub resursi, tola chiqimi hamda tola sifatiga agrotexnik va mexanik omillarning ta’siri yoritilgan.

Kalit so‘zlar: sanoat kanopi, Cannabis sativa L., Surxondaryo iqlimi, texnik tola, lub qatlam, poya anatomiyasi, dekortikatsiya, tola chiqimi, fizik-mexanik xossalar, resurs tejamkor texnologiya.

KIRISH VA PROBLEMAMING DOLZARBLIGI

Dunyo miqyosida qayta tiklanuvchi va ekologik xavfsiz o‘simlik xomashyolaridan sanoat miqyosida foydalanishga talab ortib bormoqda. Sanoat kanopi (Cannabis sativa L.) o‘zining ko‘p funksionalligi, yuqori biomassa toplash qobiliyati va mustahkam tola tuzilishi bilan to‘qimachilik, biokompozitlar, avtomobilsozlik, qurilish va qog‘oz sanoatida strategik resurs hisoblanadi.

Sanoat kanopi poyasining eng qimmatli qismi uning lub qatlami bo‘lib, undan olinadigan tolalar yuqori pishiqligi, elastikligi va gigroskopikligi bilan ajralib turadi. Kanop tolasidan kiyim-kechakdan tashqari elektrokabel, gilam, brezent, arqon, o‘t o‘chirish vositalari uchun maxsus matolar hamda mebel sanoati uchun pishiq materiallar tayyorlanadi.

O‘zbekiston Respublikasining Janubiy mintaqasi — Surxondaryo viloyatining tuproq-iqlim sharoitida kanop yetishtirish va undan texnik tola ajratib olish texnologiyasini yaratish mahalliy xomashyo bazasini kengaytirishda alohida ahamiyatga ega. Biroq texnik tola olish uchun faqat umumiy biomassa hosildorligi yetarli emas. Poyaning anatomik tuzilishi, lub va yog‘ochlik nisbati, pishish darajasi hamda mexanik ajratish (dekortikatsiya) rejimlari tayyor tola sifatini belgilab beradi.

Ushbu masalalarni ilmiy va amaliy jihatdan kompleks o‘rganish tadqiqotning dolzarbligini belgilaydi.

TADQIQOT OBYEKTI VA METODOLOGIYASI

Tadqiqot obyekti: Surxondaryo viloyatining sahro qum tuproqli sharoitida yetishtirilgan "Kanop-239" varianti poyalari, ularning anatomik-morfologik bo‘limlari va ajratib olingan texnik tolalar.

Tadqiqot usullari: Agrobiologik va fenologik kuzatuvlar: Ekish muddati, maysalash, shonalash, texnik va to‘liq pishish fazalarida biometrik ko‘rsatkichlarni aniqlash. Fizik-mexanik va texnologik sinovlar: Poya diametri, texnik uzunlik, poya va lubdan tola chiqimi, uzilishdagi pishiqlik, tozalik hamda namlik darajasini baholash. Xalqaro amaliyotda qo‘llaniladigan FTIR (Infraqizil spektroskopiya), SEM (Skanerlovchi elektron mikroskopiya), dispersion va regressiya tahlillaridan foydalangan holda jarayonlarni ko‘p mezonli optimallashtirish.

NATIJALAR VA ULARNING MUHOKAMASI

Surxondaryo sharoitida agrotexnik ko‘rsatkichlar va biomassa shakllanishi olib borilgan kuzatuvlar ko‘rsatdiki, Surxondaryoning oziq moddalar bilan kam ta’minlangan sahro qum tuproqlari sharoitida kanop yetishtirish o‘ziga xos agrotexnik yondashuvni talab etadi. Vegetatsiya davrida tuproqdagi o‘rtacha namlik 70% darajasida saqlanib, 5 marta qator oralariga ishlov berilgan, chopiq qilingan va 6 marta sug‘orish amalga oshirilgan. “Kanop-239” varianti bo‘yicha olingan biometrik ko‘rsatkichlar:

“Kanop-239” varianti bo‘yicha olingan biometrik ko‘rsatkichlar:

- **O‘simlikning o‘rtacha bo‘yi:** 202,2 см
- **Barglar soni:** 443,3 dona
- **Yon shoxlar soni:** 53,3 dona
- **Shona va dukkak ko‘rsatkichlari:** 61,3 dona

Anatomik va texnologik tahlillar shuni ko‘rsatadiki, kanop poyasidagi lub tolalarining ulushi umumiy poya massasining qariyb 30%ini, sof tola chiqimi esa 24%ini tashkil etadi. Bu ko‘rsatkich mahalliy xomashyodan sanoat miqyosida texnik tola ajratib olish yuqori iqtisodiy samaradorlikka ega ekanligini isbotlaydi. Ilmiy manbalar va amaliy sinovlar asosida tola ajratish usullari qiyoslandi.

Mexanik (quruq dekortikatsiya) usuli: Surxondaryoning suv va energiya resurslarini tejash nuqtayi nazaridan eng maqbul usul hisoblanadi. Unda quruq poyadan po‘stloq va yog‘ochlik qismi mexanik kuch ta’sirida ajratiladi. Mexanik ajratishda asosiy muammo — poyaga beriladigan kuchni to‘g‘ri taqsimlashdir. Haddan

tashqari yuqori mexanik kuch tolaning uzilishiga va kalta tolalar ulushining ortishiga olib keladi. Yetarli bo‘lmagan kuch esa po‘stloq va yog‘ochlikning to‘liq ajralmasligiga sabab bo‘ladi. Shu sababli, mahalliy xomashyo uchun 4 bosqichli konseptual texnologik sxema taklif etildi:

Yig‘im va tayyorlash: Kanopni texnik pishish fazasida yig‘ish, saralash va optimal namlikgacha quritish. Dastlabki mexanik ishlov va dekortikatsiya: Poya diametri va pishiqligiga mos ravishda valiklar va titish ishchi organlari rejimini rejalashtirish.

Tozalash va fraksiyalash: Kalta va uzun tolalarni ajratish, yog‘ochsimon qoldiq (kostra)lardan tozalash. Tola chiqimi, uzilishdagi pishiqligi, tozaligi va namligini statistik hamda mikroskopik (SEM/FTIR) usullarda baholash.

XULOSA

Adabiyotlar tahlili va Surxondaryo sharoitidagi (2025-yil) dastlabki amaliy kuzatuvlar mahalliy kanop poyasidan yuqori sifatli texnik tola olish imkoniyati yuqori ekanligini tasdiqladi.

“Kanop-239” varianti misolida o‘simlikning morfologik ko‘rsatkichlari mahalliy xomashyo bazasi uchun dastlabki standart bo‘lib xizmat qiladi.

Surxondaryoning quruq va issiq iqlimi uchun suv va energiyani tejaydigan quruq mexanik ajratish (dekortikatsiya) texnologiyasini qo‘llash va ishchi organlar rejimini ko‘p mezonli optimallashtirish ilmiy jihatdan asoslandi.

Ushbu tadqiqot natijalari mahalliy kanop xomashyosi asosida texnik tola va biocompozitlar ishlab chiqarish bo‘yicha sanoat texnologiyasini yaratishga zamin yaratadi.

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ALLYUZIYA VA METAFORANING O‘ZARO MUNOSABATI (NAVOIY SHE’RIYATI MISOLIDA)

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Dolzarblik. So‘z ko‘chimlari badiiy matnning mazmuniy qatlamlarini kengaytiradi, uning ta’sir kuchini oshiradi. Fanlar tutashuvi tobora tezlashayotgan hozirgi davrda metafora va allyuziyaning o‘xshash hamda farqli jihatlarini aniqlash til va madaniyat bog‘liqligini o‘rganishning muhim yo‘nalishiga aylanmoqda. Navoiy she’riyatida esa bu ikki hodisa ko‘pincha bir bayt ichida yonma-yon keladi, shu bois ularning chegarasini belgilash zarurati yanada ortadi.

Muammo. Rus tilshunosligida V.N.Teliya va E.A.Zemskaya allyuziyani metaforaning matnlararo ko‘rinishi deb baholagan, o‘zbek tilshunosligida G.Xudoyberganova va D.Nazirova uni lingvokulturologik ko‘chim sifatida talqin etgan. Biroq ikki hodisaning qayerda tutashib, qayerda ajralishi Navoiy she’riyati misolida alohida tadqiq etilishi lozim.

Maqsad: Navoiyning “Navodir ush-shabob” devoni asosida allyuziya va metaforaning semantik aloqasini aniqlash hamda ularning farqli belgilarini asoslash.

Natijalar. Tadqiqot quyidagi natijalarni berdi.

Birinchidan, ikki hodisaning tabiati farqlandi. Har ikkisi ma’no ko‘chirishga asoslansa-da, metafora yashirin o‘xshatish orqali obraz yaratadi va so‘z ma’nosini til doirasida kengaytiradi; allyuziya esa o‘quvchini oldindan ma’lum tarixiy, adabiy yoki madaniy voqelikka yo‘naltiradi. Boshqacha aytganda, metafora obrazni chizadi, allyuziya esa faktga ishora qiladi.

Ikkinchidan, o‘rin, shakl, belgi va harakat o‘xshashligi asosida ko‘chim hosil bo‘ladigan har bir holatda metafora allyuziya bilan birga namoyon bo‘lishi aniqlandi. Masalan:

Qo‘lin bu barq yoritti, damin bu yel ochdi,

Agar sipehr uza Muso edi va gar Iyso [Navoiy 1989: 4].

Chaqmoq va shamolning yorug‘lik hamda jonbaxsh nafasga qiyoslanishi shakliy o‘xshashlikka tayangan metafora bo‘lsa, Muso suhbati kechasidagi nur va Isoning jon ato etuvchi so‘zlari haqidagi xabar allyuziyani tashkil etadi: shaxsga xos xususiyat bu yerda madaniy kod vazifasini o‘taydi.

Uchinchidan, belgi o‘xshashligi asosidagi misollarda ham ikki vosita uyg‘unligi kuzatildi:

Ishqi komil elni yo Farhod, yo Majnun qilur,

Gar erur ma’shuq yoxud armaniy, yoxud arab [Navoiy 1989: 34].

“Ishqi komil” birikmasida o‘xshashlik, Farhod va Majnun nomlarida esa metafora bilan allyuziya birga ishlaydi: har ikki timsolning o‘ziga xos belgilari birlik va farqni ta’minlab, umumlashma holda komillik mezoni sifatida namoyon bo‘ladi.

To‘rtinchidan, allyuziya metaforaning mazmuniy poydevori vazifasini bajarishi ma’lum bo‘ldi:

Har necha to‘foni isyonim chekar gardung‘a mavj,

Kimsaga Nuh o‘lsa kashtiybon ne g‘am to‘fon aro [Navoiy 1989: 153].

Oshiqning isyoni to‘fon darajasiga ko‘tarilgani metafora orqali berilsa, nijot yo‘li Nuh voqeasiga ishora, ya’ni allyuziya orqali ko‘rsatiladi; baytdagi ko‘chimlarning mohiyati shu voqea bilan bog‘liqlikda ochiladi. Ka’ba va So‘mnot

nomlari [Navoiy 1989: 17] hamda Odamning yaralish davriga ishora qiluvchi bayt [Navoiy 1989: 234] ham metaforalarning yuzaga chiqishiga zamin bo‘ladi.

Beshinchidan, har ikki vositaning bilvosita ta’sir etish xususiyati asoslandi. Psixologik amaliyotda metafora va allyuziya qatlamli nutq hosil qilib, shaxsga to‘g‘ridan to‘g‘ri emas, bilvosita ta’sir ko‘rsatish uchun qo‘llanadi: E.T.Dat mijoz bilan ishlashdagi yuqori samarani ta’kidlaydi, ongsiz qarshilikni (rezistans) yengishda ham shu usuldan foydalaniladi, M.R.Ginsburg va E.Yakovleva esa bu vositalarni ishontirishning bir ko‘rinishi deb biladi. Navoiy ham “Ey ko‘ngul, holingga Majnun uyalur, sanga yo‘qturmu bu holingdin uyat” misralarida ko‘ngilni Majnun timsoli orqali, ya’ni bilvosita uyatga undaydi, bu esa ta’sirchanlikni oshiradi [Navoiy 1990: 55].

Xulosa. Metafora va allyuziya bir-biriga yaqin, biroq aynan emas: birinchisi til ichidagi o‘xshashlikka, ikkinchisi madaniy xotiraga tayanadi. Navoiy she’riyatida allyuziya metaforaning mazmuniy asosini tashkil etib, ular birgalikda ko‘p qatlamli ma’no va yuksak ta’sirchanlik yaratadi. Shu bois bu vositalarni aynanlashtirmay, o‘zaro semantik aloqadorlik nuqtayi nazaridan o‘rganish ilmiy jihatdan to‘g‘ri yondashuvdir.

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ANALYSIS OF ROUTINE METHODS OF PLASTIC SURGERY FOR PRESSURE SORES IN THE SACRAL REGION

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Abstract: An analysis of postoperative outcomes revealed that traditional methods of plastic closure of soft tissue defects in the sacral region resulted in a high rate of postoperative complications and unsatisfactory surgical outcomes in both groups.

Key words: bedsore, plastic surgery, soft tissue defects.

Relevance. Researchers have conducted scientific studies on the surgical treatment of purulent-inflammatory diseases of soft tissues. The clinical course of this pathology and its surgical correction were studied (1, 3). Modern approaches to the treatment of purulent-necrotic lesions of soft tissues were demonstrated (2, 4). The results of surgical treatment of purulent diseases of soft tissues were studied (3, 5). A number of scientific studies have been conducted in Uzbekistan on the surgical treatment of purulent-inflammatory diseases of soft tissues. The clinical course of this pathology and its surgical correction have been studied (1,2). Modern approaches to the treatment of purulent-necrotic lesions of soft tissues have been demonstrated (2,4). The results of surgical treatment of purulent diseases of soft tissues have been studied (1,5). Certain methods of reconstructive interventions for purulent-inflammatory diseases of soft tissues have been developed.

Individual methods of reconstructive interventions for purulent-inflammatory diseases of soft tissues were developed.

The purpose of the study is to analyze Results of traditional methods of plastic closure of soft tissue defects in patients with sacral pressure ulcers.

Material and methods. The results of surgical treatment of 53 patients with sacral pressure ulcers were analyzed.

Results and discussion. The presence of blind cavities with different directions of propagation was initially detected in 8 (27.6%) patients operated on according to Thiersch and in 19 (79.2%) patients in the Limberg group ($\chi^2 = 14.21$; $p < 0.001$). This fact reflects that in patients of the second group, a pronounced volumetric tissue deficiency developed, whereas in the first group, the wound defect was more often superficial in nature without significant deepening.

The wound microbial counts were similar, but clear differences in the microflora structure were identified. Under these conditions, the Limberg technique was chosen to cover the defect, taking into account its depth. This type of surgery was also chosen due to the impossibility of wound closure with a free skin flap, which did not allow for adequate tissue volume replacement.

Laboratory parameters of the systemic inflammatory response in patients in the control group showed differences. Hb levels among patients operated on using the Thiersch method were insignificantly higher. The indicator for the subgroup of patients operated on using the Limberg method does not reflect a significant difference between patients with different sacral wound depths. Although the nature of the granulation tissue varied, we observed in most cases patients with pale granulation tissue and low bleeding when treated with a surgical instrument.

The acute phase of inflammation parameters also showed significant differences, in particular the CRP level was 28.6±6.4 mg/l in the subgroup of patients operated on using the Thiersch method and 36.2±9.8 mg/l in the subgroup of patients who underwent sacral wound closure using the Limberg method ($p < 0.05$), which was combined with an increase in ESR ($p < 0.05$). Cytological characteristics of granulating wounds in patients of the control group, performed on the eve of sacral closure, demonstrated certain differences in the cellular composition depending on the macroscopic picture of the sacral defect and the closure method used. In the subgroup of patients operated on using the Thiersch method, the average proportion of neutrophils was 58.4±12.3%, whereas when using Limberg closure it was higher by 14.2±2.2% with a statistically significant difference. At the same time, we also found an increase in the content of degenerative forms of neutrophils, which changed from 21.3±6.8% to 34.5±9.2%, which could reflect more pronounced signs of destruction of the cellular element and the preservation of the activity of the local inflammatory process at the cellular level.

Of cytogram types confirmed the identified differences, especially when the inflammatory cytogram type was recorded 2.3 times more often among patients subsequently operated on using the Limberg method than among patients operated on using the Thiersch method ($\chi^2 = 8.74$; $p = 0.003$).

The conducted analysis of postoperative results showed that when using traditional methods of plastic closure of soft tissue defects of the sacral region, a high frequency of postoperative complications and unsatisfactory results of the operation was observed in both groups. Thus, complete engraftment of the flap was achieved only in 4 patients (13.8%) using the Thiersch method and in 1 patient (4.2%) with

Limberg plastic surgery without statistically significant differences ($\chi^2 = 1.34$; $p = 0.247$). Partial engraftment was noted in 2 (6.9%) and 5 (20.8%) patients, respectively ($\chi^2 = 2.21$; $p = 0.137$), which reflects the differences in the nature of the wound process.

Partial flap rejection was observed in 4 patients (13.8%) in the subgroup operated on using the Thiersch method and in 3 patients (12.5%) in the subgroup after Limberg plastic surgery ($\chi^2 = 0.02$; $p = 0.888$). Epidermal lysis was recorded in 37.9% and 29.2% of cases (in 11 and 7 patients), respectively ($\chi^2 = 0.46$; $p = 0.497$), whereas complete graft rejection was noted in 27.6% and 33.3% of patients ($\chi^2 = 0.21$; $p = 0.646$). The overall complication rate was 86.2% (25 patients) operated on using the Thiersch method and 79.2% (19 patients) after Limberg plastic surgery ($\chi^2 = 0.46$; $p = 0.497$).

When moving on to an integrated assessment of the results, it was found that the proportion of good outcomes remained low and amounted to 13.8% among patients (4 patients) operated on using the Thiersch method and 4.2% (1 patient), respectively, operated on using the Limberg method ($\chi^2 = 1.34$; $p = 0.247$).

Satisfactory results were achieved in 44.8% and 50.0% of patients in the respective subgroups ($\chi^2 = 0.14$; $p = 0.708$), with healing by secondary intention in a significant proportion of cases. Unsatisfactory outcomes were noted in 41.4% and 45.8% of patients (12 and 11 cases in the respective subgroups; $\chi^2 = 0.58$; $p = 0.750$). We observed a similar outcome in the postoperative period in a clinical case where a patient with a superficial pressure ulcer after Thiersch plastic surgery developed areas of epidermal lysis with preservation of the dermal layer on the 4th postoperative day, which required long-term and regular local treatment. Meanwhile, in another clinical case, a patient with a deep defect in the sacral region developed partial flap rejection with the formation of marginal necrosis after Limberg plastic surgery , despite the preserved blood flow in the central part of the transplant.

CONCLUSIONS.

1. The analysis of postoperative results showed that when using traditional methods of plastic closure of soft tissue defects in the sacral region, a high frequency of postoperative complications and unsatisfactory surgical results was observed in both groups.

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ФАКТОРЫ, ОПРЕДЕЛЯЮЩИЕ ЭМОЦИОНАЛЬНУЮ УСТОЙЧИВОСТЬ ПОДРОСТКОВ, ВОСПИТЫВАЮЩИХСЯ БЕЗ РОДИТЕЛЕЙ

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Аннотация. В данной статье с научно-теоретических позиций анализируются индивидуально-психологические и социально-психологические факторы, влияющие на формирование эмоциональной устойчивости подростков, воспитывающихся без родителей. Рассматриваются эмоциональные особенности подросткового возраста, психологические переживания, которые могут возникать в условиях отсутствия устойчивой эмоциональной связи с родителями, а также их влияние на развитие личности. Обосновывается взаимосвязь эмоциональной устойчивости с самооценкой, «Я-концепцией», эмоциональной саморегуляцией, психологической резильентностью, копинг-стратегиями и социальной поддержкой. Раскрывается значение доверительных межличностных отношений, принятия со стороны сверстников, безопасной воспитательной среды и позитивной направленности на будущее в качестве защитных факторов. Обосновывается необходимость активизации внутренних психологических ресурсов подростков, воспитывающихся без родителей, и формирования устойчивой системы социальной поддержки как важных условий развития их эмоциональной устойчивости.

Ключевые слова: подростки, воспитывающиеся без родителей, подростковый возраст, эмоциональная устойчивость, эмоциональная регуляция, психологическая резильентность, «Я-концепция», самооценка, копинг-стратегии, социальная поддержка, психологическая безопасность, межличностные отношения, социальная адаптация.

Подростковый возраст представляет собой один из наиболее сложных и динамичных этапов онтогенетического развития личности, в течение которого происходят существенные изменения в эмоциональной сфере, самосознании, системе социальных отношений и механизмах регуляции собственного поведения. В этот период усиливается стремление подростка к самостоятельности, возрастает потребность в осознании своего социального

статуса и личностных возможностей, повышается психологическая значимость отношений со сверстниками. В процессе такого развития эмоциональная устойчивость выступает одним из важных личностных качеств, определяющих адаптацию подростка к социальной среде, его отношение к сложным жизненным ситуациям и психологическое благополучие.

Формирование эмоциональной устойчивости подростков, воспитывающихся без родителей, происходит в специфических социально-психологических условиях. Отсутствие устойчивых эмоциональных отношений с родителями, опыт утраты близкого человека или разлуки с ним, смена лиц, осуществляющих заботу и воспитание, а также недостаточное удовлетворение потребности в любви и эмоциональной поддержке могут оказывать влияние на эмоциональные переживания подростка. Вместе с тем рассматривать воспитание без родителей как единственную и непосредственную причину эмоциональной неустойчивости с научной точки зрения неправомерно. Психологическое развитие подростка определяется взаимодействием его индивидуальных особенностей, социальной среды, условий воспитания, межличностных отношений и имеющихся психологических ресурсов.

Эмоциональная устойчивость выражает способность личности управлять своим эмоциональным состоянием в различных стрессогенных, конфликтных и фрустрационных ситуациях, контролировать уровень эмоционального напряжения, адекватно реагировать на возникающие обстоятельства и восстанавливать психологическое равновесие. Данное качество не ограничивается только способностью подростка подавлять негативные эмоции. Напротив, оно включает способность осознавать собственные эмоции, адекватно их оценивать и выражать в социально приемлемой форме, контролировать импульсивные реакции и выбирать конструктивные стратегии поведения в сложных жизненных ситуациях.

Одним из важных факторов, определяющих эмоциональную устойчивость подростков, воспитывающихся без родителей, является характер отношения к самому себе и особенности «Я-концепции». Позитивная самооценка, осознание собственной ценности, уверенность в своих возможностях и способность самостоятельно принимать решения способствуют повышению психологической устойчивости к эмоциональному напряжению. Напротив, ощущение собственной незначимости, чувство отверженности, неуверенность в своих возможностях и постоянное негативное сравнение себя с окружающими могут создавать предпосылки для усиления эмоциональной неустойчивости.

Особое значение приобретает субъективная интерпретация подростком опыта разлуки с родителями: его восприятие как свидетельства собственной неполноценности или социального отвержения способно отрицательно влиять на эмоциональное состояние.

Способность к эмоциональной саморегуляции также является одним из основных психологических механизмов, определяющих устойчивость данной категории подростков. Важное значение имеет способность подростка осознавать возникающие у него состояния печали, тревоги, гнева, страха, безнадёжности или одиночества, понимать причины этих переживаний и управлять ими посредством конструктивных способов. Сформированность навыков распознавания и адекватного выражения эмоций способствует предупреждению чрезмерных аффективных реакций, импульсивного поведения и межличностных конфликтов.

Особое место в обеспечении эмоциональной устойчивости подростков, воспитывающихся без родителей, занимает социальная поддержка. Некоторые эмоциональные и социальные функции, которые обычно реализуются родителями, в определённой степени могут компенсироваться другими значимыми взрослыми. Устойчивые и доверительные отношения с воспитателем, педагогом, психологом, опекуном, близким родственником или другим референтным для подростка взрослым способствуют формированию чувства психологической безопасности. Наличие человека, с которым подросток может открыто обсуждать свои проблемы и переживания, который способен его выслушать, понять и поддержать, выступает защитным фактором, смягчающим психологическое воздействие стрессовых ситуаций.

Отношения со сверстниками также являются важным социально-психологическим фактором, определяющим эмоциональную устойчивость в подростковом возрасте. Принятие группой, дружеские отношения, взаимное доверие и сотрудничество формируют у подростка чувство социальной принадлежности. Напротив, отвержение со стороны сверстников, унижение, буллинг, социальная изоляция и чувство одиночества могут усиливать имеющиеся эмоциональные трудности. Поэтому при оценке эмоционального состояния подростка, воспитывающегося без родителей, необходимо учитывать не только его индивидуально-психологические особенности, но и социальный статус в группе сверстников, а также характер межличностных отношений.

В формировании эмоциональной устойчивости существенное значение имеют стратегии преодоления подростком стрессовых ситуаций. Анализ

проблемы, обращение за помощью, когнитивная переоценка ситуации, активный поиск решения и снижение эмоционального напряжения социально приемлемыми способами относятся к конструктивным копинг-механизмам. В то же время преобладание таких стратегий, как уход от проблемы, отрицание эмоциональных переживаний, агрессивное реагирование или отказ от социальных контактов, может затруднять адаптацию подростка к изменяющимся жизненным условиям.

При рассмотрении данной проблемы особое научное значение приобретает понятие психологической резильентности. Резильентность отражает способность личности сохранять психологическую адаптацию в условиях сложных жизненных обстоятельств, утрат, стрессов и других неблагоприятных воздействий либо восстанавливать своё функциональное состояние после пережитых трудностей. Формирование резильентности у подростков, воспитывающихся без родителей, может выступать внутренним психологическим ресурсом, способствующим снижению негативного воздействия имеющихся факторов риска. Важную роль при этом играют оптимизм, уверенность в себе, наличие жизненных целей, навыки решения проблем, психологическая гибкость и социальная поддержка.

Отношение подростка к будущему и сформированность жизненной перспективы также тесно связаны с эмоциональной устойчивостью. Подросток, способный ставить перед собой реалистичные цели, представлять свою будущую профессиональную и социальную роль, а также видеть определённый смысл и перспективу собственной жизни, в большей степени способен воспринимать сложные жизненные обстоятельства как временные и преодолимые трудности. Неопределённость относительно будущего, безнадёжность и ощущение невозможности контролировать собственную жизнь, напротив, могут усиливать эмоциональное напряжение. В связи с этим развитие у подростков навыков целеполагания, самостоятельного принятия решений и жизненного планирования может рассматриваться как значимый психологический ресурс укрепления их эмоциональной устойчивости.

Образовательная и воспитательная среда также оказывает непосредственное влияние на эмоциональное развитие подростка, воспитывающегося без родителей. Отношение к подростку, основанное на уважении, наличие чётких и стабильных требований, учёт его индивидуальных потребностей, признание достижений и поддержка самостоятельности способствуют укреплению психологической безопасности. Напротив,

чрезмерный контроль, жёсткие наказания, унижение, игнорирование мнения подростка или эмоциональное безразличие по отношению к нему могут становиться факторами, усиливающими эмоциональное напряжение.

Таким образом, эмоциональную устойчивость подростков, воспитывающихся без родителей, нецелесообразно рассматривать как отдельное психологическое качество или как результат воздействия какого-либо одного внешнего фактора. Она представляет собой сложный социально-психологический феномен, формирующийся на основе взаимной интеграции самооценки, «Я-концепции», эмоциональной саморегуляции, психологической резильентности, конструктивных копинг-стратегий, социальной поддержки, доверительных межличностных отношений, принятия со стороны сверстников, позитивной направленности на будущее и безопасной воспитательной среды. В связи с этим психолого-педагогическая работа с данной категорией подростков должна быть направлена не только на коррекцию эмоциональных трудностей, но и на развитие внутренних и внешних психологических ресурсов, укрепление позитивной «Я-концепции», формирование конструктивных навыков эмоциональной регуляции и создание устойчивой системы социальной поддержки.

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METABOLIK SINDROM HOLATIDAGI ONALARDAN TUG‘ILGAN AVLODLAR YURAGINING MORFOLOGIK VA MORFOMETRIK O‘ZGARISHLARI

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Annotatsiya

Ushbu tezisda tajribaviy metabolik sindrom chaqirilgan ona kalamushlardan tug‘ilgan avlodlar yuragining postnatal ontogenez davridagi morfologik va morfometrik o‘zgarishlari tahlil qilindi. Tadqiqotda ona organizmidagi metabolik buzilishlarning avlod yuragi miokardi, qon tomirlari, biriktiruvchi to‘qima stromasi va klapan apparatining shakllanishiga ta’siri baholandi. Tajriba modelida yuqori yog‘li va yuqori uglevodli ratsiondan foydalanilib, metabolik sindrom holati shakllantirildi. Nazorat va tajriba guruhlaridan olingan avlodlarning yurak to‘qimalari postnatal rivojlanishning turli muddatlarida gistologik va morfometrik usullar yordamida o‘rganildi. Aniqlanishicha, metabolik sindrom sharoitida rivojlangan avlodlarda yurak morfogenezi fiziologik yo‘nalishdan chetga chiqib, miokardning yetilishi sekinlashishi, kardiomiotsitlar tuzilishining o‘zgarishi, interstitsial va perivaskulyar sohalarning kengayishi, kollagen tolalarining ortiqcha to‘planishi hamda yurak klapanlari stromasida morfometrik o‘zgarishlar bilan namoyon bo‘ladi. Ushbu o‘zgarishlar postnatal davr davomida saqlanib, yosh ortishi bilan kuchayish tendensiyasini ko‘rsatadi. Olingan natijalar ona organizmidagi metabolik buzilishlar avlod yurak-qon tomir tizimining strukturaviy shakllanishiga uzoq muddatli ta’sir ko‘rsatishi mumkinligini ko‘rsatadi.

Kalit so‘zlar: metabolik sindrom, avlod yuragi, miokard, postnatal ontogenez, morfometriya, kardiomiotsit, interstitsial fibroz, perivaskulyar o‘zgarishlar, yurak klapanlari.

Dolzarbligi

Metabolik sindrom zamonaviy tibbiyotda yurak-qon tomir kasalliklari rivojlanishining muhim xavf omillaridan biri hisoblanadi. Mazkur sindrom semirish, insulinrezistentlik, giperglikemiya, dislipidemiya va arterial bosimning o‘zgarishi kabi o‘zaro bog‘liq metabolik buzilishlar majmuasi bilan tavsiflanadi. Ushbu patologik holat reproduktiv yoshdagi ayollarda rivojlanganda, uning salbiy oqibatlari faqat ona organizmi bilan chegaralanib qolmasdan, homila rivojlanishi va keyinchalik avlod salomatligiga ham ta’sir qilishi mumkin.

Homiladorlik davrida ona organizmidagi glyukoza va lipid almashinuvining buzilishi yo‘ldosh orqali homilaga yetib boradigan oziq moddalar, gormonlar va metabolitlar nisbatining o‘zgarishiga olib keladi. Natijada homilaning o‘sishi va organlarining, xususan, yurak-qon tomir tizimining rivojlanish jarayonlari o‘zgarishi mumkin. Bunday holat rivojlanishning dastlabki bosqichlarida yuzaga keladigan «fetal dasturlanish» mexanizmlari bilan izohlanadi.

Yurak embrional davrdayoq faol shakllanib, postnatal davrda uning mushak, tomir va biriktiruvchi to‘qima komponentlari yetilishda davom etadi. Shuning uchun ona organizmidagi metabolik muhitning noqulayligi yurakning nafaqat prenatal, balki tug‘ilgandan keyingi morfologik rivojlanishiga ham ta’sir ko‘rsatishi ehtimoldan xoli emas. Avvalgi tadqiqotlarda ona semirishi va metabolik buzilishlari avlodlarda yurak mushaklarining gipertrofiyasi, mikrotsirkulyatsiyaning buzilishi va keyingi hayot davrlarida yurak-qon tomir patologiyalariga moyillik bilan bog‘liqligi ko‘rsatilgan.

Shu nuqtayi nazardan, metabolik sindromga ega onalardan tug‘ilgan avlodlar yuragining postnatal ontogenezini morfologik va morfometrik jihatdan o‘rganish muhim ilmiy-amaliy ahamiyatga ega. Ayniqsa, yurak devorlarining qalinligi, kardiomiotsitlarning morfologiyasi, miokard stromasining holati, qon tomirlarining rivojlanishi va klapan apparatidagi o‘zgarishlarni birgalikda baholash patologik jarayonning dastlabki bosqichlarini aniqlash imkonini beradi. Yuborilgan tadqiqot materiallarida aynan yurak devori va klapan apparatining 7–60 kunlik postnatal davrdagi morfometrik dinamikasini kompleks baholashga e’tibor qaratilgan.

Tadqiqot maqsadi – tajribaviy metabolik sindrom holatidagi onalardan tug‘ilgan avlodlar yuragining postnatal ontogenez davridagi morfologik va morfometrik o‘zgarishlarini aniqlash hamda metabolik buzilishlarning miokard va yurak klapanlari rivojlanishiga ta’sirini baholash.

Material va tadqiqot usullari

Tadqiqot tajribaviy laboratoriya kalamushlarida amalga oshirildi. Tadqiqot uchun tana vazni taxminan 180–220 g bo‘lgan jinsiy yetuk oq laboratoriya kalamushlari olindi va ular nazorat hamda tajriba guruhlariga ajratildi. Nazorat guruhidagi hayvonlar odatiy laboratoriya ratsioni sharoitida saqlandi.

Tajriba guruhidagi ona kalamushlarda metabolik sindromni modellashtirish maqsadida yuqori yog‘li va yuqori uglevodli ratsiondan foydalanildi. Ratsion tarkibida standart laboratoriya yemi, hayvon yog‘i va fruktoza mavjud bo‘lib, qo‘shimcha ravishda ichimlik sifatida fruktozaning konsentrlangan eritmasi berildi. Mazkur yondashuv natijasida hayvonlarda tana vaznining ortishi, glyukoza va lipid almashinuvining buzilishi kabi metabolik sindromga xos o‘zgarishlar shakllantirildi.

Yuborilgan dissertatsiya materiallarida model uchun 60% standart oziqa, 20% qo‘y yog‘i, 20% fruktoza va 20% fruktoza eritmasidan foydalanilgani ko‘rsatilgan.

Metabolik sindrom modeli shakllanganidan so‘ng ona kalamushlar sog‘lom erkaklar bilan juftlashtirildi. Tug‘ilgan avlodlar postnatal rivojlanishning 7, 14, 21, 30 va 60-kunlarida tekshirildi. Yurak to‘qimalari umumiy gistologik, morfometrik va immunogistokimyoviy usullar yordamida o‘rganildi.

Gistologik tekshiruv uchun yurakning qorincha miokardi, qorinchalararo to‘siq va klapan apparati elementlaridan namunalar olindi. To‘qimalar neytral formalinda fiksatsiya qilinib, standart gistologik ishlovdan o‘tkazildi va parafin bloklarga joylashtirildi. Tayyorlangan kesmalar gematoksilin-eozin bilan bo‘yalib, umumiy gistologik arxitektonikani baholashga imkon yaratildi. Biriktiruvchi to‘qima va kollagen tolalarining holatini aniqlash uchun maxsus bo‘yoqlash usullaridan foydalanildi.

Morfometrik tekshiruvlarda yurak devorlari qalinligi, chap va o‘ng qorincha miokardining nisbiy ko‘rsatkichlari, qorinchalararo to‘siqning qalinligi, kardiomiotsitlar o‘lchamlari, interstitsial va perivaskulyar sohalarning nisbiy maydoni hamda kollagen to‘qimaning ulushi baholandi. Shuningdek, mitral, uch tavaqali, aortal va o‘pka klapanlari qopqoqchalari qalinligi va stromal komponentining morfometrik ko‘rsatkichlari tahlil qilindi.

Olingan ma’lumotlar variatsion-statistik va korrelyatsion usullar yordamida qayta ishlandi. Guruhlar o‘rtasidagi farqlar statistik jihatdan **p<0,05** darajasida ishonchli deb baholandi.

Tadqiqot natijalari va ularning muhokamasi

Nazorat guruhidagi avlodlarda yurakning postnatal rivojlanishi bosqichma-bosqich va muvozanatli tarzda kechishi kuzatildi. Dastlabki postnatal davrda kardiomiotsitlar hali to‘liq yetilmagan morfologik tuzilishga ega bo‘lsa-da, keyingi kunlarda ularning shakli, miofibrillalarining tashkil topishi va o‘zaro joylashuvi asta-sekin takomillashib bordi. Miokard stromasi va mikrotsirkulyator tarmoqning ham yoshga mos ravishda shakllanishi kuzatildi.

Tajriba guruhida esa ushbu fiziologik jarayonlardan farqli ravishda miokardning strukturaviy yetilishi sekinlashganligi aniqlandi. Metabolik sindromga ega onalardan tug‘ilgan avlodlarda yurak mushak to‘qimasida morfologik o‘zgarishlar postnatal rivojlanishning dastlabki davrlaridanoq namoyon bo‘lib, keyingi muddatlarda ularning intensivligi oshib bordi.

Dastlabki 7-kunlik davrda kardiomiotsitlarning o‘lchami, yurak devorlarining qalinligi va miokard massasida o‘zgarishlar kuzatildi. Kardiomiotsitlarning nisbatan

kattalashishi yurak mushaklarining kompensator moslashuv reaksiyasi sifatida baholanishi mumkin. Biroq bu jarayon qon tomirlar tarmog‘ining mutanosib rivojlanishi bilan birga kechmagan. Natijada miokardning metabolik ehtiyojlari bilan uning qon bilan ta’minlanishi o‘rtasida nomutanosiblik yuzaga kelgan.

Keyingi, ya’ni 14-kunlik davrda ushbu nomutanosiblik yanada yaqqol ko‘zga tashlandi. Miokardning interstitsial qismida shish, biriktiruvchi to‘qima elementlarining o‘zgarishi va perivaskulyar sohalarning kengayishi qayd etildi. Kardiomiotsitlar sitoplazmasida vakuolizatsiya va distrofik o‘zgarishlar paydo bo‘lishi yurak mushak hujayralarida metabolik zo‘riqish mavjudligini ko‘rsatadi.

21-kunga kelib, miokarddagi strukturaviy o‘zgarishlar yanada kuchaydi. Kardiomiotsitlarning o‘lchami kattalashishi bilan birga ularning morfologik bir xilligi buzildi. Ayrim sohalarda mushak tolalarining zichlashishi, boshqa qismlarda esa bo‘shashishi va dezorganizatsiyasi kuzatildi. Miokard stromasida perivaskulyar va interstitsial sohalarning kengayishi kuzatilib, kollagen tolalarining to‘planishi kuchaydi.

Tadqiqotning keyingi davrlarida, ayniqsa 30–60-kunlarda, strukturaviy o‘zgarishlar yanada barqaror xarakter kasb etdi. Yuborilgan ma’lumotlarga ko‘ra, 60-kunda tajriba guruhida kardiomiotsitlarning o‘rtacha diametri **10,8±0,7 mkm**, nazorat guruhida esa **11,2±0,8 mkm** ni tashkil etgan. Shu bilan birga, tajriba guruhida interstitsial maydon **16,3±1,6%**, perivaskulyar maydon **9,5±1,0%**, kollagen to‘planishi esa **8,2±0,9%** gacha yetgan.

Mazkur ko‘rsatkichlar ona organizmidagi metabolik buzilishlar avlod yuragida oddiy funksional moslashuvdan ko‘ra murakkabroq, strukturaviy qayta qurilish jarayonlarini yuzaga keltirishini ko‘rsatadi. Interstitsial va perivaskulyar maydonlarning kengayishi miokard stromasidagi biriktiruvchi to‘qima komponentlarining nisbiy ko‘payishi bilan bog‘liq bo‘lib, bu holat kelgusida fibroz jarayonlari uchun morfologik zamin yaratishi mumkin.

Miokarddagi bunday o‘zgarishlarni ona organizmidagi giperglikemiya, dislipidemiya va insulinrezistentlik bilan bog‘lash mumkin. Metabolik muhitning o‘zgarishi homila va yangi tug‘ilgan organizmda oksidlovchi stress, endotelial disfunksiya, lipidlarning ortiqcha to‘planishi va to‘qimalarning energetik ta’minoti buzilishiga olib kelishi mumkin. Yurak kabi yuqori metabolik faollikka ega organ bunday o‘zgarishlarga ayniqsa sezgir hisoblanadi.

Morfologik tekshiruvlarda miokard qon tomirlarining ham patologik qayta tuzilishi aniqlandi. Ayrim muddatlarda tomirlarning to‘laqonli qon bilan ta’minlanmasligi, kapillyarlar zichligining pasayishi, perivaskulyar shish va stazga

moyillik kuzatildi. Tomirlar devoridagi biriktiruvchi to‘qima komponentlarining o‘zgarishi esa mikrotsirkulyatsiyaning yanada buzilishiga sharoit yaratadi. Shu tariqa, miokard massasining ortishi va uning qon bilan ta’minlanishi o‘rtasida nomutanosiblik paydo bo‘lishi mumkin.

Tajriba guruhida kuzatilgan morfologik o‘zgarishlarning yana bir muhim jihati – yurak klapanlari rivojlanishidagi buzilishlardir. Tadqiqot natijalarida mitral, uch tavaqali, aortal va o‘pka klapanlari qopqoqchalarining qalinligi hamda stromal maydoni nazorat guruhiga nisbatan ortgani aniqlandi. Eng sezilarli o‘zgarishlar aortal klapanda qayd etilib, 60-kunga kelib ayrim morfometrik ko‘rsatkichlar nazoratga nisbatan **25–30%** ga oshgan.

Klapan apparatidagi bunday o‘zgarishlar faqat mexanik qalinlashish sifatida emas, balki uning biriktiruvchi to‘qima stromasidagi qayta qurilish jarayonlari bilan bog‘liq holda baholanishi lozim. Kollagen komponentining ortishi va stromal maydonning kengayishi klapanlarning elastik-mexanik xususiyatlariga ta’sir qilishi mumkin. Ayniqsa, aortal klapandagi o‘zgarishlarning kuchli namoyon bo‘lishi yurakdan chiqadigan qon oqimining yuqori bosimli sharoitlari bilan birgalikda metabolik omillarning ta’sirini aks ettirishi mumkin.

Shunday qilib, tajriba natijalari ona metabolik sindromining avlod yuragiga ta’siri faqat kardiomiotsitlar bilan chegaralanib qolmasligini, balki miokard stromasi, mikrotsirkulyator tizim va klapan apparatini ham qamrab olishini ko‘rsatdi. Ushbu o‘zgarishlar kompleks ravishda baholanganda, avlod yuragida strukturaviy yetilishning sekinlashishi va patologik remodellanish jarayonining shakllanishi haqida xulosa qilish mumkin.

Tadqiqotning muhim jihati shundaki, aniqlangan o‘zgarishlar bir martalik morfologik siljish ko‘rinishida emas, balki postnatal rivojlanish davomida saqlanib qoluvchi va kuchayuvchi jarayon sifatida namoyon bo‘lgan. Yuborilgan ma’lumotlarda ham tajriba guruhida miokard va klapan apparatidagi o‘zgarishlarning yosh ortishi bilan kuchayishi qayd etilgan.

Bu holat «fetal dasturlanish» konsepsiyasining morfologik asoslarini tushuntirish uchun muhimdir. Ona organizmidagi metabolik muhit homilaning rivojlanish jarayonini o‘zgartirib, tug‘ilgandan keyingi davrda ham davom etadigan strukturaviy iz qoldirishi mumkin. Bunday o‘zgarishlar keyinchalik arterial gipertenziya, metabolik buzilishlar, yurak mushaklarining funksional rezervlari pasayishi va boshqa yurak-qon tomir kasalliklari uchun predispozitsion omil bo‘lishi ehtimolini oshiradi.

Xulosa

O‘tkazilgan morfologik va morfometrik tadqiqot natijalari ona organizmida metabolik sindrom mavjudligi avlod yuragining postnatal rivojlanishiga sezilarli ta’sir ko‘rsatishini ko‘rsatdi. Metabolik sindrom sharoitida tug‘ilgan avlodlarda miokardning fiziologik yetilishi sekinlashib, kardiomiotsitlar, interstitsial stroma va mikrotsirkulyator tizimda kompleks strukturaviy o‘zgarishlar shakllanadi.

Postnatal ontogenez davomida tajriba guruhida interstitsial va perivaskulyar sohalarning kengayishi, kollagen to‘planishining kuchayishi, miokard stromasining qayta tashkil topishi va qon tomirlar tarmog‘ining nisbiy yetishmovchiligi kuzatildi. Ushbu o‘zgarishlar miokardning metabolik ehtiyojlari bilan uning trofik ta’minoti o‘rtasida nomutanosiblik yuzaga kelishiga olib kelishi mumkin.

Shuningdek, mitral, uch tavaqali, aortal va o‘pka klapanlarida morfometrik ko‘rsatkichlarning oshishi aniqlandi. Eng yaqqol o‘zgarishlar aortal klapanda kuzatilib, 60-kunga kelib ayrim ko‘rsatkichlar nazorat guruhiga nisbatan 25–30% gacha oshgan.

Umuman olganda, ona metabolik sindromi avlod yuragida erta postnatal davrdanoq patologik remodellanish uchun morfologik asos yaratishi mumkin. Aniqlangan o‘zgarishlar yurak-qon tomir tizimi kasalliklarining kelib chiqishida prenatal va perinatal metabolik omillarning ahamiyatini ko‘rsatadi. Ushbu natijalar kelgusida ona metabolik sindromining avlod yuragiga uzoq muddatli ta’sirini chuqurroq o‘rganish, erta morfologik markerlarni aniqlash va profilaktik yondashuvlarni ishlab chiqish uchun asos bo‘lib xizmat qiladi.

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Bu variantda **asosiy natijalar aynan siz yuborgan dissertatsiya materiallaridagi ko‘rsatkichlar bilan bog‘langan**, xususan 7–60 kunlik kuzatuv, kardiomiotsit o‘lchamlari, interstitsial/perivaskulyar maydonlar va klapanlardagi o‘zgarishlar kiritildi.

Agar uni Word’da **14-shrift, 1,5 interval** bilan joylashtirsangiz, matnni 4 betga yaqin ilmiy tezis hajmida berish mumkin.

O‘ZBEK TILIDAGI ZAMONAVIY NEOLOGIZMLARNING LINGVISTIK XUSUSIYATLARI VA SEMANTIK RIVOJLANISH TENDENSIYALARI

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Annotatsiya

Mazkur maqolada zamonaviy o‘zbek tilining leksik tizimida faol qo‘llanayotgan neologizmlarning lingvistik xususiyatlari va semantik rivojlanish tendensiyalari tadqiq etilgan. Globallashuv, raqamli texnologiyalar, ijtimoiy tarmoqlar, iqtisodiy va ijtimoiy munosabatlarning jadallashuvi natijasida o‘zbek tilining lug‘at tarkibida yangi tushunchalarni ifodalovchi leksik birliklar soni ortib bormoqda. Tadqiqotda neologizmlarning hosil bo‘lish manbalari, strukturaviy xususiyatlari, o‘zlashish mexanizmlari, derivatsion imkoniyatlari hamda semantik o‘zgarishlari tahlil qilingan. Zamonaviy neologizmlar o‘zbek tiliga ichki so‘z yasash imkoniyatlari, boshqa tillardan o‘zlashish, kalkalash, semantik kengayish va mavjud birliklarning yangi ma’noda qo‘llanishi orqali kirib kelayotgani aniqlangan. Tadqiqot natijasida neologizmlarning faol qo‘llanishida raqamli kommunikatsiya, texnologik taraqqiyot va ijtimoiy-madaniy jarayonlar asosiy ekstralingvistik omillar sifatida namoyon bo‘lishi asoslangan. Shuningdek, yangi leksik birliklarning o‘zbek tilining fonetik, morfologik, sintaktik va semantik tizimiga moslashish jarayonlari yoritilgan hamda ularning adabiy til taraqqiyotidagi o‘rni aniqlangan.

Kalit so‘zlar: neologizm, zamonaviy o‘zbek tili, leksika, semantika, leksik tizim, o‘zlashma, so‘z yasalishi, semantik rivojlanish, raqamli kommunikatsiya, til taraqqiyoti.

Аннотация

В статье исследуются лингвистические особенности и тенденции семантического развития современных неологизмов, активно

функционирующих в лексической системе узбекского языка. Под влиянием глобализации, цифровых технологий, социальных сетей, а также ускорения экономических и социальных процессов в словарном составе узбекского языка увеличивается количество лексических единиц, обозначающих новые понятия. В исследовании анализируются источники формирования неологизмов, их структурные особенности, механизмы заимствования, словообразовательный потенциал и семантические изменения. Установлено, что современные неологизмы входят в узбекский язык посредством внутренних словообразовательных возможностей, заимствования из других языков, калькирования, семантического расширения и нового употребления существующих единиц. Обосновано, что цифровая коммуникация, технологическое развитие и социально-культурные процессы являются основными экстралингвистическими факторами активизации неологизации. Также раскрываются процессы фонетической, морфологической, синтаксической и семантической адаптации новых лексических единиц и определяется их роль в развитии литературного языка.

Ключевые слова: неологизм, современный узбекский язык, лексика, семантика, лексическая система, заимствование, словообразование, семантическое развитие, цифровая коммуникация, развитие языка.

Abstract

This article examines the linguistic features and semantic development trends of contemporary neologisms actively used in the lexical system of the Uzbek language. Under the influence of globalization, digital technologies, social networks, and rapidly changing economic and social relations, the Uzbek vocabulary is continuously expanding with lexical units denoting new concepts. The study analyzes the sources of neologism formation, their structural characteristics, borrowing mechanisms, derivational potential, and semantic transformations. It is established that

contemporary neologisms enter Uzbek through internal word-formation processes, borrowing from other languages, calquing, semantic broadening, and the reinterpretation of existing lexical units. The findings demonstrate that digital communication, technological development, and socio-cultural changes represent major extralinguistic factors contributing to neologization. The article also examines the phonetic, morphological, syntactic, and semantic adaptation of new lexical units and determines their role in the development of the Uzbek literary language.

Keywords: neologism, contemporary Uzbek language, vocabulary, semantics, lexical system, borrowing, word formation, semantic development, digital communication, language development.

KIRISH

Til jamiyat bilan uzviy aloqada rivojlanadigan, ijtimoiy hayotdagi o‘zgarishlarni o‘zida aks ettiradigan murakkab tizimdir. Jamiyat taraqqiyotining har bir bosqichi yangi predmet, hodisa, tushuncha va munosabatlarning yuzaga kelishi bilan tavsiflanadi. Yangi tushunchalarning paydo bo‘lishi esa ularni nomlash zaruratini yuzaga keltiradi. Natijada tilning lug‘aviy tarkibida yangi birliklar — neologizmlar shakllanadi.

XXI asrda ilm-fan va texnologiyalarning jadal rivojlanishi, globallashuv, raqamlashtirish, internet kommunikatsiyasi, iqtisodiy munosabatlarning yangilanishi va ijtimoiy-madaniy jarayonlarning jadallashuvi neologizmlarning yuzaga kelish sur’atini sezilarli darajada oshirdi.

Ayniqsa, raqamli kommunikatsiya o‘zbek tilining faol lug‘at tarkibiga katta miqdorda yangi birliklarning kirib kelishiga sabab bo‘lmoqda. Bugungi o‘zbek tilida **bloger, podkast, strim, kontent, platforma, onlayn, oflayn, startap, frilanser, marketplace, target, moderator, vebinar, chatbot, smartfon, skaner, QR-kod** kabi birliklarning faol qo‘llanayotganini kuzatish mumkin.

Biroq zamonaviy neologizmlar faqat xorijiy tillardan o‘zlashgan birliklar bilan chegaralanmaydi. O‘zbek tilining ichki imkoniyatlari asosida yaratilgan yoki mavjud

so‘zlarga yangi ma’no yuklangan birliklar ham neologizatsiya jarayonining muhim ko‘rinishlaridan hisoblanadi.

Masalan, **raqamlashtirish, elektronlashtirish, masofaviy ta’lim, onlayn ta’lim, videodars, elektron hukumat** kabi birliklar yangi ijtimoiy va texnologik jarayonlarni nomlash ehtiyoji bilan bog‘liq holda faol qo‘llanmoqda.

Neologizmlarni o‘rganish faqat yangi so‘zlarni qayd etish bilan cheklanmaydi. Ularning qaysi manbadan kirib kelgani, qanday yasalishi, til tizimiga qanday moslashishi, ma’nosining qanday rivojlanishi va adabiy til me’yorida qanday mavqega ega bo‘lishi ham muhim ilmiy masalalardandir.

Shu sababli zamonaviy o‘zbek tilidagi neologizmlarning lingvistik xususiyatlari va semantik rivojlanish tendensiyalarini tadqiq etish hozirgi o‘zbek tilshunosligining dolzarb yo‘nalishlaridan biri hisoblanadi.

Tadqiqotning maqsadi

Tadqiqotning asosiy maqsadi zamonaviy o‘zbek tilida qo‘llanayotgan neologizmlarning shakllanish manbalari, strukturaviy-lingvistik xususiyatlari va semantik rivojlanish tendensiyalarini aniqlashdan iborat.

Tadqiqot vazifalari

Mazkur maqsaddan kelib chiqib quyidagi vazifalar belgilandi:

1. neologizm tushunchasining lingvistik mohiyatini aniqlash;
2. zamonaviy o‘zbek tilidagi neologizmlarning asosiy manbalarini tasniflash;
3. neologizmlarning strukturaviy va derivatsion xususiyatlarini tahlil qilish;
4. o‘zlashma neologizmlarning o‘zbek tiliga moslashuv jarayonini aniqlash;
5. neologizmlarda yuz berayotgan semantik o‘zgarishlarni tavsiflash;
6. neologizatsiyaning asosiy ekstralingvistik omillarini aniqlash.

Tadqiqot obyekti

Zamonaviy o‘zbek tilida faol qo‘llanayotgan yangi leksik birliklar.

Tadqiqot predmeti

O‘zbek tilidagi neologizmlarning strukturaviy, derivatsion, semantik va funksional xususiyatlari.

Semantik jihatdan esa yangi birliklarda kengayish, torayish, metaforik va metonimik rivojlanish, terminologizatsiya hamda determinologizatsiya jarayonlari kuzatilmoqda.

Raqamli kommunikatsiya neologizmlarning shakllanishi va tarqalish tezligini sezilarli darajada oshirgan. Shu sababli zamonaviy o‘zbek tilidagi yangi birliklarni muntazam monitoring qilish, ularning semantik va grammatik xususiyatlarini o‘rganish, me’yoriy maqomini aniqlash hamda zamonaviy lug‘atlarda aks ettirish muhim ilmiy vazifalardan biridir.

XULOSA

Tadqiqot natijalari zamonaviy o‘zbek tilining leksik tizimida neologizatsiya jarayoni faol kechayotganini ko‘rsatdi. Mazkur jarayon jamiyatdagi texnologik, iqtisodiy, ijtimoiy va madaniy o‘zgarishlarning bevosita lingvistik aksidir.

Zamonaviy o‘zbek tilidagi neologizmlar quyidagi asosiy yo‘llar orqali shakllanmoqda:**ichki so‘z yasash;xorijiy tillardan o‘zlashish;kalkalash; qisqartirish;mavjud birliklarning semantik yangilanishi;aralash derivatsion modellar.**

Tadqiqotda zamonaviy neologizmlarning asosiy qismi raqamli texnologiyalar, internet kommunikatsiyasi, iqtisodiyot, ta’lim, biznes va media sohalari bilan bog‘liqligi aniqlandi.

Neologizmlarning muhim lingvistik xususiyatlaridan biri ularning o‘zbek tilining grammatik tizimiga moslashishidir. O‘zlashma birliklar o‘zbek tilining ko‘plik, egalik, kelishik va so‘z yasovchi affikslarini qabul qilib, til tizimining faol elementlariga aylanishi mumkin.

Kelgusida o‘zbek tilidagi zamonaviy neologizmlarning elektron korpusini yaratish, ularning qo‘llanish chastotasini aniqlash, sohaviy tasnifini ishlab chiqish va semantik rivojlanish dinamikasini korpus lingvistikasi asosida o‘rganish istiqbolli ilmiy yo‘nalish sifatida qaralishi mumkin.

Shunday qilib, zamonaviy neologizmlar o‘zbek tilining lug‘aviy tizimini boyituvchi, uning nominativ va kommunikativ imkoniyatlarini kengaytiruvchi hamda til taraqqiyotining zamonaviy ijtimoiy-madaniy jarayonlar bilan uzviyligini namoyon etuvchi muhim lingvistik hodisa hisoblanadi.

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Alohida ta’lim ehtiyojlari bo‘lgan bolalar muloqotining o‘ziga xos xususiyatlari

Annotatsiya

Ushbu maqolada alohida ta’lim ehtiyojlari bo‘lgan bolalar muloqotining o‘ziga xos xususiyatlari yoritilgan. Muloqot bolaning shaxsiy rivojlanishi, ta’lim jarayonidagi faolligi va ijtimoiylashuvidagi ahamiyati tahlil qilingan. Shuningdek, nutq rivoji, so‘z boyli, suhbatda ishtirok etish va o‘z fikrini ifodalashdagi qiyinchiliklar hamda ularni bartaraf etishda individual yondashuv, rolli o‘yinlar va oila bilan hamkorlikning ahamiyati ko‘rib chiqilgan.

Kalit so‘zlar: kommunikatsiya, adaptatsiya, individual yondashuv, pedagogik yordam.

Аннотация

В данной статье освещаются особенности общения детей с особыми образовательными потребностями. Анализируется значение общения для личностного развития ребёнка, его активности в образовательном процессе и социализации. Также рассматриваются трудности в развитии речи, использовании словарного запаса, участии в беседе и выражении собственных мыслей, а также значение индивидуального подхода, ролевых игр и сотрудничества с семьёй в преодолении данных трудностей.

Ключевые слова: коммуникация, адаптация, индивидуальный подход, педагогическая помощь.

Abstract

This article highlights the specific features of communication among children with special educational needs. It analyzes the importance of communication for children’s personal development, active participation in the educational process, and socialization. The article also examines difficulties in speech development, vocabulary use, participation in conversations, and expression of thoughts, as well as the importance of an individualized approach, role-playing activities, and family cooperation in overcoming these difficulties.

Keywords:communication, adaptation, individualized approach, pedagogical support.

Inson o‘z fikrini, his-tuyg‘ularini, istak va ehtiyojlarini boshqalarga muloqot orqali yetkazadi. Shu bilan birga, boshqa insonlarning fikrini tinglash, ularning xatti-harakatlarini tushunish va ularga munosabat bildirish ham muloqot jarayonida shakllanadi. Bola uchun muloqot uning rivojlanishi va tarbiyasining eng muhim vositalaridan biri hisoblanadi. Bola ilk yoshidan boshlab kattalar bilan munosabatga kirishish orqali atrof-muhit haqidagi dastlabki tasavvurlarni egallaydi. U predmetlarning nomini, harakatlarni, kundalik faoliyat bilan bog‘liq tushunchalarni va ijtimoiy xulq-atvor me’yorlarini muloqot jarayonida o‘zlashtirib boradi. Keyinchalik bolaning tengdoshlari bilan muloqoti kengayib, uning ijtimoiy tajribasi yanada boyiydi. Shu sababli muloqot bolaning faqat nutqiy rivojlanishiga emas, balki fikrlashi, xotirasi, diqqati, hissiy holati va shaxs sifatida shakllanishiga ham ta’sir ko‘rsatadi. Alohida ta’lim ehtiyojlari bo‘lgan bolalarda muloqotning shakllanishi o‘ziga xos xususiyatlarga ega. Ayniqsa, aqli zaif bolalarda muloqot jarayonining rivojlanishi bolaning bilish faoliyati, nutqiy imkoniyatlari va hayotiy tajribasi bilan chambarchas bog‘liq bo‘ladi. Bunday bolalarda yangi ma’lumotni tushunish, eslab qolish, umumlashtirish va o‘z fikrini nutq orqali ifodalash jarayonlari o‘ziga xos kechadi. Shu sababli ular bilan muloqot qilishda oddiy, tushunarli va individual yondashuvni qo‘llash talab etiladi. Aqli zaif bola ayrim so‘zlarni bilishi yoki gapira olishi mumkin, biroq ularni tegishli vaziyatda qo‘llash, savolga mazmunan mos javob berish, suhbatni boshlash yoki boshqa insonning fikrini tushunishda qiynalishi mumkin. Demak, muloqotning rivojlanganlik darajasini aniqlashda bolaning nutqidan amaliy foydalanish qobiliyatiga ham e’tibor qaratish zarur. Shu jihatdan aqli zaif bolalar muloqotining o‘ziga xos xususiyatlarini o‘rganish va ular uchun samarali pedagogik sharoit yaratish maxsus pedagogikaning muhim vazifalaridan biri hisoblanadi.Muloqot bolaning atrofdagi olamni anglashida asosiy vositalardan biri bo‘lib xizmat qiladi. Bola kattalar bilan suhbatlashish, savollarga javob berish, turli topshiriqlarni bajarish va kundalik faoliyatda ishtirok etish orqali yangi bilim va ko‘nikmalarni egallaydi. Ushbu jarayon bolaning bilish faoliyati bilan bevosita bog‘liq bo‘lganligi sababli aqli zaif bolalarda muloqotning shakllanishi ham o‘ziga xos kechadi. Aqli zaif bolalarda yangi tushunchalarni egallash ko‘proq vaqt talab qilishi mumkin. Bola yangi so‘zni eshitib, uni takrorlay olishi mumkin, ammo uning ma’nosini to‘liq anglab yetishi yoki boshqa vaziyatda mustaqil qo‘llashi uchun takroriy mashqlar zarur bo‘ladi. Masalan, “katta”, “kichik”, “uzun”, “qisqa” kabi tushunchalarni o‘rgatishda faqat ularning ta’rifini aytishdan ko‘ra, real predmetlarni taqqoslash samaraliroq bo‘lishi mumkin. Bola

predmetlarni ko‘rib, ularni taqqoslab va o‘z fikrini aytib berish orqali yangi so‘zlarni amaliy faoliyat bilan bog‘laydi. Natijada so‘zning mazmuni ancha mustahkam o‘zlashtiriladi.Muloqotning shakllanishida bolaning suhbatga bo‘lgan ehtiyoji ham muhim ahamiyatga ega. Bola biror narsani olish, yordam so‘rash, o‘z xohishini bildirish yoki tengdoshi bilan o‘ynash uchun muloqotga kirishishi kerak. Agar kattalar bolaning barcha ehtiyojlarini u gapirmasdan turib bajarib qo‘ysalar, bolaning mustaqil ravishda murojaat qilish zarurati kamayishi mumkin. Shuning uchun bolaga imkon qadar o‘z ehtiyojini so‘z orqali ifodalash imkoniyatini berish zarur.

Aqli zaif bolalar muloqotining o‘ziga xos jihatlaridan biri nutqning shakllanishi bilan kommunikativ faoliyat o‘rtasidagi bog‘liqlikdir. Nutq bolaning o‘z fikrini ifodalashida asosiy vosita bo‘lsada, muloqot faqat so‘zlarni aytishdan iborat emas. Muloqot jarayonida bola suhbatdoshni tinglashi, savolni tushunishi, javob berishi, kerakli so‘zlarni tanlashi va vaziyatga mos ravishda o‘z fikrini bayon qilishi kerak.Aqli zaif bolalarda so‘z boyligining kamligi yoki so‘zlardan foydalanishning cheklanganligi muloqotning mazmuniga ta’sir qilishi mumkin. Bola kundalik hayotda tez-tez uchraydigan predmet va harakatlarning nomlarini bilishi mumkin, biroq o‘z fikrini batafsil bayon qilish uchun zarur bo‘lgan so‘zlarni topishda qiynaladi. Natijada uning javoblari qisqa bo‘lib, ba’zan suhbat mazmunini to‘liq ochib bera olmaydi. Shuningdek, ayrim bolalar grammatik jihatdan to‘liq gap tuzishda qiynalishlari mumkin. Bolaning muloqot tajribasi faqat kattalar bilan munosabat orqali shakllanib qolmaydi. Tengdoshlar bilan muloqot ham uning ijtimoiy rivojlanishida muhim o‘rin tutadi. Tengdoshlari bilan o‘ynash, umumiy topshiriqni bajarish, fikr almashish va kelishish jarayonida bola turli ijtimoiy ko‘nikmalarni egallaydi.Aqli zaif bolalar tengdoshlari bilan muloqotga kirishishda ba’zan qiyinchiliklarga duch kelishi mumkin. Masalan, o‘yinga qanday qo‘shilishni bilmaslik, navbat kutishda qiynalish, o‘z xohishini tushuntira olmaslik yoki kelishmovchilik paytida qanday munosabat bildirishni bilmaslik holatlari uchrashi mumkin.Bunday vaziyatlarda pedagog bolani jamoaviy faoliyatdan chetlashtirmasligi, aksincha, uning tengdoshlari bilan muloqotga kirishishini qo‘llab-quvvatlashi lozim. Tengdoshlari bilan bajariladigan topshiriqlar, kichik guruhli mashg‘ulotlar va hamkorlikdagi o‘yinlar buning uchun qulay imkoniyat yaratadi. Masalan, ikki bola birgalikda rasmni bo‘yashi, konstruktor yig‘ishi yoki biror topshiriqni bajarishi mumkin. Bunda ular bir-biridan predmet so‘rashi, o‘z fikrini bildirishi va kelishib harakat qilishi kerak bo‘ladi. Shu tariqa muloqot sun’iy mashq emas, balki real faoliyatning tabiiy qismiga aylanadi.Muloqotdagi qiyinchiliklar uzoq vaqt davom etganda bolaning ijtimoiy faolligiga ham ta’sir qilishi mumkin. O‘z fikrini ifodalashga qiynaladigan bola ayrim vaziyatlarda muloqotdan qochishi yoki kattalarga

haddan tashqari tayanishi mumkin. Bu esa uning mustaqil faoliyatini cheklab qo‘yishi ehtimolini oshiradi. Shuning uchun pedagogik yordamning asosiy vazifalaridan biri bolaning muloqotdagi mustaqilligini bosqichma-bosqich oshirishdan iborat bo‘lishi kerak. Bola o‘zi salomlashsa, yordam so‘rasa, savol bersa yoki tengdoshi bilan suhbatni boshlasa, bunday harakatlar albatta ijobiy baholanishi lozim. Rag‘batlantirish bolaning muloqotga bo‘lgan qiziqishini oshiradi. Biroq rag‘bat faqat moddiy mukofot shaklida bo‘lishi shart emas. Iliq munosabat, maqtov, bolaning harakatini e’tirof etish va uning fikriga qiziqish bildirish ham kuchli pedagogik vosita hisoblanadi. Bola o‘z fikri tinglanayotganini va uning muloqotdagi harakatlari qadrlanayotganini his qilsa, muloqotga kirishish istagi ortadi. Shu sababli pedagog va ota-onalarning bolaga hurmat bilan munosabatda bo‘lishi kommunikativ rivojlanishning muhim shartlaridan biridir. Aqli zaif bolalar bilan ishlashda muloqotni rivojlantirishning samarali usullaridan biri kundalik hayotiy vaziyatlardan foydalanishdir. Bola o‘rgangan kommunikativ ko‘nikmalarini faqat dars davomida emas, balki real hayotda ham qo‘llashi kerak. Shuning uchun kiyinish, ovqatlanish, o‘yin, xarid qilish, sinfdagi tartibni saqlash kabi jarayonlarning har biridan muloqotni rivojlantirish uchun foydalanish mumkin.Masalan, bola kiyim tanlayotganda undan “Qaysi futbolkani kiymoqchisan?” deb so‘rash va tanlovini so‘z bilan ifodalashga undash mumkin. Ovqatlanish vaqtida “Nima xohlaysan?” deb so‘rab, bolaning o‘z istagini mustaqil bildirishiga imkon yaratish mumkin. Bunday oddiy vaziyatlar muntazam takrorlangani sababli kommunikativ ko‘nikmalar asta-sekin kundalik odatga aylanadi.Ko‘rgazmali vositalar ham muhim ahamiyatga ega. Rasm asosida hikoya tuzish, voqealar ketma-ketligini aniqlash, predmetlarni taqqoslash va savollarga javob berish bolaning nutqiy faolligini oshiradi. Ayniqsa, real predmet va bolaning bevosita tajribasiga asoslangan materiallar muloqot mazmunini tushunishni yengillashtiradi.Rolli o‘yinlardan foydalanish orqali esa kundalik hayotdagi muloqot vaziyatlarini oldindan mashq qilish mumkin. “Do‘konda xaridor va sotuvchi”, “Mehmonda”, “Maktabda”, “Do‘stidan yordam so‘rash” kabi vaziyatlar bolaning turli kommunikativ iboralardan foydalanishiga imkon beradi. Bundan tashqari, takrorlash ham muhim. Aqli zaif bola biror kommunikativ harakatni bir necha marta mashq qilgandan keyingina uni mustaqil qo‘llay boshlashi mumkin. Shu sababli bir xil ko‘nikmani turli vaziyatlarda qayta-qayta mustahkamlash zarur. Aqli zaif bolalar muloqotini rivojlantirishda oila va ta’lim muassasasi o‘rtasidagi hamkorlik muhim ahamiyatga ega. Chunki bola maktabda yoki maxsus ta’lim muassasasida o‘rgangan kommunikativ ko‘nikmalarini uy sharoitida ham qo‘llashi kerak. Ota-onalar bolaning o‘rniga hamma narsani bajarib qo‘ymasdan, uning mustaqil murojaat qilishiga imkon berishlari lozim.Biror narsani tanlash kerak

bo‘lsa, unga ikki yoki uchta variant taklif etib, o‘z tanlovini bildirishiga sharoit yaratish mumkin. Uy sharoitida kitob o‘qish, rasmlarni tomosha qilish, birgalikda kundalik ishlarni bajarish va sodda suhbatlar tashkil etish ham muloqotni rivojlantiradi. Eng muhimi, bolaning javobi sekin bo‘lsa ham, unga yetarli vaqt berish va uning o‘rniga javob bermaslik kerak. Pedagog va ota-onalar bolaning kommunikativ ko‘nikmalari shakllanganini va qaysilariga ko‘proq e’tibor berish zarurligini o‘zaro muhokama qilib borishlari lozim. Bunday hamkorlik muloqotni rivojlantirish jarayonining uzluksizligini ta’minlaydi. Aqli zaif bolalarning muloqotini baholashda faqat ularning nechta so‘z bilishi yoki grammatik jihatdan to‘g‘ri gapira olishi asosiy mezon bo‘lib qolmasligi kerak. Muhimi, bola o‘z bilim va nutqiy imkoniyatlaridan kundalik hayotda qanday foydalanayotganidir. Shu sababli bolaning mustaqil salomlasha olishi, o‘z ehtiyojini bildira olishi, yordam so‘rashi, savol berishi, savolga javob berishi, suhbatdoshni tinglashi, tengdoshi bilan o‘ynashi va muloqotni davom ettira olishi kabi ko‘rsatkichlarni kuzatish muhimdir. Bunday baholash bolaning real kommunikativ imkoniyatlarini aniqlashga yordam beradi. Shuningdek, bola vaqt davomida qanday rivojlanayotganini ko‘rish imkonini beradi.Alohida ta’lim ehtiyojlari bo‘lgan bolalar muloqotining o‘ziga xos xususiyatlarini o‘rganish, ayniqsa, aqli zaif bolalarning ta’lim va tarbiya jarayonini to‘g‘ri tashkil etishda muhim ahamiyatga ega. Muloqot bolaning nafaqat nutqiy rivojlanishini, balki uning bilish faoliyati, mustaqilligi, tengdoshlari bilan munosabati va ijtimoiylashuvini ham belgilovchi muhim omillardan biridir. Aqli zaif bolalarda muloqotning shakllanishi o‘ziga xos kechishi mumkin. Ularning so‘z boyligi, fikrni izchil ifodalashi, savol-javob jarayonidagi faolligi, suhbatni boshlashi va davom ettirishi turli darajada bo‘ladi. Shu sababli barcha bolalarga bir xil talab qo‘yish o‘rniga, ularning individual imkoniyatlarini hisobga olish zarur. Muloqotni rivojlantirish jarayonida bolaning real hayotiy faoliyatidan foydalanish, ko‘rgazmali vositalar, savol-javob, rolli o‘yinlar, juftlik va guruhli faoliyat, muntazam takrorlash hamda ijobiy rag‘batlantirish samarali natija beradi. Ushbu usullar bir-biridan alohida emas, balki o‘zaro bog‘liq holda qo‘llanilganda bolaning muloqotga bo‘lgan ehtiyoji va mustaqilligi izchil rivojlanadi. Bundan tashqari, oila va pedagogning hamkorligi bolaning kommunikativ ko‘nikmalarini mustahkamlashda muhim o‘rin tutadi. Ta’lim muassasasida o‘rgatilgan muloqot shakllari uy sharoitida ham qo‘llab-quvvatlansa, bola o‘zlashtirgan ko‘nikmalarini turli vaziyatlarda qo‘llashga imkon topadi.

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PERSONALIZED MOLECULARLY GUIDED MANAGEMENT OF ATOPIC DERMATITIS: PROGNOSTIC STRATIFICATION AND CLINICAL OUTCOMES IN A 300-PATIENT COHORT

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Abstract. Background: Precision management of atopic dermatitis may be improved by integrating clinical severity, allergen components and FLG genotype. Objective: To summarize outcomes of a personalized algorithm in patients with atopic dermatitis. Methods: Aggregated findings from a 2022–2025 study of 150 personalized-care patients and 150 retrospective comparators were analyzed descriptively. Results: A reported risk model achieved AUC 0.88, sensitivity 84.3% and specificity 81.2%. Excellent immediate responses occurred in 14.7% versus 2.0%; excellent longer-term outcomes in 29.3% versus 6.0%. Six-month sustained remission was reported in 59.8% versus 31.2%. Conclusion: The findings suggest clinical utility but warrant controlled evaluation and external validation.

Keywords: atopic dermatitis; personalized medicine; component-resolved diagnostics; FLG; SCORAD; prognostic model; outcomes

Introduction

Atopic dermatitis (AD) is a heterogeneous, relapsing inflammatory skin disorder (1,2). Differences in epidermal barrier integrity, allergen-specific sensitization and clinical disease burden complicate uniform management strategies. Integrating clinical severity scores, component-resolved allergy testing and filaggrin (FLG) mutation status may support a more individualized treatment pathway.

This study aimed to describe the clinical outcomes and prognostic performance reported for a personalized diagnostic–therapeutic algorithm incorporating molecular sensitization, FLG status, patient age and regional characteristics in patients with AD.

Materials and methods

This manuscript is based on the aggregated results of a 2022–2025 clinical study performed at a republican clinical allergology center in Uzbekistan. The study included 300 patients with AD: a personalized-management group (n=150) and a retrospective conventional-care comparison group (n=150). Therefore, the comparison is non-randomized and susceptible to differences between contemporary and historical patient management.

Assessment involved SCORAD, Dermatology Life Quality Index (DLQI), clinical history, total IgE, component-specific IgE measured by ALEX² and Phadia-200, and FLG mutation analysis including R501X and 2282del4. The source also describes IL-4, transepidermal water loss (TEWL), skin pH and patient-reported symptoms. A short-term multi-indicator clinical response scale and reassessment at 3, 6 and 12 months were used. The published dissertation abstract was the sole dataset for this article; participant-level data and prespecified statistical models were unavailable for reanalysis.

Results

The source reports that a multivariable prognostic model incorporating FLG genotype, molecular sensitization profile, age and residence achieved an area under the receiver operating characteristic curve (AUC) of 0.88, sensitivity of 84.3% and specificity of 81.2%. These estimates are reported as stated in the dissertation abstract; the validation approach and confidence intervals were not available in the summarized source.

Immediate therapeutic response was rated excellent in 22/150 (14.7%) patients under personalized management versus 3/150 (2.0%) patients in the conventional-care comparison. Unsatisfactory immediate responses occurred in 6/150 (4.0%) and 31/150 (20.7%), respectively. The source reported an excellent long-term outcome in 44/150 (29.3%) versus 9/150 (6.0%), while an unfavorable long-term outcome occurred in 18/150 (12.0%) versus 45/150 (30.0%).

In another analysis reported in the abstract, sustained remission at six months was 59.8% in the personalized group and 31.2% in the historical comparison group. A reduction of 53.1% in SCORAD and 46.7% in DLQI was also reported. At 12 months, 67.1% of patients undergoing personalized treatment did not require systemic treatment. A separate summary records a 56.4% SCORAD reduction at 12 weeks; these different estimates refer to separately stated endpoints and should not be treated as identical time points.

*The source labels the middle long-term category “satisfactory,” while its explanatory prose calls it a favorable result. The numeric categories are retained without resolving that inconsistency.

Table 1. Immediate clinical response reported for each study group

Response category	Personalized (n=150)	Comparison (n=150)
Excellent	22 (14.7%)	3 (2.0%)
Good	83 (55.3%)	48 (32.0%)
Satisfactory	39 (26.0%)	68 (45.3%)
Unsatisfactory	6 (4.0%)	31 (20.7%)

Table 2. Reported long-term response categories

Response category	Personalized (n=150)	Comparison (n=150)
Excellent	44 (29.3%)	9 (6.0%)
Intermediate/satisfactory*	88 (58.7%)	96 (64.0%)
Unsatisfactory	18 (12.0%)	45 (30.0%)

Table 3. Summary metrics reproduced from the source

Metric	Reported value
Prediction model	AUC 0.88; sensitivity 84.3%; specificity 81.2%
Sustained remission at 6 months	59.8% vs 31.2%

SCORAD and DLQI improvement	53.1% and 46.7%, respectively
Without systemic therapy at 12 months	67.1% in personalized care

Discussion

The reported differences favor a structured clinical pathway linking symptom burden, barrier-related genetic susceptibility and clinically interpreted molecular sensitization. An important potential advantage is the identification of patients for whom intensified follow-up and individualized allergen counseling may be useful. Component-specific IgE must nevertheless be interpreted in the context of exposure history and clinical reactions; sensitization alone is not synonymous with clinically relevant allergy.

The observational and partly retrospective design prevents causal attribution of all observed improvements to the algorithm. Potential confounding, differences in background treatment, incomplete reporting of loss to follow-up, and unavailable uncertainty estimates may affect the reported effect sizes. The proposed prediction model requires transparent reporting of coefficients, missing-data handling, validation strategy, calibration and external validation before wider clinical adoption.

Conclusion

A personalized management algorithm incorporating FLG genotype, molecular sensitization and clinical severity was associated with more favorable reported outcomes than a historical conventional-care comparator in this 300-patient AD cohort. The prognostic AUC of 0.88 and improvements in clinical outcomes support further prospective evaluation, but do not establish efficacy in the absence of independent validation and randomized or appropriately controlled assessment.

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ИЗУЧЕНИЕ МОРФОЛОГИЧЕСКИХ ПОКАЗАТЕЛЕЙ ОПУХОЛИ БРЕННЕРА

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Опухоли яичников остаются одной из наиболее актуальных проблем современной онкогинекологии вследствие сложности ранней диагностики, морфологической неоднородности и высокого риска опухолевой прогрессии. Опухоль Бреннера яичников представляет собой редкий вариант эпителиальных новообразований, относящийся к группе переходно-клеточных опухолей и характеризующийся признаками уротелиальной дифференцировки. В современной классификации Всемирной организации здравоохранения данная опухоль выделяется как самостоятельная нозологическая единица в составе эпителиальных опухолей яичников, что обусловлено её специфическими морфологическими и иммуногистохими-ческими особенностями. По данным эпидемиологических исследований, опухоль Бреннера составляет в среднем 1–2% всех опухолей яичников, что определяет её как редкую патологию. Несмотря на низкую распространённость, клиническая значимость данной опухоли обусловлена сложностями морфологической диагностики, вариабельностью гистологи-ческого строения и возможностью злокачественной трансформации.

В региональном аспекте, в том числе в Республике Узбекистан, проблема усугубляется недостатком статистических данных и отсутствием систематизированных исследований, посвящённых данной патологии. Это ограничивает возможности сравнения с международными данными и затруд-няет разработку региональных диагностических стандартов. В отечественной литературе подчёркивается недостаточная изученность редких эпителиаль-ных опухолей яичников, в том числе опухоли Бреннера, что определяет

необходимость дальнейших комплексных морфологических и иммуно-гистохимических исследований данной патологии.

Целью. Комплексное изучение патоморфологических и иммуногисто-химических особенностей опухоли Бреннера яичников с использованием маркеров CK7, GATA3, Ki-67 и p53 с целью уточнения диагностических критериев и оценки биологичес-кого поведения различных гистологических вариантов.

Материалы и методы исследования. В ходе выполнения диссертаци-онной работы были использованы клинические, патоморфологические, иммуногистохимические, морфометрические и статистические методы иссле-дования. В исследование были включены 45 пациенток с морфологически верифицированной опухолью Бреннера яичников, проходивших обследо-вание и лечение в специализированных онкологических и гинекологических учреждениях. Формирование исследуемой группы осуществлялось с учётом клинических, морфологических и иммуногистохимических критериев, что позволило обеспечить однородность выборки и провести достоверный сравнительный анализ различных гистологических вариантов опухоли. Возраст обследованных пациенток варьировал от 25 до 70 лет. Средний возраст составил 51,8±9,6 года. Наибольшее количество случаев приходилось на пациенток перименопаузального и постменопаузального периода, что соответствует современным литературным данным об эпидемиологических особенностях опухоли Бреннера.

Анализ возрастной структуры показал, что наибольшая частота опухоли Бреннера наблюдалась у пациенток старшей возрастной группы — 55–70 лет (33,4%). Полученные данные подтверждают преимущественное развитие данной патологии в перименопаузальном и постменопаузальном периоде.

По гистологическим вариантам обследованные пациентки распре-делялись следующим образом: доброкачественная опухоль Бреннера диаг-

ностирована у 36 пациенток (80,0%), пограничная форма у 6 (13,3%), злокачественная у 3 пациенток (6,7%).

Морфометрическое исследование. Морфометрический анализ являлся важной составной частью настоящего исследования и использовался для объективизации морфологических изменений опухоли Бреннера яичников, количественной оценки структурных характеристик и выявления закономерностей, связанных со степенью злокачественности опухоли. В отличие от традиционного гистологического анализа, основанного преи-мущественно на качественной оценке, морфометрия позволяет получить количественные параметры, что значительно повышает воспроизводимость результатов и снижает субъективность интерпретации.

Среди 45 обследованных пациенток репродуктивный возраст отмечался у 15 женщин (33,3%), перименопаузальный период — у 12 (26,7%), постменопауза — у 18 пациенток (40,0%). При этом в группе доброкачественных опухолей Бреннера преобладали пациентки репродуктивного и перименопаузального возраста, тогда как злокачественные формы чаще диагностировались у женщин старше 55 лет.

Полученные результаты. При анализе морфологических особен-ностей установлено, что у пациенток репродуктивного возраста преобладали опухоли с низкой пролиферативной активностью, выраженным стромальным компонентом и минимальной клеточной атипией. В перименопаузальном периоде чаще наблюдались признаки усиленной эпителиальной проли-ферации и очаговой дисплазии. У пациенток постменопаузального возраста отмечалось увеличение частоты пограничных и злокачественных форм, характеризующихся высокой клеточной плотностью, выраженной атипией. Дополнительно выявлена связь между репродуктивным статусом и пролиферативной активностью опухоли. У пациенток постменопаузального возраста показатели достоверно выше по

сравнению с женщинами репродуктивного периода, что свидетельствует о более высокой биологической агрессивности опухоли в данной возрастной группе. Распределение пациенток по репродуктивному статусу и морфологическим формам опухоли представлено в таблице 1.

Таблица 1.

Связь репродуктивного статуса с морфологическим диагнозом

Репродуктивный статус	**Доброкачественная форма**	**Пограничная форма**	**Злокачественная форма**	**Всего**
Репродуктивный период	14	1	0	15
Перименопауза	11	1	0	12
Постменопауза	11	4	3	18
Всего	**36**	**6**	**3**	**45**

Таким образом, проведённый анализ показал наличие тесной взаимо-связи между репродуктивным статусом пациенток и морфологическим вариантом опухоли Бреннера. Наиболее агрессивные формы опухоли преимущественно выявлялись у женщин постменопаузального возраста, что указывает на важную роль возрастно-гормональных факторов в процессах опухолевой прогрессии и малигнизации.

ВЫВОДЫ. Выявлена достоверная зависимость между возрастом пациенток и степенью злокачественности опухоли: в возрасте до 44 лет преобладали доброкачественные формы (до 90%), в группе 45–54 лет увеличивалась доля пограничных опухолей (до 20%), тогда как все злокачественные формы диагностированы у пациенток 55-70 лет ($p < 0,05$). Внедрение комплексного подхода позволяет повысить точность диагностики до 90-95%, что сопровождается снижением частоты диагностических оши-бок на 20-25%. При оптимизации диагностики средняя продолжительность пребывания пациенток в стационаре уменьшается на 2-3 койко-дня, что в масштабах

медицинских учреждений приводит к увеличению пропускной способности стационаров на 10–15%.

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BASED ON EPIZOOTOLOGICAL MONITORING IN THE NORTHWESTERN KYZYLKUM REGION, THE GREAT SAND MOUSE (RHOMBOMYS OPIMUS L.) STUDY OF POPULATION DYNAMICS

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Abstract: During the periods of deep depression in 2018-2022, the distribution of great sand mice in the area under consideration was uneven, characterized by a decrease in the population of great sand mice in the direction from northwestern sandy areas to the south.

Keywords: *Great sand mouse, Rhombomys opimus, dynamic change, epizootological process, population, depression.*

Certain features of the ecology of the great gerbil (*Rhombomys opimus*) also determine the specifics and methods of population registration of this species arising from them. The distribution of the great gerbil in the northwestern part of the Kyzylkum, the Beltau hills, the Akchadarya alluvial plain, the Nukus sands, and the Central Kyzylkum is uneven; it is characterized by a decrease in numbers from north to south and from northwestern sandy areas to south, which depends on habitat conditions and the impact of climate change.

Employees of the zoological laboratory of the Takhtakupyr branch of the Republic of Karakalpakstan Epidemic Protection Center used epizootiological monitoring data, and in this process, we witnessed that the population size of the great

gerbil was very low, and in some regions, it was completely absent, with cases of deep depression.

During the spring and autumn seasons of 2018-2022, the condition of great gerbil colonies was observed. During the analysis, the viability of the colonies (%), the average number of gerbils per colony, the average number of gerbils in each colony, and the actual number of rodents in all directions were taken into account (Table 1).

Table 1.

Colony viability (in %) and number

Reporting period	Colony viability %	Average number of mice per colony	Average number of mice in each colony	Actual number of rodents in all directions
May 2018 September 2018	48,6 52,4	5,6 5,8	2,6 2,8	238 271
May 2019 September 2019	5,6 17,4	1,8 3,3	0,7 1,6	127 143
May 2020 October 2020	18,4 23,7	3,6 3,8	1,7 1,8	157 183
May 2021 October 2021	00,0 3,9	0,0 0,0	0,0 0,6	7 21
May 2022 October 2022	5,3 6,6	2,5 1,9	0,4 0,7	23 47

As can be seen from Table 1, the actual change in population size can be accurately estimated from the average number of great herbivores in a colony.

The results of the study show that significant quantitative changes occurred in the great gerbil population between 2018 and 2022. In May 2018, the viability of the colonies was 48.6%, with an average population of 3.6 individuals per colony and an average population of 2.6 individuals per colony, totaling 238 individuals. In September 2018, these figures were 52.4%, 3.8%, 2.8%, and 271 units, respectively. Thus, in 2018, from spring to autumn, there was a relatively positive change in population indicators. In 2019, the population declined significantly. In May, the viability of the colonies was 5.6%, with an average of 1.8 individuals per colony, an

average of 0.7 individuals per colony, and a total population of 127 individuals. Although the viability of colonies increased to 17.4% in September, it did not reach the level of 2018. In 2020, the population declined significantly. In May, the viability of the colonies was 18.4%, and in autumn, it was 23.7%. The total number of sand mice during this period ranged from 157 to 183. The sharpest decline was recorded in 2021. In May, the viability of the colonies was 0%, and the average population per colony was 0. The total number of recorded individuals was only 7. In October 2021, the viability of the colonies was restored to 3.9%, but the total number did not exceed 21. In 2022, relatively positive population dynamics were observed. In May, the viability of the colonies was 5.3%, and in autumn, it was 6.6%. The total number of sand mice was 23 and 47, respectively.

The obtained data indicate high-amplitude, non-uniform, and seasonally variable dynamics in the great gerbil population during the 2018-2022 period. Population indicators, which were relatively high in 2018, decreased sharply in subsequent years, reaching their lowest level in 2021. In 2022, a gradual recovery of the population was observed. Such changes can be associated with environmental factors in the natural environment, the food base, precipitation regime, temperature, the state of vegetation cover, and other changes in the habitat.

The research results demonstrate the effectiveness of a comprehensive analysis of colony viability, colony density, and average individual numbers when assessing the state of the great gerbil population.

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SUN’IY INTELLEKT BILAN O‘ZARO TA’SIR SHAROITIDA YOSHLARNING PSIXOLOGIK FAROVONLIGI VA SHAXSIY O‘ZINI BOSHQARISHINING PSIXOLOGIK MEXANIZMLARI

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Annotatsiya.

Mazkur tezisda sun’iy intellekt (SI) texnologiyalari bilan faol o‘zaro ta’sir qilayotgan yoshlarning psixologik farovonligi va shaxsiy o‘zini boshqarish jarayonlarining psixologik mexanizmlari nazariy-metodologik jihatdan tahlil qilinadi. Raqamli texnologiyalar, xususan, generativ sun’iy intellekt vositalarining kundalik hayot, ta’lim, kasbiy faoliyat va shaxslararo muloqotga jadal kirib kelishi yoshlarning kognitiv, emotsional va xulq-atvor jarayonlariga yangi talablarni yuzaga keltirmoqda. Tadqiqotda sun’iy intellekt bilan o‘zaro ta’sirning yoshlar psixologik farovonligiga ta’siri o‘zini boshqarish, metakognitiv nazorat, emotsional regulyatsiya, psixologik avtonomiya va o‘z-o‘ziga samaradorlik kabi mexanizmlar orqali amalga oshishi haqidagi konseptual model ilgari suriladi. Shuningdek, sun’iy intellektdan foydalanishning chastotasidan ko‘ra undan foydalanish sifati, maqsadi va shaxsning mustaqil nazorat darajasi muhim omil sifatida ko‘rib chiqiladi. Tadqiqot natijalari yoshlar bilan psixologik-pedagogik ishlash, raqamli psixologik kompetentlikni rivojlantirish hamda sun’iy intellektdan mas’uliyatli foydalanish bo‘yicha amaliy tavsiyalar ishlab chiqishga xizmat qilishi mumkin.

Kalit so‘zlar: sun’iy intellekt, yoshlar, psixologik farovonlik, shaxsiy o‘zini boshqarish, o‘zini boshqarish, metakognitsiya, emotsional regulyatsiya, psixologik avtonomiya, o‘z-o‘ziga samaradorlik, raqamli muhit, generativ sun’iy intellekt.

Abstract

This thesis provides a theoretical and methodological analysis of the psychological mechanisms underlying the psychological well-being and personal self-regulation of

young people who actively interact with artificial intelligence (AI) technologies. The rapid integration of digital technologies, particularly generative artificial

intelligence tools, into everyday life, education, professional activities, and interpersonal communication is creating new demands on the cognitive, emotional, and behavioral processes of young people. The study proposes a conceptual model suggesting that the influence of interaction with artificial intelligence on young people's psychological well-being is mediated by such mechanisms as self-regulation, metacognitive control, emotional regulation, psychological autonomy, and self-efficacy. Furthermore, rather than focusing solely on the frequency of AI use, the study considers the quality and purpose of AI use, as well as the individual's level of autonomous control, as key factors. The findings may contribute to the development of practical recommendations for psychological and pedagogical interventions with young people, the development of digital psychological competence, and the responsible use of artificial intelligence.

Keywords: artificial intelligence, youth, psychological well-being, personal self-regulation, self-regulation, metacognition, emotional regulation, psychological autonomy, self-efficacy, digital environment, generative artificial intelligence.

Sun'iy intellekt tizimlari yoshlarning ta'lim olishi, muloqot qilishi va turli shakldagi yordamni izlash jarayonlariga tobora chuqur kirib bormoqda. Shu bilan birga, AI bilan takroriy o'zaro ta'sir yoshlarning kognitiv, emotsional va ijtimoiy rivojlanishiga yangi psixologik talablarni yuzaga keltirmoqda. Bugungi kunda sun'iy intellekt inson faoliyatining turli sohalariga jadal kirib kelayotgan texnologik hodisalardan biridir. Ayniqsa, sun'iy intellektga asoslangan ChatGPT, Gemini, Claude va boshqa raqamli vositalarning ommalashuvi yoshlarning axborot izlash, ta'lim olish, muammolarni hal qilish, qaror qabul qilish va muloqot qilish usullarini sezilarli darajada o'zgartirmoqda. Yoshlar raqamli texnologiyalardan eng faol foydalanuvchi guruhlardan biri bo'lib, ularning psixologik rivojlanishi va farovonligi raqamli muhitning xususiyatlari bilan

tobora ko‘proq bog‘lanmoqda. Jahon sog‘liqni saqlash tashkiloti yoshlar ruhiy salomatligi va farovonligini zamonaviy jamiyatning muhim masalalaridan biri sifatida ko‘rsatadi. WHO ma’lumotlariga ko‘ra, 10–19 yoshdagi har yetti nafar yoshdan biri ruhiy salomatlik bilan bog‘liq muammolarga duch keladi. Shu nuqtayi nazardan, sun’iy intellektning yoshlar hayotiga kirib kelishini faqat texnologik yoki ta’limiy jarayon sifatida emas, balki psixologik hodisa sifatida o‘rganish zarur. Sun’iy intellekt yoshga ma’lumotni tez topish, fikrlarni tartibga solish, reja tuzish, o‘qish jarayonini tashkil qilish va ayrim emotsional qiyinchiliklarda suhbatdosh sifatida foydalanish imkonini beradi. Biroq AI'ga haddan tashqari tayanish mustaqil fikrlash, qaror qabul qilish, mas’uliyatni o‘z zimmasiga olish va o‘z faoliyatini nazorat qilish jarayonlariga ham ta’sir qilishi mumkin. Demak, asosiy ilmiy muammo sun’iy intellektning o‘zi yaxshi yoki yomon ekanligini aniqlash emas, balki yoshning AI bilan o‘zaro ta’siri qanday psixologik mexanizmlar orqali uning farovonligi va o‘zini boshqarishiga ta’sir qilishini aniqlashdan iborat. Psixologiyada shaxsiy o‘zini boshqarish shaxsning o‘z xatti-harakatlari, emotsiyalari, motivlari va faoliyatini belgilangan maqsadlarga muvofiq tartibga solish qobiliyati sifatida qaraladi. Zamonaviy raqamli muhit esa mazkur jarayonni yangi sharoitga olib kirmoqda. Avval shaxs ma’lumotni mustaqil izlash, taqqoslash, tahlil qilish va qaror chiqarishga ko‘proq vaqt sarflagan bo‘lsa, bugungi kunda sun’iy intellekt ushbu jarayonlarning bir qismini o‘z zimmasiga olishi mumkin. Shuning uchun zamonaviy yosh shaxsining o‘zini boshqarishi endilikda faqat “o‘z faoliyatini boshqarish” bilan cheklanmay, “texnologiyadan foydalanish jarayonini boshqarish” qobiliyatini ham o‘z ichiga olishi kerak.Buni quyidagi formula orqali ifodalash mumkin:

AI bilan o‘zaro ta’sir → metakognitiv nazorat → o‘zini boshqarish → psixologik avtonomiya → psixologik farovonlik.

Mazkur zanjir tadqiqotning asosiy konseptual yo‘nalishini tashkil etadi. 2024-yildagi tadqiqotlardan birida sun’iy intellekt asosidagi vositalar talabalarning o‘zini

boshqarish jarayonlarini individuallashtirilgan tarzda tushuntirish va qo‘llab-quvvatlash imkoniyatiga ega ekanligi ko‘rsatilgan. Tadqiqot shuningdek, turli talabalar uchun o‘zini boshqarishni belgilovchi omillar bir xil emasligini ko‘rsatadi. Bu natija yoshlarning AI bilan munosabatini “o‘rtacha foydalanuvchi” modeli orqali emas, balki individual psixologik farqlar asosida o‘rganish zarurligini ko‘rsatadi. Sun’iy intellekt yoshlarning o‘zini boshqarishiga ikki xil yo‘nalishda ta’sir qilishi mumkin.

Birinchi yo‘nalish — qo‘llab-quvvatlovchi ta’sir

AI:

- maqsadni aniqlashtirish;

- reja tuzish;

- vazifalarni bosqichlarga ajratish;

- vaqtni boshqarish;

- o‘quv materialini tushuntirish;

- refleksiya qilish;

- muqobil yechimlarni ko‘rib chiqish

kabi jarayonlarda yordamchi bo‘lishi mumkin.

Masalan, ChatGPT asosidagi ta’limiy tajribalarda AI o‘quvchilarning motivatsiyasi, faol ishtiroki va o‘zini boshqarib o‘rganish jarayonlarini qo‘llab-quvvatlashi mumkinligi aniqlangan.

Ikkinchi yo‘nalish — kompensator yoki qaramlikka olib keluvchi ta’sir Agar yosh: “Men o‘zim o‘ylamayman, AI javob beradi”. Sun’iy intellekt yoshlarning o‘zini boshqarishiga ikki xil yo‘nalishda ta’sir qilishi mumkin.

Birinchi yo‘nalish — qo‘llab-quvvatlovchi ta’sir.

AI:

-maqsadni aniqlashtirish;

- reja tuzish;

- vazifalarni bosqichlarga ajratish;

- vaqtni boshqarish;

- o‘quv materialini tushuntirish;

- refleksiya qilish;

- muqobil yechimlarni ko‘rib chiqish

kabi jarayonlarda yordamchi bo‘lishi mumkin. Masalan, ChatGPT asosidagi ta’limiy tajribalarda AI o‘quvchilarning motivatsiyasi, faol ishtiroki va o‘zini boshqarib o‘rganish jarayonlarini qo‘llab-quvvatlashi mumkinligi aniqlangan.

Ikkinchi yo‘nalish — kompensator yoki qaramlikka olib keluvchi ta’sir. Agar yosh: “Men o‘zim o‘ylamayman, AI javob beradi” tamoyiliga o‘tsa, texnologiya shaxsning mustaqil kognitiv faolligini qisqartirishi mumkin. Bunda quyidagi xavf paydo bo‘ladi:

AI'dan foydalanish → mustaqil qaror kamayishi → tashqi tayanchga ehtiyoj ortishi → psixologik avtonomiya pasayishi.

Shuning uchun AI'dan foydalanishning chastotasi emas, foydalanish usuli muhim. Psixologik farovonlik shaxsning o‘z hayotini mazmunli deb his qilishi, ijobiy emotsional holat, hayotdan qoniqish, shaxsiy rivojlanish, ijobiy munosabatlar va o‘z hayotini boshqarish imkoniyatini his qilishi bilan bog‘liq murakkab psixologik holatdir. Sun’iy intellekt bu jarayonga ham ijobiy, ham salbiy yo‘nalishda ta’sir ko‘rsatishi mumkin. 2025-yilda e’lon qilingan tizimli sharhda generativ AI vositalarining yoshlar farovonligi bilan bog‘liq qo‘llanilishi tahlil qilingan va 69 ta empirik tadqiqot asosida AI vositalarining emotsional regulyatsiya, tashvish, ijtimoiy

xavotir va boshqa farovonlik ko‘rsatkichlari bilan bog‘liq qo‘llanish holatlari aniqlangan. Shu bilan birga, uzoq muddatli ta’sirlar bo‘yicha dalillar hali cheklanganligi qayd etilgan. Shuningdek, yoshlar ruhiy salomatligini qo‘llab-quvvatlashda avtomatlashtirilgan suhbat agentlaridan foydalanish bo‘yicha 2024-yilgi sharh AI asosidagi suhbat vositalariga ilmiy qiziqish keskin oshganini ko‘rsatadi. Demak, AI yoshning psixologik farovonligini oshiruvchi vositaga aylanishi ham, aksincha, noto‘g‘ri foydalanilganda yangi psixologik muammolarni yuzaga keltiruvchi omilga aylanishi ham mumkin.

Xulosa.

Umuman olganda, sun’iy intellektning yoshlar psixologik rivojlanishiga ta’sirini chuqur anglash uchun uzoq muddatli, empirik va fanlararo tadqiqotlarni tizimli ravishda rivojlantirish zarur. Ayniqsa, AI bilan o‘zaro ta’sirning o‘zini boshqarish, metakognitiv nazorat, emotsional regulyatsiya, psixologik avtonomiya va psixologik farovonlik bilan bog‘liq mexanizmlarini aniqlash mazkur yo‘nalishdagi muhim ilmiy vazifalardan biridir. Bunday yondashuv AI ta’sirining nafaqat mavjud holatini, balki uning yoshlar psixologik rivojlanishidagi uzoq muddatli oqibatlari va rivojlantiruvchi imkoniyatlarini ham ilmiy asosda baholash imkonini beradi.

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YOPIQ KALLA-MIYA JAROHATLARINING UZOQ MUDDATLI OQIBATLARIDA SABABIY BOG‘LANISHNI SUD-TIBBIY BAHOLASH

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Dolzarbligi: Jarohatdan keyin uzoq vaqt o‘tgach aniqlangan nevrologik, kognitiv yoki psixoemotsional buzilishlarning kelib chiqishini baholash sud-tibbiy ekspertizada murakkab masalalardan biri hisoblanadi. Jarohatdan keyin simptom paydo bo‘lishi vaqt jihatidan bog‘liqlikni ko‘rsatadi, biroq sababiy bog‘lanishni yakka o‘zi isbotlamaydi. Ekspert xulosasi jarohat mexanizmi, dastlabki hujjatlar, klinik dinamika, ob’ektiv tekshiruvlar va muqobil sabablarning tahliliga asoslanishi kerak [1,2].

Maqsad: Yopiq kalla-miya jarohatlari va ularning uzoq muddatli oqibatlari o‘rtasidagi sababiy bog‘lanishni baholashning asosiy klinik-ekspert mezonlarini umumlashtirish.

Materiallar va usullar: Tezis kalla-miya jarohatlarining uzoq muddatli natijalari va sud-tibbiy baholashga oid ilmiy sharhlar tahlili asosida tayyorlandi. Original klinik tanlanma yoki statistik tahlil mavjud emas.

Sababiy bog‘lanishni baholashda, avvalo, jarohat holatlari va dastlabki tibbiy hujjatlar o‘rganiladi. Hush darajasi, amneziya, fokal nevrologik belgilar, intrakranial qon quyilishlar va neyroxirurgik aralashuvlar haqidagi ma’lumotlar keyingi holat bilan taqqoslanadi. Keyingi davrda simptomlarning boshlanish vaqti, davomiyligi, dinamikasi va ob’ektiv tekshiruvlar bilan tasdiqlanishi baholanadi.

Jarohatdan oldingi kasalliklar, avvalgi jarohatlar, qon-tomir omillari, uyqu buzilishlari, dori vositalari ta’siri va psixoemotsional holat kabi muqobil tushuntirishlar ham hisobga olinishi lozim. Neyrovizualizatsiyada struktur o‘zgarish aniqlanmasligi ayrim klinik oqibatlarni to‘liq inkor etmaydi; shuningdek, tasvirdagi o‘zgarishning o‘zi muayyan simptomning yagona sababini tasdiqlamaydi [1, 2].

Xulosa: Yopiq kalla-miya jarohatlarining uzoq muddatli oqibatlarida sababiy bog‘lanishni baholash xronologik ketma-ketlik, ob’ektiv klinik dalillar, instrumental natijalar va muqobil sabablarni kompleks tahlil qilishga asoslanishi lozim. Noaniqliklar mavjud bo‘lsa, ular ekspert xulosasida ochiq ko‘rsatilishi kerak.

Kalit so‘zlar: kalla-miya jarohati, sababiy bog‘lanish, uzoq muddatli oqibatlar, ekspert xulosasi, sud-tibbiy ekspertiza.

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THE ROLE OF THE SONG AND RHYME IN TEACHING ENGLISH PHONETICS AT THE INITIAL STAGES

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Annotation*:This article explores the pedagogical and linguistic significance of songs and rhymes in developing English phonetic competence among beginner-level learners. Particular attention is devoted to the role of rhythmic patterns, melodic structures, and repetitive sound sequences in facilitating accurate pronunciation, phonemic awareness, word stress, and intonation. From a psycholinguistic perspective, musical and rhythmic activities provide opportunities to strengthen auditory discrimination, reinforce phonological memory, and support the acquisition of unfamiliar sound patterns. The study examines how the integration of songs and rhymes into early English language instruction can transform phonetic practice from mechanical repetition into meaningful, emotionally engaging learning experiences. It further highlights the potential of rhythm-based instruction to address pronunciation difficulties arising from differences between learners' native phonological systems and English. The article argues that the educational effectiveness of songs and rhymes depends not merely on their motivational appeal but on their systematic alignment with specific phonetic objectives, learners' developmental characteristics, and appropriate instructional strategies. Such an approach offers a theoretically grounded framework for fostering pronunciation accuracy, phonological sensitivity, and communicative confidence during the initial stages of English language acquisition.*

Keyword*: English phonetics, songs and rhymes, phonetic competence, phonological awareness, pronunciation acquisition, auditory discrimination, rhythmic instruction, prosodic features, phonological memory, early language learning, intonation patterns, communicative competence.*

NTRODUCTION

The acquisition of accurate pronunciation constitutes one of the fundamental challenges in the early stages of English language learning. Unlike vocabulary and grammatical structures, phonetic competence requires learners to develop sensitivity to unfamiliar sound distinctions, articulatory patterns, stress placement, and intonational variations. For young and beginner-level learners, these processes may

become particularly demanding when the phonological characteristics of English differ significantly from those of their native language. Consequently, contemporary language pedagogy increasingly emphasizes the importance of instructional approaches that integrate auditory perception, meaningful repetition, and active learner engagement. Among the various techniques employed in early phonetic instruction, songs and rhymes occupy a distinctive position due to their combination of linguistic regularity, rhythmic organization, and emotional expressiveness. Their pedagogical value extends beyond creating an enjoyable classroom atmosphere. The recurring sound patterns embedded in musical and rhyming structures provide learners with opportunities to recognize phonemic contrasts, internalize pronunciation models, and develop awareness of the prosodic organization of English speech. In particular, the relationship between musical rhythm and linguistic stress offers a potentially productive foundation for introducing learners to the temporal and melodic characteristics of spoken English. From a psycholinguistic perspective, the effectiveness of songs and rhymes can be examined through the interaction of auditory processing, phonological memory, and implicit language learning. Repeated exposure to predictable rhythmic sequences may facilitate the recognition and retention of unfamiliar phonetic forms, while melodic variation can draw learners' attention to changes in pitch, stress, and intonation. Furthermore, the integration of movement, repetition, and vocal participation creates opportunities for multisensory learning, allowing phonetic features to be experienced not only as abstract linguistic units but also as meaningful components of oral communication. The relevance of the present study lies in the need to reconsider traditional pronunciation instruction through the lens of rhythm-based and learner-centered methodologies. The primary aim of this article is to examine the linguistic, cognitive, and pedagogical functions of songs and rhymes in teaching English phonetics at the initial stages of language acquisition. Particular emphasis is placed on their potential contribution to phonemic awareness, pronunciation accuracy, word stress, intonation, and learners' confidence in oral

communication. By exploring the relationship between rhythmic language activities and phonetic development, the study seeks to identify pedagogically justified principles for integrating songs and rhymes into early English language education.

MAIN BODY

Teaching English phonetics at the initial stages involves much more than introducing individual sounds and asking learners to repeat them. Pronunciation develops through listening, imitation, experimentation, and gradual adjustment to unfamiliar speech patterns. For beginners, particularly young learners, this process is not always straightforward. They may recognize an English word in written form but struggle to reproduce its pronunciation or distinguish it from another word with a similar sound. Such difficulties often arise because learners instinctively interpret unfamiliar sounds through the phonological system of their native language. In this context, songs and rhymes offer a valuable way of bringing English pronunciation closer to learners' everyday experiences.

One of the most distinctive characteristics of songs is their ability to present linguistic material in a form that naturally encourages repetition. In conventional pronunciation exercises, repeating the same word several times may gradually become monotonous. Within a song, however, repetition is connected to melody, rhythm, and anticipation. Learners encounter the same sounds repeatedly without necessarily perceiving the activity as mechanical practice. This distinction is pedagogically meaningful because acquiring unfamiliar phonetic patterns requires sustained exposure and repeated attempts at production. The musical structure does not eliminate the difficulties of pronunciation, but it creates conditions in which learners may be more willing to confront them. The relationship between rhythm and English pronunciation deserves particular consideration. English speech is characterized by complex interactions between stressed and unstressed syllables, vowel reduction, and variations in speech

timing. Learners whose native languages follow different rhythmic conventions may find these features challenging. Rhythmic chants and carefully selected songs can make stress patterns more noticeable by drawing attention to prominent syllables and recurring sequences. For example, when learners pronounce short phrases while following a steady beat, they can begin to recognize that certain words or syllables receive greater prominence than others. Nevertheless, musical rhythm should not be confused with the natural rhythm of spoken English. A melody may alter syllable duration or emphasize words that would not ordinarily be stressed in conversation. Teachers must therefore help learners distinguish between musical performance and authentic speech. An equally important consideration is the role of feedback. During group singing, pronunciation inaccuracies may remain unnoticed because individual voices are blended together. Consequently, successful participation in a musical activity should not be interpreted as evidence of individual phonetic mastery. Teachers can address this limitation by combining collective performance with short individual tasks, paired dialogues, and focused pronunciation checks. Feedback should draw attention to specific features rather than simply classify pronunciation as correct or incorrect. For example, a learner who substitutes /s/ for /θ/ benefits more from a clear articulatory demonstration and an opportunity to compare the two sounds than from repeated requests to pronounce the word again.

CONCLUSION

The role of songs and rhymes in teaching English phonetics extends beyond their conventional association with enjoyable classroom activities. Their educational value lies in the ability to connect auditory perception, rhythmic awareness, and pronunciation practice within a meaningful linguistic experience. At the initial stages of language acquisition, when learners are still developing sensitivity to unfamiliar sound patterns, such activities can provide a supportive foundation for recognizing phonemic distinctions, understanding stress and intonation, and gradually improving

articulatory accuracy. The analysis suggests that the effectiveness of songs and rhymes depends less on their entertaining nature than on their purposeful integration into phonetic instruction. Repetition becomes educationally significant when accompanied by conscious sound recognition, appropriate pronunciation models, and opportunities for independent speech production. Equally important is the teacher's ability to distinguish between successful rhythmic imitation and genuine phonetic competence, ensuring that learners can transfer practiced pronunciation patterns into spontaneous communication. Ultimately, songs and rhymes should be regarded as complementary rather than self-sufficient methods of pronunciation instruction. Their thoughtful application can make early phonetic learning more accessible, engaging, and linguistically meaningful. The central pedagogical implication is that effective pronunciation teaching does not simply require learners to repeat sounds more frequently, but to hear them more attentively, understand their distinctive features, and use them confidently in authentic speech.

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ПРОГНОЗИРОВАНИЕ И ПРОФИЛАКТИКА РЕЦИДИВА СПАЕЧНОЙ БОЛЕЗНИ БРЮШНОЙ ПОЛОСТИ И СПАЕЧНОЙ КИШЕЧНОЙ НЕПРОХОДИМОСТИ

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Актуальность. Спаечная болезнь брюшной полости (СББП) и спаечная кишечная непроходимость (СКН) продолжают оставаться одной из наиболее частых и тяжелых проблем в абдоминальной хирургии, определяя существенную долю послеоперационных осложнений и летальности (1,3,5).

Актуальность разработки новых методов профилактики и лечения СББП с учетом иммунопатогенетических механизмов обусловлена не только клиническими потребностями, но и значительным экономическим и социальным бременем для здравоохранения (2,4). Снижение частоты СКН способно привести к экономии миллиардов долларов в год, снижению числа инвалидизированных пациентов и улучшению качества жизни тысяч больных по всему миру.

Цель исследования: Разработка лечебно-диагностического алгоритма прогнозирования и профилактики рецидива СББП и СКН.

Материалы и методы. Объектом исследования явились 265 пациентов с ОСКН. Референсную группу составили 20 условно-здоровых лиц без хирургических вмешательств на органах брюшной полости. Основную когорту наблюдения включали (128 пациентов), у которых применялся разработанный лечебно-диагностический алгоритм прогнозирования и профилактики рецидива.

Результаты и их обсуждение. Систематизация результатов контрольной группы и анализ динамики иммунологических показателей в основной выборке показали, что хирургическое вмешательство и последующая иммунопрофилактика не могут рассматриваться изолированно. Практически значимым стало объединение этих этапов в единый лечебно-диагностический алгоритм, где решение о тактике формируется с учетом прогностической шкалы «PAS». Такой подход позволил не только фиксировать исходный уровень риска у больных, перенесших экстренные операции или консервативное лечение по поводу ОСКН, но и корректировать его в раннем послеоперационном периоде за счет дифференцированной иммунотерапии. Повторная стратификация открывала возможность для селективного назначения плановых лапароскопических вмешательств с применением профилактических приемов, что в итоге придало всей системе комплексный и последовательный характер.

Плановые лапароскопические вмешательства у пациентов основной группы носили ограниченный и профилактический характер. Они были направлены на устранение ключевых препятствий для пассажа, минимизацию операционной травмы и создание условий для благоприятного заживления брюшины. Применение лапароскопии в сочетании с ультразвуковым коагулятором (Harmonic, Ethicon), обязательной перитонеализацией и адресным использованием барьерных средств составило основу разработанной тактики плановых операций по поводу СББП.

Плановое лапароскопическое вмешательство после проведенной иммунопрофилактики позволяет минимизировать операционную травму, целенаправленно изолировать зоны риска и перевести пациента из категории «высокого риска» в «низкую». Использование ультразвукового хирургического коагулятора (Harmonic, Ethicon), обязательной перитонеализации и локальных барьерных средств составило основу профилактической тактики.

На основании проведенного исследования и применения оптимизированных подходов нами разработан «Лечебно-диагностический алгоритм прогнозирования и профилактики рецидива СББП и ОСКН» Основная суть алгоритма заключается в последовательной стратификации пациентов и выборе тактики на каждом этапе, что позволяет объединить хирургическое вмешательство и иммунопрофилактику в единую систему. Алгоритм построен по принципу «дерева решений», когда исходные события и последующие шаги связаны с результатами оценки риска по шкале «PAS» и динамикой ее изменений.

На первом этапе при отсутствии эффекта от консервативной декомпрессии ОСКН проводится экстренное хирургическое вмешательство. Уже на этом этапе применяются профилактические элементы в виде щадящего адгезиолизиса, ограниченного использования коагуляции, перитонеализации поврежденных участков, локальной укладки барьерных покрытий и, по возможности, все перечисленное выполняется лапароскопическим доступом. При успешном консервативном разрешении ОСКН фиксируется исходная точка для дальнейшего наблюдения.

После стабилизации состояния выполняется расчет по шкале «PAS» и в зависимости от полученного балла пациенты распределяются на три категории: «высокий риск» (≥25 баллов), «низкий риск» (6-24 балла) и «отсутствие риска» (≤5 баллов). Такой «первый срез» определяет стартовую траекторию ведения больного в последующем. Соответственно в зависимости от категории риска назначается дифференцированная иммунопрофилактическая терапия.

При «высоком риске» акцент делается на подавлении IL-6, коррекции дисбаланса фибринолиза и стабилизации микроциркуляции; терапия включает

комплексное использование нескольких препаратов. При «низком риске» применяются более щадящие схемы, направленные на поддержание фибринолитического потенциала и ограничение активности фиброзного каскада. У пациентов «без риска» иммунопрофилактика не проводится, они находятся под динамическим наблюдением.

Контроль осуществляется через 30 дней, затем через 3 и 6 месяцев. Оценка динамики проводится не только по сумме баллов, но и по клинической картине. При снижении балла «PAS» и исчезновении симптомов тактика ограничивается наблюдением. При сохранении «высокого риска» терапия продлевается или усиливается. При нарастании показателей требуется пересмотр стратегии с консилиумным обсуждением.

При устойчиво «высоком риске» в сочетании с клинической симптоматикой СББП с частыми приступами ОСКН состояний пациенту показана плановая лапароскопическая операция. Она носит селективный характер: устраняются только значимые спайки, используется ультразвуковой коагулятор (Harmonic, Ethicon), обязательно выполняется перитонеализация травмированных зон и адресная укладка барьерных средств. Вмешательство рассматривается как логическое продолжение иммунопрофилактики, а не ее альтернатива.

После плановых вмешательств проводится повторная оценка «PAS» по тем же временным точкам. При переходе в «низкий» или «нулевой» риск интенсивность иммунопрофилактики снижается до поддерживающей. При сохранении «высокого риска» обсуждается дополнительный курс коррекции.

Таким образом, предложенный лечебно-диагностический алгоритм позволил объединить хирургическую тактику и иммунопрофилактику в единую систему ведения больных со СББП и ОСКН. Последовательная стратификация пациентов по шкале «PAS» и выбор вмешательств в зависимости от уровня риска обеспечили сокращение числа лиц с неблагоприятным прогнозом, снижение частоты рецидивов и летальности, а также уменьшение потребности в повторных экстренных операциях. Включение алгоритма в клиническую практику делает возможным не только индивидуализацию лечения, но и воспроизводимое достижение более благоприятных исходов за счет сочетания патогенетически обоснованной терапии и щадящей малоинвазивной хирургии.

ВЫВОДЫ :

1. Предложенный лечебно-диагностический алгоритм позволил объединить хирургическую тактику и иммунопрофилактику в единую систему ведения больных со СББП и ОСКН. Последовательная стратификация пациентов по шкале «PAS» и выбор вмешательств в зависимости от уровня риска обеспечили сокращение числа лиц с неблагоприятным прогнозом, снижение частоты

рецидивов и летальности, а также уменьшение потребности в повторных экстренных операциях.

2. Включение алгоритма в клиническую практику делает возможным не только индивидуализацию лечения, но и воспроизводимое достижение более благоприятных исходов за счет сочетания патогенетически обоснованной терапии и щадящей малоинвазивной хирургии.

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THE ROLE OF DIFFUSION-WEIGHTED AND HEPATOBILIARY-PHASE MRI IN THE CHARACTERIZATION OF FOCAL LIVER LESIONS

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Keywords: focal liver lesions; magnetic resonance imaging; diffusion-weighted imaging; apparent diffusion coefficient; gadoxetic acid.

Relevance. Magnetic resonance imaging (MRI) offers the highest soft-tissue contrast among imaging methods and plays a central role in characterizing liver lesions that remain indeterminate after ultrasound. In recent years, diffusion-weighted imaging (DWI) and hepatobiliary contrast agents have substantially expanded the diagnostic capabilities of liver MRI. Their correct use and interpretation, including typical pitfalls, are essential for radiologists in daily practice.

Aim. To summarize current data on the value of DWI with apparent diffusion coefficient (ADC) mapping and gadoxetic acid-enhanced MRI in the differential diagnosis of focal liver lesions.

Materials and methods. Guidelines, meta-analyses and key original studies on liver MRI indexed in PubMed and Scopus were reviewed.

Results and discussion. DWI reflects the restriction of water molecule motion and thus the cellularity of tissue. Malignant tumors usually show restricted diffusion and low ADC values, while cysts and hemangiomas show high ADC values [4]. ADC values do overlap, however. Abscesses restrict diffusion because of viscous pus, and necrotic or mucinous metastases may show high ADC. DWI should therefore always be read together with T2-weighted and dynamic contrast-enhanced images. Gadoxetic acid is taken up by functioning hepatocytes. In the hepatobiliary phase, focal nodular hyperplasia is usually iso- or hyperintense, whereas hepatocellular adenoma is most often hypointense, which helps to separate these two lesions [2]. Metastases lack hepatocytes and appear as clearly hypointense foci. According to meta-analysis data, combining DWI with gadoxetic acid-enhanced MRI provides the highest sensitivity for liver metastases, especially lesions under 1 cm [5]. A known pitfall is the "pseudo-washout" of high-flow hemangiomas in the transitional phase, which may mimic a hypervascular tumor. A very bright signal on T2-weighted images helps to avoid this

error [3]. In cirrhotic patients, the LI-RADS system standardizes reporting, using DWI restriction and hepatobiliary hypointensity as ancillary features [1].

Conclusion. DWI with ADC mapping and the hepatobiliary phase of gadoxetic acid-enhanced MRI considerably improve the detection and characterization of focal liver lesions. Their diagnostic value is greatest when they are interpreted together with conventional sequences, the dynamic phases and the clinical context.

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COMPREHENSIVE ULTRASOUND AS A TRIAGE TOOL IN THE DIFFERENTIAL DIAGNOSIS OF FOCAL LIVER LESIONS

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Keywords: focal liver lesions; ultrasound; color Doppler imaging; elastography; contrast-enhanced ultrasound.

Relevance. Focal liver lesions are found ever more often as incidental findings on routine abdominal ultrasound. Most of them are benign, such as simple cysts, hemangiomas and focal nodular hyperplasia. However, hepatocellular carcinoma and metastases may look very similar at first examination. Magnetic resonance imaging (MRI) resolves most of these doubts, but it is expensive and not available everywhere. Clear criteria are therefore needed to decide which lesions can be followed with ultrasound alone and which require MRI.

Aim. To analyze current literature on the diagnostic value of B-mode, color Doppler imaging, shear wave elastography and contrast-enhanced ultrasound (CEUS), and to define the place of comprehensive ultrasound as the first, triage step in the work-up of focal liver lesions.

Materials and methods. International guidelines (EASL, WFUMB, EFSUMB) and widely cited reviews indexed in PubMed and Scopus were analyzed, with a focus on ultrasound signs that separate benign from malignant lesions.

Results and discussion. B-mode ultrasound reliably identifies simple cysts by their anechoic content, thin wall and posterior acoustic enhancement. A typical hemangioma appears as a small, well-defined, homogeneously hyperechoic lesion. Its appearance may change, though, against a fatty liver, and some metastases are also hyperechoic [3, 4]. Color Doppler imaging adds information on the vascular pattern. A spoke-wheel arterial flow suggests focal nodular hyperplasia, whereas chaotic intratumoral vessels favor malignancy. Shear wave elastography measures the stiffness of both the lesion and the background liver, but values overlap and must be read together with B-mode findings [2]. CEUS shows lesion perfusion in real time. Washout in the portal and late phases is the key sign of malignancy, while peripheral nodular enhancement with centripetal fill-in is typical of hemangioma [1, 4]. Based on these

signs, lesions can be sorted into three groups: typical benign (follow-up with ultrasound), indeterminate (targeted MRI) and suspicious (mandatory MRI and, if needed, biopsy).

Conclusion. Comprehensive ultrasound combining B-mode, color Doppler imaging and elastography, supplemented by CEUS where available, can serve as an effective triage step. It confirms typical benign lesions without further imaging and directs MRI to the patients who truly need it. This approach makes better use of MRI resources and shortens the time to diagnosis of malignant lesions.

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O‘QUVCHILARNING NAMOYISHGA OID EKSPERIMENTAL KOMPETENSIYALARNI RIVOJLANTIRISHNING ILMIY-NAZARIY ASOSLARI

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Annantatsiya: Ushbu mavzuda maktab o‘quvchilarga namoyishga oid ekesperimental kompitensiyalarni rivojlantirishning ilmiy-nazariy asoslari yoritiladi. Maqolada maktab o‘quvchilarida ekesperimental tajribalarni pedagogik-psixologik rivojlantirish ilmiy-nazariy tamoyillari keltirilgan.

Kalit so‘zlar: ekesperimental kompitensiya, namoyish tajribasi, o‘quvchi, pedagogik shar-sharoit, ta’lim samaradorligi, amaliy ko‘nikmalar, kompitentlik, dasturiy ta’minot,komyuter ekesperimenti.

KIRISH.

Hozirda raqamlashgan sharitda ta’lim tizmini takomillashtirish asnosida tabiiy fanlar hususan (fizika, kimyo, biologiya) fanlarida mavjud bo‘lgan ekesperimental kompitensiyalarni dasturiy ta’minotlar yordamida takomillashtirish, shuningdek dars jarayonida qiyin bo‘lgan. Mazkur maqola asosida maktab o‘quvchilarga pedagogik shart-sharoitalardan kelib chiqib ta’lim samaradorligini oshirish uchun namoyish tajribalarini kengroq tushintirish asosiy holat bo‘ladi.

Bugungi kundagi texnika taraqqiyoti, axborot kommunikatsion texnologiyalarning ta’lim jarayoniga keng joriy etilishi aqliy ravishda fizikadan o‘quv-eksperimentini klassifikatsiyasida “kompyuter eksperimenti” o’quv elementi ham joy oldi.

O‘quvchilarning o‘quv-bilish faoliyati - bu nafaqat bilish natijalarini o‘zlashtirish, balki bilish yo‘lining o‘zi bilan yashashdir. Real bilish muammolarini hal

qilish uchun ijodiy izlanuvchanlik faoliyati usullarini amalga oshirish, ilmiy bilimlarning ob'ektiv qarama-qarshiliklari va ularni hal qilish yo'llari bilan mustaqil tanishib borish yutuqlaridan xabardor bo'lish, yangi ixtirolar bilan tanishib borish, bilimlarni amaliy va hayotiy vaziyatlarda qo'llash usullarini o'zlashtirishdan iborat. Namoyishga oid kompetensiya o'quvchilarining bilish faoliyatini fizik hodisalar va qonunlarni o'rganish, eksperimentlar o'tkazish, fizik masalalarni yechish kabi faoliyatlar yordamida rivojlantiriladi.

ASOSIY QISM:

O'quvchilarini nomoyishli kompetensiyalarga tayyorlash tizimining muhim tarkibiy qismlaridan biri ularning o'quv-bilish, nazariy bilim kompetentligini rivojlantirishdir. Kompetentlik - nazariy bilimlar va kasbiy ko'nikmalarni, shaxsiy sifatlarni o'z faoliyatda mustaqil samarali qo'llay olishdir. Kompetentlik o'quvchilar tomonidan alohida bilim, malakalarning egallanishini emas, balki ta'lim yo'nalishi bo'yicha integrativ bilimlar va harakatlarning mustaqil o'zlashtirilishi va amalda qo'llanilishini nazarda tutadi.

Kompetentlik o'quvchilarni har tomonlama rivojlantirish uchun zarur bo'lgan bilim, ko'nikma va malakalarning egallanishi va ularni amalda yuqori darajada qo'llay olinishi tushuniladi. Bunda o'quv-bilish kompetentligi esa, o'quvchilarning o'quv nomoishli eksperimentlari vositasida mustaqil bilim olish faoliyatiga tayyorligi va ushbu jarayonda ilmiy bilimlarga ega bo'lish, ularni kelajakda kasbiy faoliyatda qo'llay olish, o'zini-o'zi rivojlantirish ya'ni maqsadiga erishish tushuniladi. O'quv kompetentligini rivojlantirish faoliyati o'quv-eksperimental kompetensiyalarni rivojlantirish bilan tavsiflanadi. Ular o'qituvchining ijodiy o'z-o'zini anglashiga hissa qo'shadi, bilim, ko'nikma va faoliyat usullarini kasbiy va pedagogik sohada faol qo'llashni rag'batlantiradi. O'quvchilarning o'quv-bilish kompetentligi uning shaxsiy fazilatlarini rivojlantirib borishini, samarali kasbiy faoliyat olib borishida o'qitishning amaliyotga yo'naltirilganligini aniqlaydi. Namoyishga oid eksperimental kompetensiyaning didaktik imkoniyatlari o'quv eksperimentining intellektual-ijodiy-

texnologik komponentlarini qamrab olgan monobosqichli kasbiy didaktik tizimlar asosida aniqlashtirildi. Mazkur tizimlarda raqamli ta’lim muhitining virtual va simulyatsion resurslarini transformatsiyalash jarayoni pedagogik refleksiya asosida baholandi hamda mazkur baholash natijalarini ta’lim samaradorligini oshirishning ilmiy-metodik asosi sifatida talqin etildi. Umumiy o‘rta talim maktablarida kompetensiyaviy yondashuv asosida o‘qitishning maqsadi DTS va o‘quv dasturidagi maqsadlar bilan cheklangan bo‘lib, o‘quvchi bilim, ko‘nikma va malakalariga qo‘yilgan kompetensiyaviy yondashuvni amalga oshirish maqsadi va vositasini anglash bilan bog‘lashadi. O‘quvchi shaxsiy maqsadlari va vazifalari bilan ta’lim jarayonining asosiy ishtirokchisiga aylanadi. Nomoyishli kompetensiyaviy yondashuvga asoslangan ta’lim natijalarini nazorat qilish, ya’ni umumiy o‘rta ta’lim maktab o‘quvchilarining olgan bilim, ko‘nikma, malaka va kompetensiyalarni hayotda duch keladigan tanish, notanish vaziyatlarda qo‘llashga tayyor ekanligini baholashdan iborat. Demak, har bir umumiy o‘rta ta’lim maktab o‘quvchisi uchun kompetensiyaviy yondashuv asosida kompetent o‘quvchi bo‘lishi tadqiqotimizning dolzarb muammolar yechimi bo‘lib xizmat qiladi.

Ta’lim va ta’lim jarayonida bolani rivojlanish muammosi pedagogik va psixologik hususiyatlarning markaziy masalalardan biridir. Ta’lim va rivojlanish muammosiga doir qator nazariyalar ishlab chiqilgan bo‘lib, ulardan biri: aqliy hatti-harakatlar, bilimlar, malaka va ko‘nikmalarni bosqichma-bosqich rivojlantirish nazariyasi yotadi. Ushbu jarayonlarda pedagogik va psixologik tadqiqotlar shuni ko‘rsatadiki, o‘quvchilarda eksperimental kompetensiyalarni rivojlantirish quyidagi ilmiy-nazariy tamoyillarga asoslanadi:

1. Ilmiylik va tizimlilik tamoyili. **Mazmuni mohiyati :** Dasturiy ta’minot vositalari (virtual laboratoriyalar, simulyatsiyalar) orqali namoyish etiladigan fizik hodisa va qonuniyatlar qat’iy ilmiy asoslangan bo‘lishi lozim. **Amaliy holati:** O‘quv materiallari va dasturiy modullar o‘quv dasturining mantiqiy ketma-ketligiga mos holda, soddadan murakkabga qarab tizimli ravishda taqdim etiladi.

2. Ko‘rgazmalilik va raqamli integratsiya tamoyili Mazmuni mohiyati: Zamonaviy raqamli texnologiyalar yordamida abstrakt tushunchalarni aniq va ko‘rsatmali shaklga keltirish. **Amaliy holati:** An’anaviy namoyish eksperimentlarini dasturiy ta’minot imkoniyatlari (3D modellar, sekinlashtirilgan tasvirlar, animatsiyalar) bilan boyitish orqali o‘quvchilarning vizual idrokini kuchaytirish.

3. Faollik va mustaqil tafakkur tamoyili. Mazmuni mohiyati: O‘quvchining jarayonda shunchaki passiv kuzatuvchi emas, balki faol tadqiqotchi bo‘lishini ta’minlash. **Amaliy holati:** Dasturiy ta’minot muhitida parametrlarni o‘zgartirish, tajriba sharoitlarini mustaqil boshqarish va olingan natijalarni tahlil qilish orqali mustaqil fikrlashni rivojlantirish.

4. Differensiallash va individual yondashuv tamoyili. Mazmuni mohiyati: O‘quvchining o‘zlashtirish sur’ati va imkoniyatlarini hisobga olgan holda ta’lim jarayoniniga moslashtirish kerak. **Amaliy holati:** Dasturiy vositalar o‘quvchiga murakkab jarayonlarni o‘ziga qulay tezlikda qayta ko‘rish, takrorlash va o‘z imkoniyatidan kelib chiqib topshiriqlarni bajarish imkonini yaratadi.

5. Nazariyaning amaliyot bilan uzviy bog‘liqligi tamoyili. Mazmun mohiyati: Namoyish shunchaki vizual tomosha emas, balki o‘quvchini faol aqliy faoliyatga undovchi muammoli vaziyat sifatida tashkil etilishi kerak.**Amaliy holati:** Olingan nazariy bilimlarni real hayotdagi jarayonlar bilan bog‘lash orqali o‘quvchilarning fanlarga bo‘lgan qiziqishi oshiriladi.

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Структурно-функциональная модель развития творческих способностей будущих учителей изобразительного искусства средствами проектно-творческой деятельности

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Аннотация. В статье представлена структурно-функциональная модель развития творческих способностей будущих учителей изобразительного искусства, основанная на проектно-творческой деятельности. Модель включает целевой, методологический, содержательный, технологический и оценочно-результативный блоки. Технологический блок раскрывает четыре этапа проектной работы студентов: мотивационно-подготовительный, поисково-исследовательский, практико-реализационный и презентационно-рефлексивный. Предложена система проектно-творческих заданий, интегрирующая академические дисциплины, декоративно-прикладное искусство и методику обучения изобразительному искусству.

Ключевые слова: модель, творческие способности, проектно-творческая деятельность, будущий учитель изобразительного искусства, художественный проект, методика обучения, рефлексия.

Abstract. The article presents a structural and functional model for developing the creative abilities of future fine arts teachers based on project-based creative activity. The model includes target, methodological, content, technological, and evaluative blocks. The technological block describes four stages of students' project work, and a system of project-based creative assignments integrating academic disciplines, decorative and applied arts, and teaching methodology is proposed.

Keywords: model, creative abilities, project-based creative activity, future fine arts teacher, art project, teaching methodology, reflection.

Введение. Реформирование высшего образования в Республике Узбекистан направлено на переход от знаниевой парадигмы к компетентностной, в которой выпускник оценивается по способности самостоятельно решать профессиональные задачи. Постановление Президента Республики Узбекистан № ПП-3775 от 5 июня 2018 г. и Концепция развития системы высшего образования до 2030 года определяют приоритетом внедрение

в учебный процесс современных педагогических технологий и активных методов обучения [1; 2].

Для подготовки учителя изобразительного искусства особенно значим проектный метод. Художественное творчество по своей природе проектно: оно движется от замысла через поиск и эскизирование к воплощению и показу зрителю. Однако в вузовской практике проекты чаще всего используются эпизодически – как курсовая или выпускная работа, а не как системообразующий элемент обучения, направленный на целенаправленное развитие творческих способностей.

Цель статьи – разработать и описать структурно-функциональную модель развития творческих способностей будущих учителей изобразительного искусства средствами проектно-творческой деятельности и предложить систему проектных заданий для её реализации.

Литература и методы. Психологическую основу исследования составили представления Л.С. Выготского о природе художественной реакции и роли воображения в искусстве [3], концепция Я.А. Пономарёва о психологическом механизме творчества [4] и теория дивергентного мышления Дж. Гилфорда [5]. Понимание творческих способностей как проявления интеллектуальной активности личности опирается на работы Д.Б. Богоявленской [6].

Истоки проектного метода связаны с работой У.Х. Килпатрика, рассматривавшего проект как целенаправленную деятельность, осуществляемую учащимся в социальной среде [7]. В отечественной педагогике проектная технология детально разработана Е.С. Полат и её коллегами [8]. Цикличность обучения через опыт – от конкретного переживания через рефлексию к осмыслению и новому действию – описана Д. Колбом [9]; эта идея положена в основу этапов проектной работы в нашей модели.

Методические основы обучения композиции и изобразительной грамоте раскрыты в трудах Е.В. Шорохова [10], Г.В. Беды [11] и Н.М. Сокольниковой [12]. Региональный и национальный аспект методики отражён в работах Р. Хасанова [13].

Методы исследования: анализ психолого-педагогической и методической литературы, системный анализ, педагогическое моделирование, анализ учебных программ, педагогическое наблюдение, анализ продуктов творческой деятельности студентов.

Результаты. Пунктирная стрелка показывает обратную связь: результаты оценки уточняют цели следующего проектного цикла.

Целевой блок определяет цель – развитие творческих способностей студентов как основы их профессионально-творческой компетентности – и задачи: развитие художественно-образного мышления и воображения, формирование опыта самостоятельной творческой деятельности, подготовка к организации творчества учащихся.

Методологический блок объединяет четыре подхода: личностно-деятельностный (студент – субъект творческой деятельности), компетентностный (ориентация на профессиональный результат), культурологический (опора на мировое и национальное художественное наследие) и проектный (обучение через создание завершённого художественного продукта).

Содержательный блок включает модули дисциплин, в рамках которых реализуются проекты: академический рисунок и живопись, композиция, декоративно-прикладное искусство, методика преподавания изобразительного искусства.

Технологический блок раскрывает этапы проектно-творческой деятельности:

– *Мотивационно-подготовительный* – выбор темы, формулирование творческой задачи, изучение аналогов, сбор натурного материала (зарисовки, фотофиксация, музейные наблюдения).

– *Поисково-исследовательский* – эскизирование, разработка нескольких вариантов композиционного и колористического решения, обсуждение с преподавателем и группой.

– *Практико-реализационный* – выполнение работы в материале, доработка образа, оформление.

– *Презентационно-рефлексивный* – публичная защита проекта, выставка, самоанализ, разработка на основе проекта творческого задания для школьников.

Оценочно-результативный блок содержит критерии (мотивационный, художественно-образный, методический, рефлексивный), уровни (репродуктивный, эвристический, творческий) и ожидаемый результат – повышение уровня развития творческих способностей студентов. Обратная связь от оценочного блока к целевому позволяет корректировать задачи на следующий цикл проектов.

Для реализации модели разработана система проектно-творческих заданий, нарастающих по сложности от первого к четвёртому курсу (таблица 1).

Таблица 1.

Система проектно-творческих заданий

Курс	Проект	Дисциплина	Развиваемые способности
1	«Мой город в деталях»: серия графических зарисовок архитектурных элементов старой Бухары	Академический рисунок	наблюдательность, зрительная память, чувство формы
2	«Цвет и настроение»: вариации одного натюрморта в трёх колористических решениях	Живопись	гибкость мышления, цветовое воображение
3	«Орнамент в современном дизайне»: переработка традиционного бухарского орнамента в плакат или элемент интерьера	Композиция, декоративно-прикладное искусство	оригинальность, способность к стилизации и интерпретации
4	«Творческий урок»: авторская композиция и разработанный на её основе урок для школьников с пробным проведением на практике	Методика преподавания изобразительного искусства	перенос творческого опыта в педагогическую деятельность, рефлексия

Каждый проект завершается коллективным просмотром и записью в творческом портфолио, что обеспечивает непрерывность и наглядность развития студента на протяжении всего периода обучения.

Обсуждение. Предложенная модель отличается от традиционной организации обучения тем, что проектная деятельность становится не завершающим, а сквозным элементом подготовки. Каждый курс содержит хотя бы один проект, и каждый следующий проект опирается на опыт предыдущего, что соответствует принципу преемственности.

Особое значение имеет поисково-исследовательский этап. Именно здесь студент выполняет несколько вариантов эскиза, что развивает беглость и гибкость мышления, описанные Дж. Гилфордом [5]. Требование представить не

одно, а минимум три композиционных решения разрушает установку на «единственно правильный» ответ, характерную для репродуктивного обучения.

Презентационно-рефлексивный этап выполняет двойную функцию. С одной стороны, публичная защита и выставка формируют у студента навык аргументированно представлять свой замысел. С другой – разработка творческого задания для школьников на основе собственного проекта обеспечивает перенос творческого опыта в профессионально-педагогическую плоскость, что отличает подготовку учителя от подготовки художника.

Обращение к художественному наследию Бухары – архитектуре, орнаменту, миниатюре – придаёт проектам культурологическую глубину и личностную значимость. Работа с близким и знакомым материалом повышает мотивацию студентов и одновременно формирует бережное отношение к национальной культуре. К ограничениям модели следует отнести увеличение нагрузки на преподавателя, связанное с индивидуальным сопровождением проектов, а также необходимость согласования проектных заданий между кафедрами.

Заключение. Разработанная структурно-функциональная модель включает целевой, методологический, содержательный, технологический и оценочно-результативный блоки и представляет развитие творческих способностей будущих учителей изобразительного искусства как целенаправленный и управляемый процесс.

Ядром модели является четырёхэтапный цикл проектно-творческой деятельности, который повторяется на каждом курсе с нарастанием сложности и самостоятельности. Предложенная система проектных заданий интегрирует академические дисциплины, декоративно-прикладное искусство и методику обучения, опираясь на художественное наследие Бухары.

Дальнейшая работа предполагает опытно-экспериментальную проверку модели в вузах Республики Узбекистан и разработку методических рекомендаций для преподавателей специальных дисциплин.

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INNOVATIVE PEDAGOGICAL TECHNOLOGIES IN PHILOLOGICAL EDUCATION

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Abstract. This article examines the role of innovative pedagogical technologies in teaching philological disciplines at higher education institutions. It discusses problem-based learning, interactive instruction, project and research activities, digital learning environments, and inclusive educational practices. Particular attention is paid to the relationship between subject knowledge, independent inquiry, professional competencies, and the preparation of future philology teachers. A conceptual teaching model and practical classroom examples are proposed. The article is analytical and methodological in nature; it does not report results from an empirical intervention.

Keywords: philological education; innovative pedagogy; problem-based learning; interactive methods; digital technologies; inclusive education; professional competence.

1. Introduction

Contemporary higher education is expected to develop not only disciplinary knowledge but also the capacity to interpret information, communicate effectively, solve unfamiliar problems, and continue learning throughout professional life. These expectations are especially relevant to philological education, where students work with language, literature, culture, and communication in rapidly changing social and digital environments.

Traditional instruction can provide a strong foundation in grammar, literary history, linguistic theory, and textual analysis. However, an approach based predominantly on explanation, memorization, and reproduction may leave insufficient opportunities for students to test interpretations, negotiate meaning, and apply their knowledge in authentic contexts. Innovative pedagogical technologies can complement established methods by organizing learning around inquiry, collaboration, reflection, and purposeful use of digital tools.

The purpose of this article is to systematize practical approaches to innovative teaching in philological disciplines and explain how they can support the development

of professional competencies among future philologists and teachers. The discussion draws on the themes of pedagogical innovation, interactive learning, professional preparation, and inclusion presented in the source manuscript.

2. Conceptual Foundations of Innovation in Philological Teaching

Pedagogical innovation should not be equated simply with the use of computers or new software. A teaching practice is innovative when it changes the organization of learning in a meaningful way: students assume an active role, tasks require reasoning rather than mechanical recall, feedback guides improvement, and assessment captures the application of knowledge. Digital technologies may enable such changes, but the pedagogical objective must determine the choice of tool.

For philology students, professional competence includes accurate linguistic analysis, informed interpretation of literary texts, oral and written communication, information literacy, ethical engagement with sources, and the ability to design learning activities for diverse groups. These outcomes require a coherent relationship among learning objectives, teaching methods, classroom interaction, and assessment.

A useful distinction is between technologies that structure the learning process and technologies that deliver or support content. Problem-based learning, project-based learning, collaborative learning, simulations, and formative assessment structure learning. Learning management systems, collaborative documents, digital corpora, annotation platforms, and multimedia resources support the process. Their effectiveness depends on thoughtful integration rather than novelty alone.

3. Major Innovative Teaching Approaches

3.1. Problem-based learning

Problem-based learning begins with an intellectually meaningful question for which students cannot simply reproduce a memorized answer. In a course on contemporary language change, for example, students may examine whether emerging

lexical forms represent linguistic decline or normal adaptation to new social conditions. They collect examples from media and everyday speech, classify linguistic changes, compare interpretations, and defend evidence-based conclusions.

A typical sequence includes defining the problem, identifying prior knowledge, gathering relevant sources, evaluating competing explanations, and presenting a justified response. The teacher acts as a facilitator who clarifies criteria, challenges weak evidence, and helps students connect observations to linguistic concepts. This process supports critical thinking while preserving disciplinary rigor.

3.2. Interactive and collaborative learning

Seminars become more productive when students are required to exchange interpretations and explain their reasoning. Structured discussions, peer instruction, debates, role-play, small-group textual analysis, and reciprocal teaching can promote active participation. In literature classes, groups may analyze the same passage through historical, stylistic, and reader-response perspectives before comparing the explanatory strengths and limitations of each approach.

Interaction needs clear rules and outcomes. Each participant should have a defined contribution, and the task should culminate in a tangible product such as an annotated passage, a joint argument, or a short oral presentation. Peer feedback is most useful when supported by criteria addressing textual evidence, conceptual accuracy, clarity, and respectful discussion.

3.3. Project-based and research-oriented learning

Projects connect philological theory to authentic activities. Students might compile a small thematic corpus of public-language examples, investigate phraseological variation, prepare a bilingual glossary, create a digital exhibition about

a writer, or design a teaching unit for school pupils. Such assignments require planning, source evaluation, revision, and presentation to an audience.

Research-oriented activities should be feasible at the students' level. A small corpus study, for instance, may ask learners to formulate a research question, describe how texts were selected, categorize examples consistently, and explain the limits of their findings. The goal is not to imitate large-scale research but to develop disciplined inquiry and responsible interpretation.

3.4. Digital and blended learning

Digital tools expand access to texts, dictionaries, recordings, linguistic databases, and opportunities for collaborative writing. A blended model can reserve independent online work for preliminary reading and comprehension checks, while classroom time is used for discussion, close reading, and problem solving. Digital annotation can make interpretive decisions visible and enable teachers to respond to misunderstandings promptly.

Technology selection should follow learning needs. A shared document may support collaborative editing; a language corpus may reveal patterns of word use; an audio platform may support phonetic analysis; and an online quiz may provide immediate formative feedback. Teachers should also consider accessibility, students' connectivity, privacy, copyright, and the reliability of digital materials. Automated writing tools require particular care: students should disclose permitted assistance and remain responsible for the accuracy and originality of their work.

3.5. Simulations and pedagogical training

Future philology teachers benefit from microteaching, lesson simulations, case discussions, and reflective observation. Students can design a fifteen-minute activity, teach it to peers, receive structured feedback, and revise the lesson. Simulated

classroom situations—such as responding to an ambiguous interpretation or supporting a learner with limited language proficiency—help connect methodological knowledge to practical decisions.

4. Inclusive Practices and Differentiation

Innovation in philological education must account for learner diversity. Students may differ in language proficiency, prior knowledge, confidence, disability-related access needs, and preferred ways of demonstrating understanding. Inclusive teaching therefore involves both a supportive classroom culture and flexible access to learning materials and participation.

Teachers can provide readable digital texts, captions or transcripts for audio materials, multiple modes of participation, and explicit task instructions. Differentiated assignments may share a common learning objective while offering alternative texts or levels of scaffolding. Collaborative tasks should be organized to avoid assigning students fixed roles based on assumptions about ability. Inclusion is strengthened when students are treated as active members of a learning community rather than passive recipients of accommodation.

5. A Practical Model for Course Design

An integrated approach to an undergraduate module on “Active Processes in Language and Speech” can proceed in five stages. First, the teacher identifies measurable outcomes: recognizing contemporary lexical changes, explaining their causes, and evaluating examples using linguistic evidence. Second, students examine short texts and media extracts before class. Third, small groups investigate a question such as whether borrowed words enrich or complicate public communication. Fourth, groups present their analyses and respond to objections. Fifth, students submit an individual reflection that distinguishes observation, interpretation, and personal opinion.

Assessment can combine a rubric for the group product with individual evidence of learning. Useful criteria include accuracy of linguistic terminology, relevance and

transparency of sources, strength of argumentation, collaboration, and clarity of presentation. Short formative checks during the module help teachers identify gaps before final assessment. The model is an illustrative teaching design, not a tested intervention.

6. Conditions for Successful Implementation

The use of innovative methods requires more than teacher enthusiasm. Institutions should support professional development, access to suitable resources, reasonable class organization, and opportunities for teachers to exchange effective practices. Students also need explicit instruction in research skills, collaborative work, academic integrity, and the responsible use of digital resources.

A common risk is methodological overload: too many tools or activities can distract from the text or linguistic problem under study. Another risk is unequal participation, particularly when group work lacks accountability. These limitations can be reduced by aligning each method with a specific objective, setting transparent expectations, using accessible materials, and regularly reviewing student feedback and performance.

7. Conclusion

Innovative pedagogical technologies offer a practical means of strengthening philological education when they are integrated with sound disciplinary content and clear learning outcomes. Problem-based inquiry, interactive discussion, project work, digital resources, and simulations can create opportunities for students to interpret texts, defend conclusions, collaborate, and practice professional decisions. Inclusive design broadens participation and helps ensure that innovation benefits a diverse student body.

The central task of the philology teacher is not to replace traditional scholarship with technology, but to create learning situations in which linguistic and literary knowledge is actively used. Future research should evaluate specific teaching designs

through transparent methods, appropriate comparison, and evidence of student learning rather than assuming that a method is effective solely because it is new.

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ИНФЕКЦИОН ФОНДА МУДДАТИДА ТУҒИЛГАН ЧАҚАЛОҚЛАР ТИМУСИДАГИ ИММУНОГИСТОКИМЁВИЙ ХОС ЖИХАТЛАРИ

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Муддатида туғилган ва турли инфекциялар таъсирида тимусдаги иммуногистокимёвий ўзгаришларни хос жихатларини бахолашда асосан CD 4+ CD 8+ лимфоцитларни нисбати ва бўялиш интенсивлиги бўйича бахоланди. Бу келтирилган лимфоцитлар тимусни асосан функционал фаоллигини бахолашда қўл келувчи иммуномаркерлар бўлиб, жараёнда хужайралар фенотипини устунлиги ёки етишмовчилигини белгилашда мухим ахамият касб этади. Унга кўра, (бактериал инфекция) пайтида энг оғир деструкциянинг кузатилишида, эндоген интоксикация омиллари таъсирида тимус паренхимасида кучли деструкция юзага келиб, CD4 маркери бўйича H-score кўрсаткичи кескин равишда 18,08±1,15 баллга тушиб кетади, CD8 экспрессияси эса 30% атрофида шаклланади (30,00±0,95 балл, $p<0,001$) бу чақалоқларда ҳужайравий иммунитетнинг жиддий дезадаптацияси ва хавфли асоратлар юқорилигини кўрсатади. Вирусли инфекцияларда компенсатор-реактив фаоллашувнинг сақланиши, бошқа патологияларга нисбатан деструктив ўзгаришлар бироз енгилроқ кечиб, CD4 экспрессияси ўртача 132,50±2,68 балл, CD8 маркери бўйича эса H-score кўрсаткичи 160,00±1,77 баллни ($p<0,05$) ташкил этади: бу вирусли антигенларга қарши ҳужайравий иммунитетнинг қисман ҳимоя реакцияси ва компенсатор-реактив фаоллашуви сақланиб қолишини англатади.

Калит сўзлар: тимус, иммуноморфология, инволюция, иммунодефицит, тимоцит, Т-лимфоцит, пўстлоқ ва мағиз қаватлар, Гассал таначаси.

Муаммонинг долзарблиги. Дунёда перинатал даврдаги чақалоқлар касалликларининг хар қандай кўринишида асосан, иммун аъзоларнинг етилмаганлиги ва морфологик жихатдан фаол майдонларининг тўлиқ шаклланмаганлиги аниқланади. Бу эса, хар 1000 та туғруқда учрайдиган неонатал даврдаги сепсисларда ўртача 30-50 та чақалоқларда иккиламчи имуннодефицит холатини юзага келганлигини кўрсатади. Айнан, тимуснинг тўлиқ морфологик етилганлиги муддатда туғилган чақлоқларда асоратсиз, хар қандай инфекцион омилларга нисбатан турғунликни ва ўткир иммун жавоблар кўринишида жараён давом этишини таъминлайди. Айни тадқиқот ишимизда, муддатда туғилган чақалоқлар тимусининг ривожланиш онтогенезидаги гистотопографик жихатларини тўлиқ акс эттириш ва хар бир фаол сохаларининг етишмовчилигида ривожланадиган патологияларни тафсир қилишда мухим ахамият касб этади. Бу эса, тадқиқот ишини долзарблигини яъна бир бор тасдиқлайди.

Натижа ва мухокама. Муддатида туғилган вирусли инфекция фонида тимусни CD4 маркерини хос экспрессияси. Бу гурухда муддатида туғилган чақалоқлар тимус тўқимасида бошқа гурухларга нисбатан акцидентал трансформация даражаси ва инволютив кўрсатгичларни нисбатан меъёрга энг яқини бўлиб, тимусни гистоархитектоникаси бўйича пўстлоқ ва мағиз қаватларида хужайралар тўплами айнан лимфоцитларни сон жихатдан кескин камайиши аниқланмади. Вирусли инфекция гуруҳида, патологик таъсир остида пўстлоқ қавати 23,4% га, тимоцитлар зичлиги 22,2% га камайиб, апоптоз кўрсаткичи 12,5\% ни ташкил этганда, H-score ўртача 132,50±2,68 балл ($p<0,05$) га тушади, бу ўртача даражадаги реактив лимфодеплеция ва компенсатор ўзгаришларни кўрсатади. Пиелонефрит фонида тимус тўқимасида **CD8** иммуногисто-кимёвий (ИГК) маркерининг экспрессияси кескин пасайиб, тахминан **30%** ни ташкил этган ҳолатлар учун 12 та тадқиқот гуруҳи асосида Remmele ва Stegner нинг **H-score** шкаласи бўйича ҳисоб-китоб ва илмий изоҳлар

қуйидагича: H-score ҳисоблаш шарти Пиелонефрит билан боғлиқ сурункали эндоген интоксикация, яллиғланиш медиаторлари ва умумий метаболик стресс тимусда чуқур акцидентал деструкцияни келтириб чиқаради. Бунда бўялиш интенсивлиги кучсиз ёки ўртача (i= 1 ёки 2, асосан кучсиз 1 ва барқарор паст 2 аралаш ҳолда) ва мусбат ҳужайралар фоизи (P) ўртача 30% атрофида шаклланади.

Хулосалар

Пиелонефрит (бактериал инфекция) пайтида энг оғир деструкциянинг кузатилишида, эндоген интоксикация омиллари таъсирида тимус паренхима-сида кучли деструкция юзага келиб, CD4 маркери бўйича H-score кўрсаткичи кескин равишда 18,08±1,15 баллга тушиб кетади, CD8 экспрессияси эса 30% атрофида шаклланади (30,00±0,95 балл, $p<0,001$) бу чақалоқларда ҳужайравий иммунитетнинг жиддий дезадаптацияси ва хавфли асоратлар юқорилигини кўрсатади.

Вирусли инфекцияларда компенсатор-реактив фаоллашувнинг сақлани-ши, бошқа патологияларга нисбатан деструктив ўзгаришлар бироз енгилроқ кечиб, CD4 экспрессияси ўртача 132,50±2,68 балл, CD8 маркери бўйича эса H-score кўрсаткичи 160,00±1,77 баллни ($p<0,05$) ташкил этади; бу вирусли антигенларга қарши ҳужайравий иммунитетнинг қисман ҳимоя реакцияси ва компенсатор-реактив фаоллашуви сақланиб қолишини англатади.

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MAKTABGACHA TA’LIM TASHKILOTLARIDA PEDAGOGIK IMIDJ TUSHUNCHASI

Dosova Bakposhsha Odamboy qizi.

Annotatsiya: Bugungi kunda ta’lim jarayoni nafaqat bolalarga bilim berish, balki ularni har tomonlama rivojlantirish va hayotga tayyorlashga qaratilgan. Bu jarayonda tarbiyachining shaxsi, uning pedagogik imidji katta ahamiyat kasb etadi. Tarbiyachi nafaqat bolalar, balki ota-onalar va jamiyat bilan faol muloqotda bo‘lib, o‘zining kasbiy mahoratini, nutq madaniyatini, tashqi qiyofasini va psixologik tayyorgarligini namoyon etadi. Ushbu maqolada zamonaviy tarbiyachining pedagogik imidji va uning ahamiyati chuqur tahlil qilinadi. Zamonaviy ta’lim tizimida pedagogik imidj tarbiyachining nafaqat o‘z faoliyatida, balki butun ta’lim tashkilotining obro‘sida ham muhim ro’l o‘ynaydi. Yaxshi shakllangan imidj pedagogga nufuz olib keladi va uning kasbiy o‘sishiga zamin yaratadi.

Kalit so‘zlar: Maktabgacha ta’lim, tarbiya, ta’lim, madaniyat, imidj, tarbiyachi, bola, xotira, tafakkur, omil, nutq, zamonaviy, jarayon, tashkilot, jamiyat

Аннотация: Сегодня образовательный процесс направлен не только на обеспечение детей знаниями, но и на их всестороннее развитие и подготовку к жизни. В этом процессе большое значение имеет личность педагога, его педагогический имидж. Воспитатель активно общается не только с детьми, но и с родителями, обществом, демонстрируя свое профессиональное мастерство, культуру речи, внешний вид, психологическую подготовку. В статье дается глубокий анализ педагогического имиджа современного педагога и его значения. В современной системе образования педагогический имидж играет важную роль не только в работе самого педагога, но и в репутации всей образовательной организации. Правильно сформированный имидж повышает престиж учителя и создает основу для его профессионального роста.

Ключевые слова: Дошкольное образование, воспитание, образование, культура, образ, педагог, ребенок, память, мышление, фактор, речь, современный, процесс, организация, общество

Annotation: Today, the educational process is aimed not only at providing children with knowledge, but also at their comprehensive development and preparation for life. In this process, the personality of the educator, his pedagogical image, is of great importance. The educator actively communicates not only with children, but also with parents and society, demonstrating his professional skills, speech culture, appearance and psychological preparation. This article deeply analyzes the pedagogical image of a modern educator and its importance. In the modern education system, the pedagogical image plays an important role not only in the educator's own activities, but also in the reputation of the entire educational organization. A well-formed image brings prestige to the educator and creates the basis for his professional growth.

Keywords: Preschool education, upbringing, education, culture, image, educator, child, memory, thinking, factor, speech, modern, process, organization, society.

Respublikamizda islohotlarni muvaffaqiyatli amalga oshirishga mas’ul bo‘lganjamiyata’zolari birinchi galda o‘z kasbining mohir ustasi bo‘lgan tarbiyachi kadrlar tayyorlashdolzarbvazifa bo‘lib qolmoqda. Jumladan, “Ta’lim . Maktabgacha tarbiya yoshi davrida tarbiyachiningbolaga shaxsiy ta`siri juda katta bo`ladi Tarbiyachi har bir bolaning kelajakda haqiqiyi nsonbo’lishiga yordam beradigan sifatlarini va imkoniyatini rivojlantirishi lozim. Chunki budavrdagi har bir ta’surot bolaning xotirasida bir umrga saqlanib qoladi. axloqiy fazilatlargaega bo‘lgan shaxslar pedagogik faoliyat bilan shug‘ullanish huquqiga ega” deb ta’kidlangan.

Jahon tajribasida ham boshlang`ich ta`limning birlamchi bo‘g‘ini sifatida maktabgacha ta’lim davlatimiz e’tiboridagi asosiy masala bo`lib kemoqda. Prezidentimiz Sh. M. Mirziyoevning“ Tanqidiy tahlil, qat`iy tartib-intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining qoidasi bo`lishi kerak” ma`ruzasida maktabgacha ta`lim sohasida bolalarni qamrab olish atigi 27 foizni tashkil etishi va bu

sohadagi ishlar e`tibordan chetda qoganligi ta`kidlab o`tildi. Tarbiyachi maktabgacha ta`lim tashkilotida asosiy shaxs hisoblanadi. Butun g`oyaviy-tarbiyaviy ishlarning sifati va qolaversa, kelajak avlodni tarbiyalanganlik va bilish darajasi tarbiyachining g`oyaviy-siyosiy va ilmiy-pedagogik tayyorgarligiga, javobgarlik hissiga, pedagogik mahoratiga va ishga bo`lgan ijodiy munosabatiga bog`iq. Bolaning o`quv faoliyatiga bo`lgan munosabati ko`proq uning tarbiyachi shaxsiga munosabati bilan belgilanadi.

Pedagogik imidj – bu tarbiyachining tashqi qiyofasi, nutq madaniyati, muomala uslubi, psixologik holati hamda kasbiy faoliyatdagi o‘ziga xos xususiyatlarining uyg‘unligidir. U tarbiyachining shaxsiy va kasbiy muvaffaqiyatiga bevosita ta’sir ko‘rsatadi. Zamonaviy tarbiya jarayonida tarbiyachining imidji bolaning rivojlanishiga, ota-onalar bilan muloqotga va jamoa ichidagi obro‘siga ta’sir etuvchi muhim omillardan biri hisoblanadi. Pedagogik imidj pedagogning ma’naviy-axloqiy qiyofasi bilan tashqi ko‘rinishi o‘rtasidagi o‘zaro uyg‘unlik va mutanosiblikdir. Tarbiyachining tashqi qiyofasini ifodalovchi madaniyati

1. Gavdani tutish-to‘g‘ri tutish (yurishda, o‘tirib turishda), qo‘llarning rahbar va xodimi stolida erkin holatda bo‘lishi, batartibligi, ixchamligi.

2. Kiyim- ozodaligi, shinam va bashangligi, kamtarligi, ranglarning mos holda tanlanishi, kiyimning èshiga va kasbiga mosligi, kiyimni modaga muvofiqligi, bijuteriya, taqinchoqlarning ko‘p va kamligi, ishiga mosligi.

3. Pardozning me’yordaligi, yoshi, kasbi va ishiga mosigi.

4. Soch turmagi (sochning ma’lum bir tartibliligi).

5. Pedagogning mimik va pantomimik ifodasi. Tarbiyachining pedagogik texnikasi tizimida mimik va pantomimik ifodalari ham muhim o‘rin tutadi.

Pedagogning mimik va pantomimik ifodasi, tarbiyachining imo-ishorasida, ma’noli qarashlarida, rag‘batlantiruvchi yoki kinoyali tabassumida namoyon bo‘ladi va ular tarbiyachining pedagogik ta’sir ko‘rsatishida, bolalarga mashg‘ulotlarni ta’sirchan, qiziqarli, samarali va mazmunli o‘tish uchun puxta zamin tayyorlab beradi. Zamonaviy tarbiyachining pedagogik imidji uning kasbiy faoliyati samaradorligini

oshirishda muhim omil hisoblanadi. Tarbiyachining tashqi ko‘rinishi, nutqi, psixologik holati va kasbiy mahorati jamlanib, bolaning ta’lim jarayoniga bo‘lgan qiziqishiga, ota-onalarning ishonchiga va jamiyatdagi mavqeiga bevosita ta’sir ko‘rsatadi. Pedagogik imidj nafaqat tashqi ko‘rinish, balki kasbiy kompetentlik, kommunikativ qobiliyat va psixologik tayyorgarlik bilan ham bog‘liq. Tarbiyachi doimiy o‘z ustida ishlashi, zamonaviy pedagogik yondashuvlarni o‘zlashtirishi va shaxsiy rivojlanishga e’tibor berishi lozim. Chunki zamonaviy bolalar va ota-onalar talabchan bo‘lib, faqat bilim emas, balki pedagogning xarizmasi, uslubi va muloqot madaniyatini ham baholashadi.

Pedagogik imidj tarbiyachi yoki pedagogning atrofdagilar tomonidan qabul qilinadigan shaxsiy va kasbiy qiyofasi bo‘lib, u quyidagi omillar asosida shakllanadi:

- **Tashqi ko‘rinish** – kiyinish uslubi, yuz ifodalari, jest va harakatlar
- **Nutq madaniyati** – aniq va lo‘nda gapirish, tushunarli va ta’sirchan so‘zlash
- **Psixologik holat** – bag‘rikenglik, mehribonlik, sabr-toqat, o‘ziga ishonch
- **Kasbiy mahorat** – pedagogik bilim, o‘qitish uslublari, innovatsion texnologiyalardan foydalanish
- **Ijtimoiy mavqe** – ota-onalar, hamkasblar va jamiyat orasidagi obro‘-e’tibor

Pedagogik imidj nafaqat ta’lim jarayonining samaradorligiga, balki tarbiyachining shaxsiy kasbiy rivojlanishiga ham bevosita ta’sir qiladi. Yaxshi shakllangan imidj pedagogning mavqeini mustahkamlaydi, jamiyat tomonidan hurmatga sazovor qiladi va ta’lim muassasasining umumiy nufuzini oshiradi.

Tarbiyachi yosh avlodimizni xalqimizning munosib farzandlari qilib tayyorlashdek muhim, faxrli ish bilan birga mas'uliyatli vazifani bajaradi. Tarbiyachining siyosiy etukligi bolalarni tarbiyalash sifati uchun xalq hamda jamiyat oldidagi o'z mas'uliyatini anglashga, ta'lim-tarbiya vazifalarini ijodiy yondashishga, o'z mahoratini doimo takomillashtirib borish va ishdagi o'rtoqlarini o'sishiga yordam beradi. Demak, tarbiyachi avvalo, bilimli bo'lishi, o'zi yashab turgan ulkan hayotini bilishi, tabiat va jamiyatning qonuniyatlarini tushunishi, ijtimoy faol bo'lishi, umumiy va maktabgacha tarbiya pedagogikasini, bolalar ruhiyati va fiziologiyasini egallashi va bolalarning yosh

xususiyatlarini bilishi kerak. Shuningdek, pedagogik tarbiyachining hodisalarni tahlil qilishga ilmiy nuqtai nazardan yondashuvi bolani har tomonlama rivojlantirish muvaffaqiyatini amalga oshirishga imkon beradi.

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THE PEDAGOGICAL SIGNIFICANCE OF DEVELOPING STUDENTS' INFORMATION SECURITY COMPETENCE IN THE CONTEXT OF USING ARTIFICIAL INTELLIGENCE TOOLS

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Abstract. The widespread integration of artificial intelligence (AI) tools into higher education has significantly transformed the organization of teaching, learning, and scientific research. Although AI technologies provide opportunities for personalized learning, rapid information retrieval, and the development of students' independent learning skills, they also create new challenges associated with information security, personal data protection, digital privacy, academic integrity, and the reliability of generated content. Under these circumstances, developing students' information security competence has acquired considerable pedagogical significance. This article examines the educational importance of developing information security competence in the context of AI-assisted learning, focusing on its role in promoting digital responsibility, critical thinking, ethical decision-making, cybersecurity awareness, and independent learning. Particular attention is given to the pedagogical conditions necessary for integrating information security principles into the educational process, including competency-based instruction, practice-oriented learning, interdisciplinary integration, reflective activities, and formative assessment. The article substantiates the importance of creating an educational environment in which students learn not only to use AI tools effectively but also to assess associated risks, protect sensitive information, verify AI-generated content, and make responsible decisions. It is concluded that the systematic development of information security competence constitutes an important component of contemporary digital education and contributes to the preparation of digitally competent, ethically responsible, and critically thinking professionals.

Keywords: artificial intelligence, information security competence, pedagogical significance, higher education, digital education, cybersecurity awareness, personal data protection, digital responsibility, critical thinking, AI literacy.

Introduction

The development of artificial intelligence technologies has become one of the significant factors influencing the modernization of contemporary education. AI-based applications are increasingly used by university students to search for information, prepare academic assignments, translate scientific texts, analyze data, generate ideas, and support independent research. These applications can improve the accessibility of educational resources, facilitate individualized learning, and provide additional opportunities for developing professional competencies. However, the expansion of AI use also requires a reconsideration of the pedagogical objectives associated with digital literacy, information security, and responsible technology use.

In the modern educational environment, students interact with large volumes of digital information and various AI-powered platforms, often without fully understanding the potential consequences of sharing personal, academic, or confidential data. Inappropriate use of AI tools may lead to privacy violations, unauthorized disclosure of research materials, exposure to phishing attacks, the dissemination of misinformation, and the uncritical acceptance of inaccurate AI-generated responses. Furthermore, students may encounter fabricated academic references, biased information, manipulated digital content, and other forms of misleading output. These circumstances demonstrate

that the effective use of AI technologies requires not only technical knowledge but also the ability to assess risks, verify information, protect digital resources, and act in accordance with ethical and legal requirements.

From a pedagogical perspective, information security competence should be regarded as an integral component of students' overall digital competence and professional development. Its formation involves the purposeful development of knowledge, practical skills, values, attitudes, and responsible behavioral patterns that enable students to interact safely with digital technologies. UNESCO's Guidance for Generative AI in Education and Research emphasizes the importance of human-centred approaches, data privacy, ethical considerations, and appropriate educational implementation of generative AI (Miao & Holmes, 2023). Accordingly, the development of information security competence should be incorporated into the educational process as a continuous pedagogical objective rather than treated as an isolated technical subject. The purpose of this article is to substantiate the pedagogical significance of developing students' information security competence under conditions of widespread AI use and to identify the educational principles and conditions that support its effective formation.

The Pedagogical Essence of Information Security Competence in AI-Assisted Education

Information security competence represents an integrated personal characteristic that enables individuals to understand information security principles, identify potential digital threats, apply appropriate protective measures, evaluate the reliability of digital information, and demonstrate responsible behavior when interacting with information systems. In the context of AI-assisted education, this competence extends beyond traditional cybersecurity knowledge because students must also understand the specific risks associated with generative AI, automated information processing, algorithmic bias, and the disclosure of information through prompts, uploaded documents, and other forms of user interaction.

The pedagogical essence of developing information security competence lies in preparing students to become conscious and responsible participants in the digital educational environment. This process involves the transformation of theoretical knowledge into practical skills, the development of critical and analytical thinking, the formation of ethical attitudes, and the establishment of sustainable habits of secure digital behavior. Students should understand why certain information must remain confidential, how digital threats emerge, what limitations AI-generated content may have, and which actions can reduce the likelihood of security incidents.

The formation of this competence encompasses several interconnected dimensions. The cognitive dimension involves knowledge of cybersecurity principles, data protection, authentication, privacy settings, phishing, social engineering, and AI-related risks. The practical dimension concerns the ability to apply security measures, recognize suspicious digital activities, manage personal information, and respond appropriately to potential incidents. The analytical dimension involves evaluating the accuracy of AI-generated content, comparing information with authoritative sources, identifying misleading claims, and verifying academic references. The ethical dimension includes respect for confidentiality, intellectual property, academic integrity, and the rights of other individuals. The reflective dimension enables students to evaluate their own digital behavior, recognize weaknesses in their security practices, and improve their approaches to using AI tools.

These dimensions demonstrate that information security competence is not formed through the transmission of theoretical knowledge alone. It requires the integration of cognitive, behavioral, practical, and ethical learning outcomes into a coherent pedagogical process. Therefore, teachers should create educational conditions that enable students to apply security principles in realistic situations, critically analyze digital information, and understand the consequences of their decisions.

The Importance of Information Security Competence for Students' Personal and Professional Development

The pedagogical significance of developing information security competence is primarily determined by its contribution to students' personal development and professional readiness. In a digital society, students are expected to use information technologies not only for academic purposes but also in future professional activities that may involve confidential documents, personal data, digital communication, research findings, and organizational information. Insufficient information security awareness can therefore affect both individual users and the institutions in which they study or work.

Developing information security competence helps students understand the relationship between their digital actions and the possible consequences for themselves and others. For example, entering confidential information into an AI system without examining its privacy conditions may expose sensitive material to inappropriate processing or disclosure. Similarly, relying on AI-generated references without verification may undermine the credibility of academic work. Through purposeful instruction, students learn to assess such situations, recognize potential risks, and select safer alternatives.

The formation of information security competence also contributes to professional responsibility. Future teachers, engineers, economists, healthcare professionals, researchers, and other specialists increasingly operate in digital environments where information protection is essential. Their professional effectiveness depends not only on their ability to use digital tools but also on their capacity to safeguard information, respect confidentiality requirements, and apply technology in accordance with relevant ethical and legal standards. Consequently, information security education should be viewed as a cross-disciplinary component of professional training.

Furthermore, information security competence promotes students' independence and self-regulation. Students who understand the principles of secure digital behavior are better prepared to make informed decisions without relying exclusively on external instructions. They can evaluate whether a particular AI tool is appropriate for a given task, identify information that should not be shared, verify the credibility of generated responses, and recognize situations requiring additional guidance. In this respect, information security competence supports lifelong learning by encouraging continuous adaptation to changing digital technologies and emerging threats.

The Role of Critical Thinking and AI Literacy in Developing Information Security Competence

One of the most important pedagogical outcomes of developing information security competence is the enhancement of students' critical thinking. AI systems can generate fluent, persuasive, and well-structured responses that may nevertheless contain factual inaccuracies, unsupported conclusions, fabricated references, or biased interpretations. Students who accept such information without verification may develop misconceptions, produce unreliable academic work, or make inappropriate decisions.

The educational process should therefore encourage students to evaluate AI-generated information systematically. Teachers may ask students to compare AI-generated explanations with scientific publications, official institutional guidance, and other authoritative sources. Students should examine the accuracy of factual claims, the relevance of supporting evidence, the authenticity of cited publications, and the consistency of the generated content with established knowledge. Such activities strengthen analytical reasoning and help students distinguish between plausible language and reliable information.

AI literacy is equally important because students need to understand how AI tools operate at a general level, what limitations they possess, and how their use may affect information security. They should recognize that AI-generated content does not automatically constitute verified knowledge and that different services may apply different data-processing and retention practices. Consequently, students should examine the privacy policies and institutional requirements relevant to the AI tools they use.

From a pedagogical perspective, the integration of AI literacy and information security education creates opportunities for developing informed digital judgment. Students learn to evaluate not only the content generated by AI but also the appropriateness of submitting particular information to a specific platform. This approach strengthens their ability to make independent decisions, question unsupported claims, and maintain responsibility for the accuracy and security of their academic work.

The Role of Teachers and the Educational Environment in Forming Information Security Competence

Teachers play a central role in developing students' information security competence because they organize learning activities, establish expectations for responsible digital behavior, provide feedback, and demonstrate appropriate practices. In the context of AI-assisted education, the teacher's role extends beyond the transmission of subject knowledge to include the development of students' capacity for critical evaluation, ethical reasoning, and secure interaction with digital systems.

An effective pedagogical environment should provide clear explanations of information security principles and opportunities for students to apply them in practice. Teachers can integrate security-related scenarios into lectures, seminars, laboratory sessions, independent assignments, and research activities. For example, students may analyze a hypothetical situation involving the disclosure of confidential research data to an external AI service, identify the associated risks, and propose measures to prevent unauthorized disclosure. They may also evaluate simulated phishing messages, assess the credibility of AI-generated academic references, or develop recommendations for responsible AI use within their academic discipline.

The educational environment should encourage questions, discussion, experimentation within authorized settings, and reflection on mistakes. Students should be able to explore the consequences of unsafe digital behavior without being exposed to unnecessary risks or being required to disclose their own sensitive information. For this reason, instructors should use fictional or anonymized data, approved educational platforms, and clearly defined rules for practical activities.

Teachers also need sufficient digital and pedagogical competence to guide students effectively. They should understand the general characteristics of AI tools, recognize common information security risks, and be able to explain appropriate preventive measures. Continuous professional development is therefore essential for ensuring that educational practices remain relevant to technological changes.

At the institutional level, universities should establish clear policies concerning acceptable AI use, personal data protection, confidentiality, academic integrity, and incident reporting. These policies should be communicated in accessible language and integrated into academic orientation, course materials, and research procedures. A supportive institutional environment helps ensure that the development of information security competence is not limited to individual classroom activities but becomes a shared educational responsibility.

Pedagogical Conditions for the Effective Formation of Information Security Competence

The successful development of students' information security competence depends on several interrelated pedagogical conditions. One of the most important is the systematic integration of information security topics into the curriculum. Rather than being restricted to specialized computer science courses, information security principles should be incorporated into research methodology, academic writing, professional training, and other disciplines where students use AI tools or process digital information. This interdisciplinary approach enables students to understand how information security principles apply across different academic and professional contexts.

Another essential condition is the use of active and practice-oriented teaching methods. Problem-based learning, project-based learning, case-study analysis, simulation-based exercises, collaborative activities, and reflective assessment enable students to connect theoretical knowledge with practical decision-making. Through these methods, students can identify digital threats, evaluate

alternative solutions, and justify their decisions. Practical activities are particularly valuable when they reproduce realistic situations while maintaining a controlled and safe learning environment.

The development of information security competence also requires the individualization of learning. Students differ in their prior digital experience, technical knowledge, and understanding of AI-related risks. Initial diagnostic assessment can help teachers identify these differences and select appropriate learning tasks. Students with limited knowledge may require additional explanations of basic cybersecurity concepts, while more advanced learners may undertake complex analyses of AI-related risks, information governance, and digital ethics.

A further condition is the integration of continuous feedback and transparent assessment criteria. Students should receive information about the strengths and weaknesses of their performance and understand how their knowledge and behavior are evaluated. Assessment should consider not only theoretical understanding but also practical performance, analytical reasoning, ethical decision-making, and the ability to explain security-related choices. This approach supports the gradual development of competence and helps teachers adjust instructional strategies according to students' learning needs.

Finally, information security education should be supported by a culture of digital responsibility. Students need to understand that secure AI use involves shared responsibilities among individuals, educational institutions, and technology providers. The educational process should therefore promote respect for privacy, careful information sharing, source verification, responsible reporting of security incidents, and continuous improvement of digital practices.

The Relationship Between Information Security Competence, Academic Integrity, and Ethical AI Use

Developing information security competence has a close relationship with academic integrity and the ethical use of artificial intelligence. The availability of AI tools creates opportunities for academic support but also introduces questions concerning authorship, attribution, the reliability of generated information, and the responsible handling of research materials. Students need to understand that the use of AI should be consistent with institutional requirements and the academic expectations applicable to their assignments and research activities.

Academic integrity requires students to take responsibility for the originality, accuracy, and credibility of their work. When AI tools are used to generate explanations, summarize literature, or suggest references, students should verify the information and ensure that the final work meets the relevant academic standards. Fabricated citations, unverified claims, and the inappropriate use of confidential material may compromise the quality and integrity of research.

Ethical AI use also involves respect for privacy and intellectual property. Students should not upload sensitive personal data, confidential institutional documents, unpublished research materials, or information belonging to others unless such use is explicitly authorized and complies with applicable policies and data protection requirements. They should also understand the importance of disclosing AI assistance when required by the relevant institution, publisher, or assignment guidelines.

From a pedagogical perspective, integrating academic integrity with information security education helps students recognize that responsible technology use is not limited to technical protection. It also involves honesty, accountability, respect for others' rights, and an awareness of the consequences of digital actions. These values are essential for preparing professionals who can use AI tools effectively without compromising ethical and academic standards.

Assessment of the Development of Students' Information Security Competence

The pedagogical effectiveness of developing information security competence should be evaluated through a combination of diagnostic, formative, and summative assessment. Diagnostic assessment helps identify students' initial knowledge, digital habits, and ability to recognize common

information security threats. It may involve scenario-based questions, short practical exercises, and assessments of students' understanding of data protection and AI-related risks.

Formative assessment provides continuous feedback during the learning process. Teachers may evaluate students' responses to simulated incidents, their ability to identify suspicious messages, the quality of their source verification, and their reasoning when determining whether particular information can be shared with an AI system. Reflective journals, peer assessment, group discussions, and short analytical reports can provide additional evidence of students' progress.

Summative assessment may include practical tasks, case-study analyses, project presentations, and structured examinations. Students should be required to demonstrate not only knowledge of information security principles but also the ability to apply them in realistic educational situations. For instance, they may be asked to analyze an AI-use scenario, identify possible privacy risks, verify generated information, and recommend appropriate protective measures.

The assessment process can be organized around cognitive, practical, analytical, and ethical-reflective criteria. The cognitive criterion concerns understanding of information security principles and AI-related risks. The practical criterion assesses the ability to apply protective measures and respond to simulated incidents. The analytical criterion examines the capacity to verify information, recognize misleading content, and justify decisions using credible evidence. The ethical-reflective criterion evaluates respect for confidentiality, academic integrity, responsible AI use, and the ability to recognize weaknesses in personal digital practices.

For practical implementation, these criteria may be measured using initial, developing, proficient, and advanced performance levels. Clear indicators should be established for each level so that assessment remains transparent and consistent. Importantly, students' self-reported confidence should be supplemented by observable performance because awareness of information security principles does not necessarily demonstrate the ability to apply them correctly.

Discussion

The pedagogical significance of developing students' information security competence is determined by the interaction of educational, technological, ethical, and professional factors. The increasing availability of AI tools makes it necessary to reconsider the content of digital education and to expand the traditional understanding of digital literacy. Students must not only know how to operate digital applications but also understand the implications of their use, evaluate the reliability of generated information, and protect the information they process.

The integration of information security competence into higher education can support the development of independent learning, critical thinking, professional responsibility, and ethical decision-making. Practice-oriented educational activities help students transform abstract knowledge into practical skills, while reflective learning encourages them to evaluate their own digital behavior and identify areas for improvement. Institutional policies and teacher guidance provide the conditions necessary for applying these skills consistently across academic contexts.

These considerations are consistent with UNESCO's emphasis on human-centred and ethically informed approaches to generative AI in education (Miao & Holmes, 2023), as well as the risk-management principles outlined in the NIST AI Risk Management Framework (Tabassi, 2023). The NIST Cybersecurity Framework 2.0 also provides a structured approach to understanding, prioritizing, and communicating cybersecurity risks (Pascoe et al., 2024). Although these frameworks were not designed exclusively for pedagogical purposes, their principles can inform the development of educational content and institutional practices related to secure AI use.

Nevertheless, the proposed pedagogical considerations should be understood as a theoretically grounded analysis rather than evidence of experimentally verified effectiveness. Further empirical research is needed to determine which combinations of teaching methods produce the most substantial improvements in students' information security competence. Such research may involve pre- and post-assessment, observation of practical performance, analysis of student projects, and comparisons

across different educational contexts. Particular attention should be given to measuring students' ability to protect sensitive information, recognize AI-assisted phishing attempts, verify AI-generated content, and make ethically justified decisions.

Conclusion

The development of students' information security competence in the context of using artificial intelligence tools represents an important pedagogical priority in contemporary higher education. The widespread use of AI technologies creates opportunities for improving learning and research, but it also introduces risks associated with personal data protection, information reliability, cybersecurity, academic integrity, and responsible digital behavior. These challenges require an educational approach that combines theoretical knowledge, practical skills, critical thinking, ethical awareness, and self-regulation.

The pedagogical significance of information security competence lies in its contribution to students' personal development, academic responsibility, professional readiness, and ability to participate safely in digital environments. Its effective formation depends on the integration of information security principles into the curriculum, the use of active and practice-oriented teaching methods, the development of teachers' digital competence, the establishment of clear institutional policies, and the application of transparent assessment procedures.

Particular importance should be assigned to AI literacy, the verification of generated information, the protection of confidential materials, and the development of responsible information-sharing practices. Students should be encouraged to use AI as a supportive educational resource while retaining responsibility for their decisions, academic work, and the security of information.

In conclusion, developing information security competence should be regarded as a continuous, interdisciplinary, practice-oriented, and ethically informed pedagogical process. Its systematic implementation can contribute to preparing digitally competent professionals who are capable of using artificial intelligence tools critically, safely, and responsibly. Further empirical research is necessary to evaluate the effectiveness of specific pedagogical approaches and to refine educational models that respond to the changing demands of AI-supported higher education.

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CHRONIC INFLAMMATION AND OXIDATIVE STRESS IN ENDOMETRIOSIS-ASSOCIATED INFERTILITY

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ANNOTATION

Background: Endometriosis-associated infertility is a heterogeneous syndrome in which distorted pelvic anatomy interacts with immune dysregulation, iron-dependent oxidative injury, altered follicular and peritoneal environments, and endometrial receptivity. Objective: To critically integrate mechanistic and clinical evidence and examine whether real-world analytics can improve decisions without overstating the validity of candidate biomarkers. Methods: This integrative narrative review prioritizes the 2022 ESHRE endometriosis guideline, recent systematic reviews, randomized trials, and regulatory guidance on real-world evidence and responsible artificial intelligence. It explains confounding, outcome selection, time-zero alignment, propensity scores, inverse probability weighting, target trial emulation, and survival models as methods suitable for future research rather than analyses conducted here. Results: Biological evidence supports reciprocal interactions between macrophage activation, proinflammatory cytokines, recurrent bleeding, free iron, reactive oxygen species, lipid peroxidation, and mitochondrial dysfunction. These pathways plausibly impair oocyte competence, sperm function, embryo development and implantation, but causal effects on live birth are not established by biomarker associations. A recent antioxidant meta-analysis pooled 21 randomized trials and 1,626 participants; the reported clinical pregnancy effect was not significant (risk ratio 1.12, 95% confidence interval 0.79–1.61), despite some favorable symptom and biochemical outcomes. Imaging, stage, age, ovarian reserve, tubal factors, partner fertility and preferences remain essential determinants of care. Real-world datasets can address longer-term outcomes and equity only when exposure, timing, missingness, selection and measurement bias are addressed. Conclusions: Redox and immune mechanisms offer plausible therapeutic targets and useful research hypotheses; they do not currently justify routine antioxidant prescribing to improve conception. Prospective multi-center registries linked to reproductive outcomes, ethically governed computational research, and adequately powered fertility trials are priority next steps. This article distinguishes

mechanistic plausibility from clinical effectiveness and proposals from empirical findings.

Keywords: endometriosis; infertility; oxidative stress; reactive oxygen species; iron overload; macrophages; cytokines; implantation; follicular microenvironment; real-world evidence; target trial emulation; artificial intelligence; reproductive outcomes

ABSTRACT

Background: Endometriosis-associated infertility is a heterogeneous syndrome in which distorted pelvic anatomy interacts with immune dysregulation, iron-dependent oxidative injury, altered follicular and peritoneal environments, and endometrial receptivity. Objective: To critically integrate mechanistic and clinical evidence and examine whether real-world analytics can improve decisions without overstating the validity of candidate biomarkers. Methods: This integrative narrative review prioritizes the 2022 ESHRE endometriosis guideline, recent systematic reviews, randomized trials, and regulatory guidance on real-world evidence and responsible artificial intelligence. It explains confounding, outcome selection, time-zero alignment, propensity scores, inverse probability weighting, target trial emulation, and survival models as methods suitable for future research rather than analyses conducted here. Results: Biological evidence supports reciprocal interactions between macrophage activation, proinflammatory cytokines, recurrent bleeding, free iron, reactive oxygen species, lipid peroxidation, and mitochondrial dysfunction. These pathways plausibly impair oocyte competence, sperm function, embryo development and implantation, but causal effects on live birth are not established by biomarker associations. A recent antioxidant meta-analysis pooled 21 randomized trials and 1,626 participants; the reported clinical pregnancy effect was not significant (risk ratio 1.12, 95% confidence interval 0.79–1.61), despite some favorable symptom and biochemical outcomes. Imaging, stage, age, ovarian reserve, tubal factors, partner fertility and preferences remain essential determinants of care. Real-world datasets can address longer-term outcomes and equity only when exposure, timing, missingness, selection and measurement bias are addressed. Conclusions: Redox and immune mechanisms offer plausible therapeutic targets and useful research hypotheses; they do not currently justify routine antioxidant prescribing to improve conception. Prospective multi-center registries linked to reproductive outcomes, ethically governed computational research, and adequately powered fertility trials are priority next steps. This article distinguishes mechanistic plausibility from clinical effectiveness and proposals from empirical findings.

Keywords: endometriosis; infertility; oxidative stress; reactive oxygen species; iron overload; macrophages; cytokines; implantation; follicular microenvironment; real-world evidence; target trial emulation; artificial intelligence; reproductive outcomes

1. INTRODUCTION

Clinical problem and explanatory limits

Endometriosis is a chronic inflammatory condition with diverse anatomic manifestations and symptom trajectories. Its relationship with infertility is neither universal nor mechanistically singular. Superficial lesions, ovarian endometriomas, deep disease, adhesions and coexisting adenomyosis can represent different causal routes to a common clinical presentation. Some people conceive despite extensive disease, while others experience infertility with comparatively limited visible disease. Such discordance argues against relying on staging alone to infer reproductive prognosis. The relevant causal question is how a particular inflammatory and redox profile changes fecundability or live birth after accounting for age, partner factors, ovarian reserve and treatment pathways. [1,2]

Inflammation and reactive oxygen species

The peritoneal cavity is normally an immunologically active reproductive environment rather than a sterile biochemical compartment. Macrophages, mesothelial cells, lymphocytes, endocrine signals and circulating cells contribute to tissue maintenance. In endometriosis, cyclic bleeding, ectopic tissue persistence and recruitment of innate immune cells may produce sustained cytokine signaling. Reactive oxygen species (ROS) are physiologic signaling molecules at controlled concentrations; pathologic oxidative stress occurs when ROS generation, clearance and repair become imbalanced. Therefore oxidative stress is not synonymous with a high concentration of any single biomarker, and its influence must be interpreted according to tissue, sampling time and functional outcome. [1,3,4]

Real-world data and real-world evidence

Real-world data (RWD) are information routinely generated during healthcare delivery or daily life, such as electronic health records, laboratory feeds, claims, imaging reports and patient-recorded symptoms. Real-world evidence (RWE) is clinically interpretable evidence produced by appropriately analyzing these data. A large RWD dataset is not

automatically reliable evidence: diagnosis coding, encounter patterns, treatment selection and follow-up can distort estimands. For endometriosis-associated infertility, RWE could compare time to pregnancy after clinically reasonable pathways, track adverse effects, and assess differential access to assisted reproduction, but only after patient pathways and causal assumptions are explicitly specified. [6,7]

RCTs, efficacy and effectiveness

Randomized controlled trials address efficacy under protocol-specified assignment and eligibility criteria; pragmatic randomized trials and high-quality observational studies may address effectiveness in more heterogeneous settings. Fertility studies require particular attention to the distinction between biochemical pregnancy, clinical pregnancy, ongoing pregnancy and live birth. An intervention might suppress an inflammatory marker, relieve pelvic pain or increase oocyte yield without increasing live birth. Symptom response and infertility response are therefore separate therapeutic targets. Observational estimates of effectiveness are vulnerable to confounding by indication because patients with more severe disease may receive different interventions and surveillance intensity. [1,5]

Regulatory and ethical environment

The FDA and EMA recognize that carefully characterized real-world data may complement trials in medicines regulation; the EMA DARWIN EU network is an operational example of distributed observational analyses. Neither agency regards observational datasets as a substitute for appropriate causal design. WHO guidance emphasizes transparency, human oversight, equity, protection of privacy and accountability when artificial intelligence is adopted in healthcare. For endometriosis, these standards are particularly salient because fertility information, cycle tracking and reproductive decisions are intimate and potentially stigmatizing. [6–10]

Critical scope and clinical purpose

The present review is organized around an explicit evidence hierarchy. Molecular and animal experiments establish plausibility but cannot directly quantify human live-birth benefits. Diagnostic association studies test discrimination but not whether acting on the marker improves outcomes. Cohorts quantify prognosis or associations but require stronger assumptions for causal effects. Randomized treatment studies provide direct intervention evidence, although their endpoints, size and transportability still require

appraisal. This hierarchy also determines how AI tools and mechanistic predictors should be assessed: model accuracy is insufficient unless predictions lead to better, fairer and safe clinical decisions. [1,3,5]

2. MATERIALS AND METHODS

Design and transparency. This is a structured, critical integrative narrative review rather than a PRISMA-compliant systematic review or meta-analysis. No original participant-level data were obtained, no pooled effect estimates were recalculated, and no new machine-learning model was trained. Accordingly, the results are a thematic synthesis of published findings and explicitly identified research proposals, not a report of new statistical analyses.

Evidence identification. Clinical and mechanistic literature was located through accessible indexed records and publisher pages, with attention to PubMed-indexed research, Cochrane-style evidence synthesis, the ESHRE clinical guideline, WHO, FDA, EMA and relevant methodological scholarship. PubMed, Embase, Scopus, Web of Science and Cochrane Library are recommended databases for a future reproducible systematic search; access to or completed exhaustive searches of every database is not claimed. Journal platforms such as Nature Medicine, The Lancet, JAMA and NEJM were treated as possible publication venues rather than databases whose comprehensive holdings were individually screened.

Inclusion logic. Priority was given to 2020–2026 clinical studies, systematic reviews, major guidelines and mechanistic studies that can contextualize fertility. Earlier seminal papers were retained where necessary for a core mechanism or methodology. Studies focused exclusively on pain were not used to infer reproductive benefit. Mechanistic findings from cell culture and animal models were treated as hypothesis-generating. Papers without independently verifiable bibliographic detail were not represented as confirmed clinical findings.

Synthesis framework. Evidence was organized by compartment—peritoneal cavity, follicular fluid, ovary, endometrium, immune system and embryo—and by the outcome each study could actually support. The methodological evaluation considered selection bias, treatment-selection mechanisms, timing of exposure, outcome definition, attrition, missing data, assay heterogeneity, multiplicity and precision. For observational designs, target-population generalizability was kept separate from internal causal validity.

Propensity score matching

Estimate the conditional probability of treatment from pre-treatment covariates, match patients within adequate overlap, diagnose standardized mean differences and report exclusions. Matching cannot balance unmeasured surgical expertise, disease severity or patient preferences.

Inverse probability weighting

Use inverse treatment probabilities to construct a pseudo-population balanced on measured baseline determinants. Inspect extreme weights, positivity, weight truncation and effective sample size; consider time-varying confounding when treatment changes over fertility follow-up.

Cox proportional hazards regression

Model hazard of a clearly defined event such as first clinical pregnancy, with diagnosis or treatment anchored to a consistent time zero. Check proportional hazards, competing risks and differential observation; a hazard ratio does not directly equal a pregnancy probability.

Kaplan–Meier and survival analysis

Describe cumulative event-free probability when censoring is noninformative. If treatment stops, loss to follow-up or assisted reproduction occurs differentially, standard Kaplan–Meier may misrepresent untreated conception. Competing-risk estimators and restricted mean time-to-event can be useful.

Target trial emulation

Specify eligibility, competing treatment strategies, assignment, time zero, follow-up, outcome, causal contrast and analysis before processing RWD. Avoid immortal-time bias when comparing immediate IVF, surgery-first and expectant management strategies.

Causal inference

Use directed acyclic graphs to distinguish confounders, mediators and colliders. Do not adjust for post-treatment markers when estimating total treatment effects. Compare assumptions through sensitivity analyses for unmeasured confounding and measurement error.

Machine learning and deep learning

Potential prediction tasks include IVF ovarian response or endometrioma recurrence using imaging, longitudinal records and omics. Use patient-level train-validation-test separation, calibration, external validation, decision curves and subgroup audits; cross-validation alone is insufficient.

Natural language processing and large language models

Extract surgical stage, lesion location, fertility intention and adverse effects from de-identified clinical notes with human adjudication. LLM-generated summaries require provenance, accuracy review and checks for unsupported assertions.

Reinforcement learning

Sequential decision strategies for treatment changes could be studied in simulation or carefully designed offline datasets. Exploration on patients is not ethically acceptable without robust safety constraints and approval; confounding and limited policy overlap challenge offline evaluation.

3. RESULTS: THEMATIC EVIDENCE SYNTHESIS

The following results summarize existing mechanistic and clinical evidence. No frequency or numerical estimate below should be read as deriving from a new cohort assembled for this manuscript. The mechanistic links are graded descriptively as established physiologic pathways, associated human findings, or experimental hypotheses rather than combined into an invented numerical score.

3.1 Pelvic inflammatory microenvironment

Repeated activation of innate immune pathways in the peritoneal environment involves macrophage recruitment, cytokine release, prostaglandin signaling and changes in immune-cell phenotype. Macrophage number or polarization alone is not a sufficiently specific infertility test: menstrual phase, coexisting pelvic disease and sampling at surgery introduce variability. IL-1β, IL-6, TNF-α and chemokine networks may influence gamete transport, ovarian activity and receptivity, but pathway activation does not automatically prove clinically meaningful fertility impairment.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical

pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

Study-design implications. A feasible prospective program would prespecify eligibility and follow-up, measure age, infertility duration, ovarian reserve, partner factors and imaging phenotype at baseline, then record subsequent treatment changes and pregnancy outcomes. Laboratories should use harmonized specimen handling, blinded assessment and documented quality controls. When an observational comparison is unavoidable, investigators should define a treatment decision point, evaluate measured covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.2 Macrophage phenotypes and failed resolution

The binary M1/M2 description is a simplification of diverse cellular states. Resident and recruited macrophages may simultaneously participate in clearance of menstrual debris, angiogenesis, lesion survival and tissue remodeling. In endometriosis, defective clearance, reciprocal lesion–macrophage signaling and persistent iron-rich debris could prevent normal inflammatory resolution. Single-cell profiling offers mechanistic detail but studies vary in stage, treatment exposure and sample-processing methods; definitive cell-state signatures with clinical fertility utility remain unvalidated.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.3 Ectopic bleeding, heme and free iron

Hemoglobin released during repeated bleeding introduces heme and catalytic iron into lesion-adjacent compartments. Iron participates in Fenton chemistry and can amplify oxidative membrane and DNA injury. Iron is essential for normal cellular metabolism, so excessive local exposure rather than iron itself is the relevant biological problem. A 2023 systematic review reported excess iron in endometriotic tissues and linked iron-mediated oxidative stress to relevant disease biology; observational tissue measurements alone cannot prove that iron removal increases conception. [3]

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.4 Ferroptosis and lipid peroxidation

Ferroptosis is an iron-associated, phospholipid-peroxidation-dependent form of regulated cell death. GPX4-related antioxidant defenses, glutathione availability and membrane lipid composition shape cell susceptibility. Endometriotic lesions can display redox adaptations that support survival under stress while nearby healthy reproductive tissues may experience injury. This compartment-specific asymmetry cautions against simplistic claims that increasing antioxidant capacity everywhere will restore fertility; interventions might affect lesions and physiologic ovulatory signaling differently. [4]

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.5 Oxidative stress markers: validity problems

Malondialdehyde, 8-hydroxy-2′-deoxyguanosine, total antioxidant capacity, lipid hydroperoxides and oxidative protein products are used as proxies for redox disturbances. These markers differ in analyte specificity and preanalytic sensitivity; storage temperature, cycle phase, hemolysis and assay kit strongly affect comparability. A change in one marker does not itself validate an intervention. Fertility-specific biomarker qualification requires reproducible measurement, independent prediction beyond standard clinical variables and evidence that acting on the test improves outcomes.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.6 Mitochondria and energetic competence

Mitochondria are central to oocyte maturation, spindle organization, intracellular calcium regulation and early embryonic development. Oxidative injury can disrupt mitochondrial membranes and compromise energy availability, yet mitochondrial ROS are also involved in signaling. Follicular-fluid oxidative measurements are imperfect proxies for individual oocyte competence, and selection into IVF populations constrains generalization to spontaneous conception. Prospective studies should define whether tissue biomarkers improve clinically useful predictions of mature oocyte yield, embryo quality or live birth.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic

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3.7 Follicular fluid and ovarian microenvironment

The follicular compartment is exposed to inflammatory and endocrine inputs distinct from those in peripheral blood. Endometriomas, previous surgery, age and ovarian stimulation protocols can change follicular-fluid constituents. A higher inflammatory marker may reflect underlying ovarian pathology, active stimulation or tissue trauma rather than a direct cause of failed fertilization. Mechanistic fertility research must compare lesions and treatment groups within appropriate clinical strata and avoid conditioning on variables affected by disease and intervention.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.8 Oocyte maturation and meiotic integrity

Reactive oxygen species can theoretically influence chromosomal segregation, meiotic spindle architecture and cumulus–oocyte communication. However, embryo morphology is a limited surrogate for chromosomal competence and healthy live birth. Age-related aneuploidy, stimulation intensity and gamete factors frequently exert large independent effects. Experimental observations require cautious translation, especially when a study reports cellular endpoints without controlled comparisons of pregnancy or live birth.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.9 Sperm exposure in the inflammatory peritoneal environment

Inflammatory peritoneal fluid can influence sperm motility, capacitation and membrane integrity in ex vivo experimental systems. Such effects are biologically plausible contributors to infertility where gametes encounter altered peritoneal conditions. Their relative importance in natural conception is difficult to estimate because sperm transit, cervical factors, tubal anatomy and partner semen characteristics

co-determine fertility. Prognostic models that omit partner testing risk falsely attributing infertility entirely to endometriosis.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.10 Tubal motility, adhesions and anatomy

Pelvic adhesions and distorted tubo-ovarian relationships are mechanical pathways distinct from molecular inflammation, although inflammation can promote fibrosis. Severe adhesive disease may impair oocyte capture even with normal ovarian reserve. An antioxidant may change redox chemistry but will not necessarily restore an obstructed tube. Analyses that combine patients with minimal disease, deep disease and severe adhesions can mask biologically distinct treatment effects and produce misleading average estimates.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic

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3.11 Endometrial receptivity and progesterone resistance

Eutopic endometrial changes have been implicated in altered implantation signaling, progesterone responsiveness and immune tolerance. Candidate mediators include local prostaglandins, inflammatory transcription factors and altered stromal differentiation. Yet reduced expression of a receptivity marker is not equivalent to implantation failure, and tests must be interpreted in the context of embryo competence. A personalized intervention guided by an endometrial signature should be supported by prospective clinical utility studies rather than association alone.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.12 Adenomyosis as a frequent competing explanation

Adenomyosis may coexist with endometriosis and is associated with abnormal uterine contractility and reproductive morbidity. It can confound observed links between endometriosis and implantation because diagnostic imaging intensity varies across clinics. Studies that do not report adenomyosis assessment may attribute uterine effects to peritoneal disease. Ideally, transvaginal ultrasound or MRI phenotyping should be standardized and recorded before treatment decisions.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.13 Immune-cell crosstalk at implantation

Natural killer cells, macrophages, T cells and decidual stromal cells coordinate a controlled inflammatory-to-tolerogenic transition around implantation. Immune phenotypes measured in peripheral blood do not necessarily reflect the endometrium. Empiric immunomodulation for a laboratory-defined “immune abnormality” is not justified without validated thresholds, outcome evidence and risk-benefit assessment.

This is especially important in fertility settings where low-risk appearance can obscure meaningful drug exposure during conception.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.14 Pelvic pain, sexual function and conception exposure

Infertility is not exclusively an oocyte–embryo problem. Dyspareunia and chronic pelvic pain can reduce intercourse frequency or timing, while distress, sleep disruption and access constraints affect care pathways. Studies focusing only on biological markers risk excluding behavioral and treatment-mediated factors. A useful causal framework distinguishes physiologic fecundability from the opportunity to conceive, and treats symptom relief as a clinically meaningful endpoint even when it does not prove improved biological fertility.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic

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3.15 RCT evidence for antioxidant supplementation

A 2025 systematic review and meta-analysis included 21 randomized trials totaling 1,626 participants. It identified favorable signals for certain symptoms and malondialdehyde, but did not observe a statistically significant clinical pregnancy benefit: RR 1.12, 95% CI 0.79–1.61, p = 0.52. Heterogeneous compounds, doses, comparators and endpoint definitions limit the inference. A null pooled result is not proof that every redox-targeted intervention is ineffective; it means routine fertility benefit has not been demonstrated. [5]

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

Published trial synthesis	Reported finding	Interpretation
RCTs/participants	21 trials / 1,626 participants	Pooled meta-analysis, heterogeneous compounds
Clinical pregnancy	RR 1.12; 95% CI 0.79–1.61; p=0.52	Not statistically significant; do not claim fertility benefit
Oxidative stress	Some favorable MDA findings	Biochemical surrogate, not live birth

3.16 Why a biochemical effect may not produce live birth

The transition from reducing lipid peroxidation to live birth involves multiple causal stages: ovulation, fertilization, tubal transport, implantation, placentation and fetal development. Interventions can improve one intermediate without affecting the total pathway, particularly when anatomical disease, age or male factors remain unresolved. Trials powered for pain or serum biomarkers often cannot rule out clinically important benefit or harm for live birth. Future studies should prespecify live birth and report pregnancy loss, treatment discontinuation and adverse events.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

Study-design implications. A feasible prospective program would prespecify eligibility and follow-up, measure age, infertility duration, ovarian reserve, partner factors and imaging phenotype at baseline, then record subsequent treatment changes and

pregnancy outcomes. Laboratories should use harmonized specimen handling, blinded assessment and documented quality controls. When an observational comparison is unavoidable, investigators should define a treatment decision point, evaluate measured covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.17 Clinical management and fertility priorities

The 2022 ESHRE guideline warns against ovarian suppression solely to improve fertility in infertile women with endometriosis. Management should incorporate age, pain, ovarian reserve, endometrioma-related risks, partner evaluation, tubal factors and access to assisted reproductive technology. Surgery may be appropriate for selected indications but can also compromise ovarian reserve, particularly after repeated endometrioma procedures. No mechanistic biomarker currently replaces individualized guideline-based assessment. [1,2]

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.18 Real-world sources: electronic health records

Electronic records can link diagnosis dates, symptoms, surgical findings, imaging, infertility duration and treatment decisions. Their limitations include undocumented

fertility intention, delayed diagnosis and absent out-of-network pregnancies. Failure to capture a live birth may indicate a transfer of care rather than an adverse fertility outcome. Data quality procedures should compare structured codes with narrative and procedure records, establish reliable patient linkage, and audit missing pregnancy and neonatal outcomes.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.19 Real-world sources: prescriptions and pharmacy

Electronic prescribing and dispensing data describe what clinicians ordered and what pharmacies supplied, not necessarily what patients took. Hormonal suppression, analgesic regimens, progestins and fertility medications have different indications and risk periods. Medication exposure should include dose, route, adherence proxies and preconception timing. Confounding by indication is severe when comparing medically managed pain patients with individuals actively attempting conception.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical

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3.20 Real-world sources: laboratories and registries

Laboratory information systems contribute hormone panels, inflammatory markers, oocyte retrieval and fertilization results when linked to ART platforms. Disease and birth registries can provide longer follow-up, although linkage governance and coding quality determine reliability. Biobank specimen collection must record cycle phase, temperature, processing delay and assay batch. Without calibration, combining oxidative-marker values from separate laboratories can generate spurious center effects.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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unavoidable, investigators should define a treatment decision point, evaluate measured covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.21 Real-world sources: pharmacovigilance and claims

Adverse-event reporting systems are designed for safety signal generation, not estimation of comparative incidence without valid denominators. Claims data capture utilization and billing but may incompletely represent clinical staging or reproductive intention. A pharmacovigilance report concerning a supplement or hormonal product cannot be directly interpreted as the frequency of an adverse reaction among users. Linked claims, medical records and registry data are better suited to estimating comparative outcomes after a carefully specified design.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.22 Wearables and patient-facing applications

Cycle-tracking applications and wearables can provide longitudinal pain scores, sleep, activity and self-reported menstrual symptoms between visits. Consumer app participants are selected populations; algorithms can misclassify ovulation and conception timing, and app engagement may correlate with symptoms and

socioeconomic status. Such data should supplement—not replace—validated reproductive endpoints and clinical examination. Consent must specify secondary research use and prevent secondary exploitation of intimate fertility information.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.23 AI: supervised machine learning

Prediction algorithms may combine age, ovarian reserve, ultrasound phenotypes, surgical history and conventional laboratory results to forecast ART response or time to conception. Flexible learners can discover nonlinear interactions but often overfit narrow single-center datasets. Evaluation should report discrimination and calibration, missingness by site, clinical net benefit and transportability. Any improvement over transparent baseline clinical models must be shown with independent data and prospective decision-impact assessment.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for

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3.24 AI: deep imaging and multimodal models

Deep learning could quantify lesion patterns from ultrasound or MRI and combine them with longitudinal reproductive outcomes. Image acquisition, machine settings, operator experience and referral spectrum can dominate performance. A model trained to distinguish surgically confirmed endometriosis from controls may perform poorly when deployed among unselected infertility patients. Multimodal modeling raises additional data-leakage and missing-modality issues that require frozen evaluation protocols.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.25 AI: NLP, LLMs and reinforcement learning

NLP can recover lesion descriptors and prior treatment histories from unstructured reports, with physician-adjudicated validation. Large language models may assist literature triage or draft summaries but must not invent clinical facts or populate unverified research results. Reinforcement learning is a research avenue for sequential care decisions, not an authorization for autonomous prescribing. Safe offline policy evaluation and independent clinical supervision are prerequisites for any prospective study.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.26 Comparative drug-effectiveness hypotheses

In endometriosis, an effectiveness model should distinguish symptom control from fertility optimization. For example, analgesics may improve quality of life but not directly increase live births, while hormonal suppression can be appropriate for pain yet temporarily prevent conception. Drug-response models developed for diabetes, cardiovascular disease, oncology, infection or neurology offer methodological

analogies—treatment heterogeneity, adverse events, longitudinal covariates—but results from those diseases cannot be transferred as endometriosis-specific effect sizes.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.27 Safety signals and pharmacovigilance

Adverse drug reactions relevant to endometriosis include effects of hormonal treatment, analgesics, procedure-associated drugs and unregulated supplements, each requiring intervention-specific assessment. Drug-safety signal detection tools search for disproportionate reporting, emerging combinations or unusual temporal patterns. They generate hypotheses to investigate, not causal proof. Pregnancy outcomes merit specific surveillance because time-dependent exposure and reporting delays can produce biased safety profiles.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic

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3.28 Precision medicine and biomarker panels

Candidates for personalized care include inflammatory proteins, oxidative products, circulating miRNAs, imaging signatures, ovarian reserve markers and genomic or pharmacogenetic predictors of drug response. Precision medicine is meaningful only if a stratification rule improves decisions compared with existing care. Clinical validation should evaluate assay reproducibility, value beyond age and disease phenotype, decision thresholds, harms of misclassification and whether a biomarker-guided strategy improves a patient-centered endpoint.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

3.29 Comparative implications for comorbid diseases

Diabetes, cardiovascular disease, obesity, malignancy, infection and neurologic disorders illustrate why background health status and medication exposure matter in causal research, but their prediction frameworks should not become substitutes for disease-specific biological reasoning. For example, metabolic dysfunction may modify inflammation and conception independently. A model that treats all comorbidities as interchangeable predictors misses distinct causal roles such as treatment contraindication, fertility confounder or competing risk.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.30 Uzbekistan: service integration and prospective research

For Uzbekistan, an ethically governed multi-center reproductive-health registry could link outpatient gynecology, imaging, surgery, ART, pharmacy and obstetric records. The Ministry of Health and relevant digital-health bodies would need to define data stewardship, clinical terminology, opt-out or consent where applicable, lawful linkage and minimum reporting standards. Electronic prescriptions may support drug-exposure

records but should not be equated with adherence. Proposed measures include standardized fertility endpoints, ovarian reserve recording, validated diagnosis codes, data-access review, clinician training and secure linkage with birth outcomes.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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3.31 External validation and equitable implementation

Transportability requires testing prediction and causal effect estimates in urban and rural services, across language groups and facilities with different diagnostic access. Racial or geographic proxy variables can create inequity if they encode healthcare access instead of disease mechanisms. Missing outcomes may be greatest among financially constrained patients, biasing model calibration. External validation should report subgroup performance and decision consequences rather than only an overall area under the receiver-operating curve.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for

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3.32 Evidence synthesis across biological scales

The central synthesis is a multiscale model: recurrent bleeding and iron loading can promote oxidative injury; inflammatory cells amplify local cytokine signaling; ovarian and endometrial environments may become less favorable; and anatomic, endocrine and behavioral pathways interact. Confidence is higher for the presence of inflammatory and oxidative abnormalities than for claims that changing a particular marker increases live birth. Translational priorities should therefore move from biomarker discovery to prespecified interventional hypotheses and clinically meaningful trial outcomes.

Evidence interpretation. This domain must be examined in relation to the exact reproductive estimand: spontaneous conception, oocyte yield, implantation, clinical pregnancy or live birth. The direction and magnitude of associations can differ with disease phenotype, menstrual-cycle phase, surgical exposure and treatment history. Robust appraisal therefore compares the source population with the intended clinical population, specifies when variables were measured, and distinguishes adjustment for baseline confounding from adjustment for downstream mediators. A mechanistic signal should remain a hypothesis until independent clinical data establish predictive and interventional value.

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unavoidable, investigators should define a treatment decision point, evaluate measured covariate overlap, quantify loss to follow-up and conduct sensitivity analyses rather than presenting a single adjusted coefficient as conclusive evidence.

4. DISCUSSION

Mechanistic convergence versus causal certainty

The convergence of human specimen studies, experimental models and redox biology supports the proposition that inflammation and oxidative stress participate in the pathophysiology of endometriosis. Nevertheless, the clinically crucial question is whether modulating one pathway improves time to pregnancy and live birth without unacceptable harms. Lesion persistence, tissue-specific antioxidant adaptation, ovarian reserve and anatomy create competing pathways; consequently, identifying ROS excess is neither sufficient for a fertility diagnosis nor proof of therapeutic reversibility.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

Why clinical results disagree

Published studies sample distinct populations and tissues, use different assays and report different outcomes. Patients who undergo surgery or IVF are selected by severity, infertility history and clinical access. A positive association between oxidative markers and poor embryo quality could be confounded by age or stimulation protocol; a negative association could reflect protective treatment given to higher-risk patients. Without careful timing and prespecified estimands, statistical adjustment can aggravate bias by conditioning on mediators or colliders.

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Strengths and limitations of artificial intelligence

AI could identify multimodal patterns beyond handcrafted rules, support imaging interpretation and recover structured outcomes from narrative records. But data leakage, model drift, subgroup underrepresentation, poor calibration, shortcut learning and opaque decision rules threaten safety. Explainable AI offers tools to interrogate feature contributions, not a guarantee of biological causation or fairness. Clinical decision support systems should document intended users, action thresholds, oversight, fail-safe behavior and evidence that use improves decisions.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

Missing data and measurement error

Missing fertility outcomes are likely informative: individuals achieving pregnancy may stop infertility visits, while those with poor access may disappear from records. Multiple imputation assumes an explicit mechanism and should be complemented by missing-not-at-random sensitivity analyses where warranted. Endometriosis diagnosis misclassification differs by facility because access to imaging and laparoscopy varies. Biomarker error may be heteroscedastic across assays and sampling windows, undermining naive pooling of data.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

Ethics and regulatory science

WHO guidance requires protection of autonomy, wellbeing, transparency, accountability and inclusion. FDA RWE guidance and EMA regulatory initiatives encourage reliable observational evidence within rigorous design and data standards.

DARWIN EU illustrates the value of common data models and distributed analytic governance, not the automatic validity of any specific observational endometriosis finding. Algorithmic updates, reproducibility and independent monitoring must be planned as part of clinical implementation.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

Implications for Uzbekistan

A useful first stage is to harmonize documentation and build a minimal fertility dataset before purchasing complex AI technology. Standardized patient identifiers, reproductive outcomes, diagnostic phenotype, prescription exposure and consent controls are prerequisites for valid research. Multi-center oversight should involve clinicians, methodologists, information-security experts and patients. Any proposed registry or electronic prescribing linkage must be evaluated against current Uzbek law and actual infrastructure; it should not be described as an already operational nationwide evidence network without verification.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

Priorities for prospective research

Researchers should favor pre-registered multicenter cohorts, nested biobanks, assay standardization and pragmatic trials that include live birth as an endpoint. A redox-targeted treatment trial requires justification of dose, timing, biological target, reproductive safety and interaction with established management. Observational target-trial emulation can complement but not replace trials when important residual confounding persists. Economic evaluation should incorporate medication costs, repeated procedures, ART use and opportunity cost to patients.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

Limitations of the present review

This is an integrative review, not a formal exhaustive search or a quantitative synthesis. It does not claim screening counts, pooled meta-analytic effect sizes beyond those attributed to published sources, individual-level regressions or validated AI performance. Regulatory literature is used primarily as a methodological context and is not automatically disease-specific. The breadth requested—including analogies with multiple other diseases—reduces the space available for detailed appraisal of each individual experimental endometriosis study.

A rigorous interpretation separates feasibility from evidence of benefit. Decisions based on findings in one setting require comparison of baseline risk, patient eligibility, measurement methods and competing treatments across settings. Clinically persuasive results should persist after sensitivity analyses and ideally be replicated externally. For fertility, the most defensible intervention endpoint is live birth supplemented by patient-reported outcomes and maternal safety rather than a single molecular surrogate.

5. CONCLUSION

Endometriosis-associated infertility emerges from interacting inflammatory, iron-dependent redox, ovarian, endometrial, anatomic and behavioral mechanisms. These domains are biologically plausible and useful for research stratification, yet clinical translation must distinguish association from intervention effect. Current antioxidant trial synthesis does not establish improvement in clinical pregnancy, and published guidelines do not support ovarian suppression solely to enhance fertility. The evidence-based next step is to connect standardized molecular measurements with carefully phenotyped clinical cohorts and live-birth outcomes, while maintaining individualized care based on age, symptoms, ovarian reserve, anatomy, partner factors and patient preferences. RWD, causal methods and well-validated AI may complement randomized trials if deployed within reproducible and ethically governed research infrastructure.

DECLARATIONS

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Bibliographic note: The 16 entries above are individually identifiable publications or institutional sources. The requested 30–50 independently verified publications were not achieved; additional peer-reviewed studies should be verified and added before

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MICRONUTRIENT STATUS AND ITS RELATIONSHIP WITH INFLAMMATORY ACTIVITY IN PATIENTS WITH ULCERATIVE COLITIS

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Background. Assessing micronutrient status may provide additional information when evaluating patients with ulcerative colitis (UC). However, differences in micronutrient concentrations between patient groups should be distinguished from associations with clinical severity and inflammatory activity. Understanding these relationships is important for selecting individualised supplementation rather than prescribing multiple vitamin and mineral preparations routinely.

Objective. To characterise baseline micronutrient status in patients with UC receiving conservative or surgical treatment and assess its relationship with clinical severity, inflammatory markers and endoscopic activity.

Materials and methods. This observational study included 105 patients with confirmed UC treated at Bukhara Regional Multidisciplinary Medical Centre during 2023–2024. The conservative treatment group comprised 74 patients, while 31 patients underwent surgery. Thirty healthy participants formed the control group. Mean ages were 43.97±14.25, 41.55±11.11 and 36.73±11.74 years, respectively. Laboratory measurements were obtained before treatment or surgery and included serum iron, zinc, copper, magnesium, total calcium, 25-hydroxyvitamin D, vitamin B12 and folate. C-reactive protein and faecal calprotectin were assessed alongside endoscopic findings. Clinical severity was classified using Truelove–Witts criteria, and endoscopic activity was evaluated using the Mayo endoscopic subscore. Group comparisons used Mann–Whitney and Kruskal–Wallis tests. Spearman correlations were calculated

separately within each patient group. Holm adjustment was applied to multiple comparisons. Results are presented as mean±standard deviation.

Results. The surgical group showed a distinct preoperative micronutrient profile. Compared with conservatively treated patients, these patients had lower serum iron (8.20±1.29 versus 10.63±1.93 μmol/L), zinc (9.76±1.76 versus 12.43±2.56 μmol/L), magnesium (0.649±0.074 versus 0.766±0.090 mmol/L) and total calcium (1.96±0.10 versus 2.21±0.11 mmol/L). Conversely, copper was higher in the surgical group (24.42±4.50 versus 19.89±2.86 μmol/L). All these between-patient-group differences were significant after adjustment ($p<0.001$).

Vitamin concentrations followed a similar pattern. Vitamin D levels were 12.01±4.31 ng/mL in the surgical group, 21.45±6.20 ng/mL in the conservative group and 44.58±5.23 ng/mL in controls. Corresponding vitamin B12 concentrations were 213.74±58.58, 317.96±80.41 and 529.90±128.94 pg/mL, while folate concentrations were 3.91±1.24, 6.96±1.91 and 11.31±2.37 ng/mL. All pairwise comparisons for these vitamins were significant (adjusted $p<0.001$).

Despite these differences, none of the investigated mineral or vitamin concentrations differed significantly across mild, moderate and severe clinical categories. High endoscopic activity was recorded in 67.7% of surgical patients and 33.8% of conservatively treated patients; the overall distribution of endoscopic activity differed significantly ($p=0.006$). Within the surgical group, serum iron correlated positively with faecal calprotectin ($r_s=0.657$; Holm-adjusted $p=0.0021$). No other investigated correlation remained significant after adjustment.

Conclusion. Patients undergoing surgery had lower baseline concentrations of several minerals and vitamins and higher copper than conservatively treated patients. However, these differences were not reproduced across clinical severity categories, and most within-group correlations with inflammatory activity were not significant. Micronutrient status should therefore be assessed directly and individually rather than inferred from clinical severity or inflammatory markers alone. The observed

associations do not establish causality, and differences in age and clinical characteristics should be considered when interpreting comparisons with controls.

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COMPARATIVE DIAGNOSTIC PERFORMANCE OF CHEST RADIOGRAPHY, COMPUTED TOMOGRAPHY AND ARTIFICIAL INTELLIGENCE IN COPD: THE GREATEST BENEFIT AT AN EARLY STAGE

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Relevance. Chest radiography, visual CT reading and AI-based image analysis are all used in COPD imaging, yet the literature lacks studies that compare them directly in one patient cohort against a single reference standard. Such a comparison is needed to define the place of each method in the diagnostic pathway, particularly for early disease.

Aim. To compare the diagnostic performance of chest radiography, visual and quantitative CT, a baseline AI model and a locally retrained AI model in patients with COPD.

Materials and methods. We examined 117 subjects: 78 patients with COPD confirmed by post-bronchodilator FEV1/FVC < 0.70, 24 individuals with risk factors and 15 healthy controls. All underwent digital radiography in two projections and 128-slice CT. Images were assessed by two radiologists, by a baseline AI model (C1) and by the same model retrained on local data (C2). Post-bronchodilator spirometry served as the reference standard. Diagnostic accuracy was evaluated by ROC analysis with pairwise DeLong comparison; sensitivity, specificity and predictive values were calculated on an independent test subset (n = 29).

Results. Diagnostic accuracy rose consistently from radiography (AUC 0.782) to the baseline model (0.887), expert CT (0.914) and the retrained model (0.962). CT outperformed radiography (p = 0.021), and the overall gain from radiography to the retrained model reached ΔAUC = +0.180 (p = 0.002). Without local adaptation the AI model fell behind expert CT; after retraining it surpassed it. On the test subset, sensitivity increased from 73.7% for radiography to 94.7% for the retrained model, and overall accuracy from 75.9% to 93.1%. The largest difference concerned the negative

predictive value: 61.5% for radiography versus 90.0% for the retrained model. The methods differed most at GOLD 1, where sensitivity was 40.0% for radiography, 60.0% for the baseline model, 70.0% for expert CT and 80.0% for the retrained model; at GOLD 4 all CT-based approaches reached 100%. Fully automated analysis took 52.4 ± 11.3 seconds per study compared with 8.7 ± 2.1 minutes for manual quantitative analysis, added no radiation dose beyond the standard CT protocol and raised the examination cost by about 11%.

Conclusion. In COPD, diagnostic accuracy increases stepwise from radiography to CT and further to a locally adapted AI model, and the benefit is greatest at the early stage, where conventional imaging is least reliable. A negative result of the retrained model reliably excludes the disease in nine out of ten cases, which supports including automated quantitative CT analysis in the examination of at-risk patients.

Keywords: chronic obstructive pulmonary disease, chest radiography, computed tomography, artificial intelligence, diagnostic accuracy, early diagnosis.

BIOLOGIK FANLARNI O‘QITISHDA INNOVATSION VA RAQAMLI TEXNOLOGIYALAR: INTERAKTIV USULLAR VA VIRTUAL MIKROSKOPIYA

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ANNOTATSIYA: Mazkur ilmiy maqolada biologik fanlarni o‘qitish jarayonida innovatsion pedagogik yondashuvlar va raqamli texnologiyalardan foydalanishning nazariy-metodik asoslari, interaktiv ta’lim usullarining didaktik imkoniyatlari hamda virtual mikroskopiya texnologiyasining ta’lim samaradorligini oshirishdagi o‘rni tahlil qilinadi. Zamonaviy ta’lim tizimida biologiya fanlarini o‘qitishning an’anaviy shakllarini raqamli ta’lim vositalari bilan uyg‘unlashtirish, o‘quvchilarning mustaqil fikrlashi, ilmiy dunyoqarashi, kuzatish, tahlil qilish va tadqiqotchilik kompetensiyalarini rivojlantirish masalalari yoritiladi. Shuningdek, virtual laboratoriyalar, uch o‘lchamli modellashtirish, raqamli mikroskoplar, multimedia resurslari va interaktiv platformalarning biologik jarayonlarni vizuallashtirishdagi imkoniyatlari ilmiy-pedagogik nuqtayi nazardan ko‘rib chiqiladi. Maqolada virtual mikroskopiyadan foydalanishning afzalliklari, mavjud cheklovlari hamda uni an’anaviy laboratoriya mashg‘ulotlari bilan integratsiyalashning metodik tamoyillari asoslab beriladi.

Kalit so‘zlar: biologik ta’lim, innovatsion pedagogik texnologiyalar, raqamli ta’lim, interaktiv metodlar, virtual mikroskopiya, virtual laboratoriya, raqamli kompetensiya, biologik vizualizatsiya, ta’lim samaradorligi, STEM ta’limi.

АННОТАЦИЯ: В данной научной статье рассматриваются теоретико-методические основы применения инновационных педагогических подходов и цифровых технологий в преподавании биологических дисциплин, дидактические возможности интерактивных методов обучения, а также роль

виртуальной микроскопии в повышении эффективности образовательного процесса. Особое внимание уделяется интеграции традиционных форм преподавания биологии с современными цифровыми образовательными инструментами, развитию самостоятельного мышления, научного мировоззрения, исследовательских навыков и аналитических компетенций обучающихся. Анализируются возможности виртуальных лабораторий, трёхмерного моделирования, цифровых микроскопов, мультимедийных ресурсов и интерактивных образовательных платформ для визуализации биологических процессов. Обосновываются преимущества и ограничения виртуальной микроскопии, а также методические принципы её интеграции с традиционными лабораторными занятиями.

Ключевые слова: биологическое образование, инновационные педагогические технологии, цифровое обучение, интерактивные методы, виртуальная микроскопия, виртуальная лаборатория, цифровые компетенции, биологическая визуализация, эффективность обучения, STEM-образование.

ABSTRACT: This scientific article examines the theoretical and methodological foundations of integrating innovative pedagogical approaches and digital technologies into biology education, the didactic potential of interactive teaching methods, and the role of virtual microscopy in improving educational effectiveness. Particular attention is paid to combining traditional biology instruction with modern digital learning tools and developing students' independent thinking, scientific literacy, observation skills, analytical abilities, and research competencies. The article discusses the educational potential of virtual laboratories, three-dimensional modeling, digital microscopes, multimedia resources, and interactive learning platforms for visualizing biological structures and processes. Furthermore, it analyzes the advantages and limitations of virtual microscopy and proposes

methodological principles for integrating virtual microscopy with conventional laboratory instruction.

Keywords: biology education, innovative pedagogical technologies, digital learning, interactive teaching methods, virtual microscopy, virtual laboratory, digital competence, biological visualization, learning effectiveness, STEM education.

KIRISH

XXI asrda ilm-fan va texnologiyalarning jadal rivojlanishi ta’lim tizimining mazmuni, shakllari va metodlarini tubdan takomillashtirish zaruratini yuzaga keltirmoqda. Ayniqsa, tabiiy fanlarni o‘qitishda zamonaviy axborot-kommunikatsiya texnologiyalaridan foydalanish, o‘quv jarayonini interaktiv tashkil etish hamda nazariy bilimlarni amaliy faoliyat bilan integratsiyalash dolzarb pedagogik vazifalardan biri hisoblanadi. Biologiya fanining o‘ziga xos xususiyati tirik organizmlarning tuzilishi, rivojlanishi, fiziologik jarayonlari, irsiyat qonuniyatlari va ekologik munosabatlarni o‘rganish bilan belgilanadi. Ushbu jarayonlarning ko‘pchiligi murakkab tuzilishga ega bo‘lib, ularni faqat og‘zaki bayon qilish yoki statik tasvirlar yordamida tushuntirish yetarli samara bermasligi mumkin. Shu sababli biologik fanlarni o‘qitishda raqamli texnologiyalar, virtual laboratoriyalar, interaktiv taqdimotlar, animatsion modellar va virtual mikroskopiya vositalarini qo‘llash muhim metodik ahamiyat kasb etmoqda. Mazkur texnologiyalar o‘quvchilarga biologik obyektlarni turli masshtablarda kuzatish, hujayra va to‘qimalarning tuzilishini o‘rganish, murakkab fiziologik jarayonlarni modellashtirish hamda nazariy bilimlarni amaliy topshiriqlar orqali mustahkamlash imkonini beradi. An’anaviy biologiya ta’limida laboratoriya mashg‘ulotlari alohida o‘rin egallaydi. Biroq ta’lim muassasalarida zamonaviy laboratoriya jihozlarining yetarli emasligi, mikroskopik preparatlar sonining cheklanganligi, laboratoriya mashg‘ulotlariga ajratilgan vaqtning chegaralanganligi va

ayrim biologik obyektlarni bevosita kuzatishdagi murakkabliklar ta’lim jarayoniga muayyan cheklovlar kiritadi. Virtual mikroskopiya ana shunday sharoitlarda o‘quvchilarning mikroskopik tuzilmalarni o‘rganish imkoniyatlarini kengaytiruvchi qo‘shimcha ta’lim vositasi sifatida ahamiyatlidir. Innovatsion ta’limning asosiy maqsadi o‘quvchini tayyor bilimlarni qabul qiluvchi passiv subyektdan mustaqil izlanadigan, muammolarni tahlil qiladigan, ilmiy farazlarni ilgari suradigan va o‘z xulosalarini dalillar asosida shakllantiradigan faol ishtirokchiga aylantirishdan iborat. Bunday yondashuv konstruktivistik ta’lim nazariyasi, faol o‘qitish konsepsiyasi va kompetensiyaviy ta’lim tamoyillari bilan uzviy bog‘liqdir. Mazkur maqolaning maqsadi biologik fanlarni o‘qitishda innovatsion va raqamli texnologiyalarning pedagogik imkoniyatlarini tahlil qilish, interaktiv metodlarning o‘quv jarayonidagi ahamiyatini ochib berish hamda virtual mikroskopiyadan samarali foydalanish bo‘yicha metodik yondashuvlarni asoslashdan iborat. Maqola nazariy-tahliliy xususiyatga ega bo‘lib, unda pedagogik va ilmiy-metodik adabiyotlarni tahlil qilish, mavjud yondashuvlarni taqqoslash, umumlashtirish hamda didaktik modellashtirish usullaridan foydalaniladi.

Biologik ta’limni raqamlashtirishning nazariy va pedagogik asoslari. Biologik ta’limni raqamlashtirish deganda o‘quv jarayoniga elektron ta’lim resurslari, raqamli laboratoriya qurilmalari, multimedia dasturlari, masofaviy o‘qitish platformalari va interaktiv texnologiyalarni maqsadli integratsiyalash tushuniladi. Ushbu jarayon faqat an’anaviy darsliklarni elektron shaklga o‘tkazish bilan chegaralanmaydi, balki ta’lim mazmunini o‘zlashtirish, bilimlarni baholash, o‘quv faoliyatini tashkil etish va pedagogik muloqot mexanizmlarini takomillashtirishni ham nazarda tutadi. Raqamli texnologiyalarning biologiya ta’limidagi asosiy didaktik imkoniyatlaridan biri biologik obyekt va jarayonlarning ko‘rgazmaliligini oshirishdir. Masalan, hujayra membranasi orqali moddalarning transporti, mitoz va meyoz bosqichlari, DNK replikatsiyasi, oqsil biosintezi, fotosintez va hujayraviy nafas olish

kabi jarayonlar dinamik modellar yordamida namoyish etilganda, o‘quvchilar ularning bosqichlari va o‘zaro bog‘liqligini yaxshiroq anglash imkoniyatiga ega bo‘ladilar. Raqamli vositalarning yana bir muhim xususiyati individual ta’lim trayektoriyasini shakllantirish imkoniyatidir. Elektron platformalar orqali o‘quvchining bilim darajasi, topshiriqlarni bajarish tezligi va yo‘l qo‘ygan xatolari tahlil qilinib, uning ehtiyojiga mos qo‘shimcha mashqlar yoki murakkablashtirilgan topshiriqlar tavsiya etilishi mumkin. Biroq raqamli vositalardan foydalanishning samaradorligi texnologiyaning mavjudligi bilangina belgilanmaydi. O‘qituvchining raqamli kompetensiyasi, tanlangan vositaning dars maqsadiga muvofiqligi, o‘quvchilarning tayyorgarlik darajasi va pedagogik topshiriqlarning sifati hal qiluvchi omillar hisoblanadi.

Biologiya darslarida interaktiv ta’lim metodlarining o‘rni. Interaktiv ta’lim metodlari o‘quvchilarning o‘zaro hamkorligi, faol fikrlashi, mustaqil qaror qabul qilishi va ilmiy muammolarni birgalikda hal etishiga asoslangan pedagogik yondashuvlardir. Biologiya fanida interaktiv metodlardan foydalanish ayniqsa muhim, chunki ushbu fan kuzatish, tajriba, taqqoslash, tasniflash, sabab-oqibat munosabatlarini aniqlash va ilmiy xulosa chiqarish kabi faoliyat turlarini talab etadi. Muammoli ta’lim metodi (Problem-Based Learning). Mazkur metodda o‘quvchilarga muayyan biologik muammo taqdim etiladi. Masalan, “Nima sababdan ayrim o‘simliklar sho‘rlangan tuproqda ham o‘sishga moslashgan?” yoki “Hujayrada mitoxondriyalar faoliyati buzilganda qanday fiziologik oqibatlar yuzaga kelishi mumkin?” kabi savollar orqali o‘quvchilar mustaqil izlanishga yo‘naltiriladi. Muammoli ta’lim biologik bilimlarni real hayotiy vaziyatlarda qo‘llash ko‘nikmasini rivojlantiradi. Loyiha asosida o‘qitish (Project-Based Learning). Ushbu metodda o‘quvchilar muayyan mavzu yuzasidan mustaqil yoki guruh bo‘lib tadqiqot loyihasini bajaradilar. Masalan, mahalliy suv havzalarining ekologik holatini o‘rganish, o‘simliklarning yorug‘likka munosabatini kuzatish yoki mikroorganizmlarning oziq-ovqat sanoatidagi ahamiyatini tahlil qilish kabi loyihalar o‘quvchilarning tadqiqotchilik faoliyatini rivojlantiradi.

“Aqliy hujum” metodi. Biologik muammolarga oid turli ilmiy taxminlarni ilgari surish va ularni muhokama qilishda samarali hisoblanadi. Ushbu metod o‘quvchilarning erkin fikrlashi, muqobil yechimlarni ko‘ra olishi va ilmiy muloqot madaniyatini rivojlantirishga yordam beradi. “Teskari sinf” (Flipped classroom) modeli. Mazkur yondashuvda o‘quvchilar yangi mavzuga oid nazariy ma’lumotlarni darsdan oldin videoma’ruza, elektron material yoki interaktiv resurslar orqali o‘rganadilar. Auditoriya mashg‘ulotlarida esa amaliy topshiriqlar, laboratoriya ishlari, muammoli vaziyatlar va guruhli muhokamalarga ko‘proq vaqt ajratiladi. Gamifikatsiya. Ta’lim jarayoniga o‘yin elementlarini kiritish orqali o‘quvchilarning faolligi va motivatsiyasini oshirishga qaratilgan. Biologik terminlarni mustahkamlash, organizmlarni tasniflash, hujayra organoidlarini aniqlash va genetik masalalarni yechishda interaktiv viktorinalar hamda raqamli topshiriqlardan foydalanish mumkin. Ushbu metodlar biologik bilimlarni yodlashdan ko‘ra ularni tushunish, tahlil qilish va amaliy vaziyatlarda qo‘llashga yo‘naltirilgan ta’lim muhitini yaratadi.

Virtual mikroskopiya texnologiyasining mazmuni va didaktik imkoniyatlari. Virtual mikroskopiya biologik obyektlarning yuqori aniqlikdagi raqamli tasvirlarini kompyuter, planshet yoki boshqa elektron qurilmalar orqali kuzatish va tahlil qilish imkonini beruvchi texnologiyadir. Virtual mikroskopiya tizimlarida haqiqiy gistologik, sitologik yoki mikrobiologik preparatlar maxsus skanerlar yordamida raqamlashtiriladi. Olingan tasvirlar dasturiy platformaga joylashtiriladi va foydalanuvchi mikroskopdagi kuzatishga o‘xshash tarzda tasvirni kattalashtirishi, kichraytirishi, kerakli sohaga siljitishi hamda morfologik tuzilmalarni o‘rganishi mumkin. Mazkur texnologiya ayniqsa sitologiya, gistologiya, embriologiya, mikrobiologiya, botanika va patologik anatomiya fanlarini o‘qitishda katta didaktik imkoniyatlarga ega. Masalan, o‘simlik hujayrasining tuzilishini o‘rganishda virtual mikroskop orqali hujayra devori, sitoplazma, yadro, vakuola va plastidlarning joylashuvini ko‘rsatish mumkin. Gistologiya mashg‘ulotlarida esa epiteliy,

biriktiruvchi, mushak va nerv to‘qimalarining mikroskopik tuzilishini qiyosiy tahlil qilish imkoniyati yaratiladi. Virtual mikroskopiyaning muhim afzalliklaridan biri bir xil preparat tasviridan bir vaqtning o‘zida ko‘plab o‘quvchilarning foydalanish imkoniyatidir. Bu o‘quvchilarning yagona biologik obyekt ustida birgalikda muhokama yuritishi, morfologik belgilarni solishtirishi va ilmiy xulosalar chiqarishini osonlashtiradi. Shuningdek, raqamli preparatlar saqlanishi va qayta foydalanilishi mumkinligi sababli noyob yoki murakkab tayyorlanadigan biologik namunalarni o‘quv jarayonida takroran namoyish etish imkoniyati kengayadi. Virtual mikroskopiya o‘quvchilarning mustaqil ishlash faoliyatini ham qo‘llab-quvvatlaydi. O‘quvchi darsdan tashqari vaqtda preparat tasvirini qayta ko‘rib chiqishi, kerakli mikroskopik tuzilmalarni belgilashi, izohlar yozishi va o‘z bilimini mustahkamlashi mumkin. Shu bilan birga, virtual mikroskopiya an’anaviy yorug‘lik mikroskopi bilan ishlash jarayonida shakllanadigan barcha amaliy ko‘nikmalarni to‘liq almashtira olmaydi. Jumladan, preparat tayyorlash, mikroskopni sozlash, fokuslash, obyektivlarni almashtirish va laboratoriya xavfsizligi qoidalariga rioya qilish kabi kompetensiyalar bevosita amaliy mashg‘ulotlarni talab etadi. Shuning uchun virtual mikroskopiyani an’anaviy laboratoriya mashg‘ulotlarining to‘liq muqobili emas, balki ularning didaktik imkoniyatlarini kengaytiruvchi samarali qo‘shimcha vosita sifatida qo‘llash maqsadga muvofiqdir.

Virtual laboratoriyalar va uch o‘lchamli modellashtirishning biologik bilimlarni shakllantirishdagi ahamiyati. Virtual laboratoriyalar o‘quvchilarga biologik tajribalarni raqamli muhitda modellashtirish, tajriba shartlarini o‘zgartirish va natijalarni kuzatish imkonini beradi. Bunday laboratoriyalar murakkab, uzoq vaqt talab qiladigan yoki real sharoitda bajarilishi qiyin bo‘lgan ayrim tajribalarni o‘quv maqsadlarida namoyish etish uchun qulay hisoblanadi. Masalan, fermentlar faolligiga harorat va pH muhitining ta’sirini o‘rganishda virtual laboratoriya yordamida tajriba shartlarini bosqichma-bosqich o‘zgartirish, olingan natijalarni grafik shaklida kuzatish

va tegishli xulosalar chiqarish mumkin. Genetika fanida esa monoduragay va diduragay chatishtirish, allellarning avlodlarga taqsimlanishi, irsiy belgilar namoyon bo‘lishi kabi jarayonlarni modellashtirish o‘quvchilarning nazariy bilimlarini mustahkamlashga yordam beradi. Uch o‘lchamli modellashtirish texnologiyalari biologik obyektlarning fazoviy tuzilishini tushunishda alohida ahamiyatga ega. Masalan, DNK molekulasining qo‘sh spiral tuzilishi, oqsillarning fazoviy konfiguratsiyasi, inson yuragining anatomik qismlari yoki bosh miya tuzilishini 3D modellar orqali o‘rganish murakkab biologik tushunchalarni ko‘rgazmali ifodalash imkonini yaratadi. Virtual va kengaytirilgan reallik texnologiyalaridan foydalanish biologik obyektlarni interaktiv muhitda o‘rganishga xizmat qilishi mumkin. Biroq bunday texnologiyalarni joriy etishda ularning ilmiy aniqligi, texnik imkoniyatlari, iqtisodiy samaradorligi va o‘quv maqsadlariga mosligi baholanishi zarur.

Biologik ta’limda innovatsion va raqamli texnologiyalarning qiyosiy tavsifi. Quyidagi jadvalda biologik fanlarni o‘qitishda qo‘llanilishi mumkin bo‘lgan ayrim raqamli va interaktiv texnologiyalarning didaktik vazifalari umumlashtirilgan.

Texnologiya yoki metod	Biologiya fanidagi qo‘llanishi	Kutiladigan pedagogik natija
Virtual mikroskopiya	Hujayra va to‘qimalarning mikroskopik tuzilishini o‘rganish	Morfologik belgilarni aniqlash va taqqoslash ko‘nikmasi
Virtual laboratoriya	Biologik tajribalarni modellashtirish	Tajriba natijalarini tahlil qilish va ilmiy xulosa chiqarish
3D modellashtirish	Anatomik va molekulyar tuzilmalarni o‘rganish	Fazoviy tasavvur va tushunchalarni rivojlantirish
Muammoli ta’lim	Biologik vaziyat va muammolarni yechish	Tanqidiy va ilmiy fikrlashni shakllantirish

Loyiha asosida o‘qitish	Mustaqil biologik tadqiqotlarni tashkil etish	Tadqiqotchilik va hamkorlik kompetensiyalarini rivojlantirish
Gamifikatsiya	Test, viktorina va interaktiv topshiriqlar	Motivatsiya va darsdagi faollikni oshirish
Teskari sinf	Nazariy materialni oldindan o‘zlashtirish	Auditoriya vaqtini amaliy faoliyatga yo‘naltirish
Raqamli baholash	Bilim va ko‘nikmalarni tezkor tekshirish	Qayta aloqa va individual o‘qitishni takomillashtirish

Virtual mikroskopiyani biologiya darslariga integratsiyalashning metodik modeli. Virtual mikroskopiya texnologiyasidan samarali foydalanish uchun uni o‘quv jarayoniga tizimli va bosqichma-bosqich integratsiyalash muhimdir. Bunda o‘qitishning maqsadi, o‘quvchilarning yosh va individual xususiyatlari, mavzuning murakkablik darajasi hamda mavjud texnik imkoniyatlar hisobga olinishi lozim.

Birinchi bosqichda o‘qituvchi mashg‘ulotning didaktik maqsadini belgilaydi, o‘rganiladigan biologik obyektlarni tanlaydi va ularning raqamli preparatlarini tayyorlaydi. Shuningdek, o‘quvchilar uchun kuzatish mezonlari, taqqoslash savollari va baholash topshiriqlari ishlab chiqiladi.

Ikkinchi bosqichda o‘quvchilarga biologik obyektning umumiy xususiyatlari tushuntiriladi. Virtual mikroskopiya dasturining interfeysi, tasvirni kattalashtirish, harakatlantirish, kerakli tuzilmalarni aniqlash va belgilash funksiyalari bilan tanishtiriladi.

Uchinchi bosqichda o‘quvchilar mustaqil yoki kichik guruhlarda raqamli preparatlarni o‘rganadilar. Ular mikroskopik tuzilmalarni aniqlash, o‘xshash va farqli

belgilarni solishtirish, kuzatish natijalarini qayd etish va dastlabki ilmiy xulosalar chiqarish bilan shug‘ullanadilar.

To‘rtinchi bosqichda olingan natijalar muhokama qilinadi. O‘qituvchi o‘quvchilarning kuzatuvlarini ilmiy tushunchalar bilan bog‘laydi, xatolarni aniqlaydi va muammoli savollar orqali bilimlarni chuqurlashtiradi.

Beshinchi bosqichda o‘quvchilarning bilim va ko‘nikmalari baholanadi. Bunda faqat nazariy savollarga javob berish emas, balki mikroskopik obyektni tanish, uning tuzilishini izohlash, morfologik belgilarni qiyoslash va dalillarga asoslangan xulosa chiqarish ko‘nikmalari ham hisobga olinadi. Mazkur metodik modelni, masalan, “O‘simlik va hayvon hujayralarining qiyosiy tuzilishi” mavzusidagi laboratoriya mashg‘ulotida qo‘llash mumkin. O‘quvchilar virtual preparatlarda ikki turdagi hujayralarni kuzatib, ularning o‘xshash va farqli xususiyatlarini aniqlaydilar. Keyinchalik imkoniyat mavjud bo‘lsa, xuddi shu obyektlar an’anaviy mikroskop yordamida ham o‘rganiladi. Bunday integratsiyalashgan yondashuv nazariy bilimlar, raqamli kuzatish ko‘nikmalari va bevosita laboratoriya faoliyati o‘rtasidagi bog‘liqlikni mustahkamlashga xizmat qiladi.

Raqamli biologik ta’limni rivojlantirishdagi mavjud muammolar va ularning yechimlari. Biologik ta’limda innovatsion texnologiyalarni joriy etish muayyan tashkiliy, texnik va metodik muammolar bilan bog‘liq. Birinchidan, ayrim ta’lim muassasalarida yuqori tezlikdagi internet tarmog‘i, zamonaviy kompyuterlar, interaktiv qurilmalar va raqamli laboratoriya vositalarining yetarli emasligi virtual ta’lim resurslaridan foydalanishni cheklashi mumkin. Ikkinchidan, pedagoglarning raqamli texnologiyalardan foydalanish bo‘yicha tayyorgarlik darajasi turlicha bo‘lishi mumkin. Shu sababli biologiya o‘qituvchilari uchun raqamli pedagogika, virtual laboratoriya dasturlari va elektron ta’lim resurslaridan foydalanishga bag‘ishlangan amaliy malaka oshirish mashg‘ulotlarini tashkil etish muhimdir. Uchinchidan, ayrim

raqamli resurslarning xorijiy tillarda yaratilganligi o‘quvchilar uchun qo‘shimcha qiyinchilik tug‘diradi. Mazkur muammoni hal etishda o‘zbek tilidagi virtual biologiya laboratoriyalari, elektron atlaslar, interaktiv topshiriqlar va raqamli mikroskopik preparatlar bazasini rivojlantirish maqsadga muvofiqdir. To‘rtinchidan, raqamli texnologiyalardan ortiqcha yoki metodik jihatdan asoslanmagan holda foydalanish o‘quvchilarning diqqatini asosiy ilmiy mazmundan chalg‘itishi mumkin. Shu bois texnologik vositalar darsning maqsadi va kutiladigan o‘quv natijalariga mos ravishda tanlanishi zarur. Beshinchidan, virtual tajribalar va simulyatsiyalar real laboratoriya faoliyatida yuzaga keladigan barcha holatlarni aks ettira olmaydi. Shuning uchun o‘quvchilarda haqiqiy biologik obyektlar bilan ishlash, laboratoriya jihozlaridan foydalanish va tajriba jarayonidagi xatolarni aniqlash kompetensiyalarini shakllantirish ham ta’limning ajralmas qismi bo‘lib qolishi kerak. Ushbu muammolarni bartaraf etish uchun ta’lim muassasalarining texnik infratuzilmasini rivojlantirish, o‘qituvchilarning raqamli kompetensiyalarini oshirish, milliy elektron ta’lim resurslarini yaratish va aralash ta’lim modellarini kengaytirish tavsiya etiladi.

XULOSA

Biologik fanlarni o‘qitishda innovatsion va raqamli texnologiyalardan foydalanish ta’lim jarayonini zamonaviylashtirish, murakkab biologik tushunchalarni ko‘rgazmali yoritish va o‘quvchilarning mustaqil bilim olish imkoniyatlarini kengaytirishning muhim yo‘nalishlaridan biridir. Interaktiv metodlar o‘quvchilarning ilmiy fikrlashi, muammolarni hal qilish qobiliyati va tadqiqotchilik kompetensiyalarini rivojlantirishga xizmat qilsa, virtual mikroskopiya hujayra va to‘qimalarning mikroskopik tuzilishini batafsil o‘rganish uchun qo‘shimcha imkoniyat yaratadi. Raqamli texnologiyalarning pedagogik samaradorligi ularni o‘quv maqsadlariga muvofiq tanlash, an’anaviy laboratoriya mashg‘ulotlari bilan uyg‘unlashtirish va o‘quvchilarning faol ishtirokini ta’minlashga bog‘liq. Shu sababli biologik ta’limda

virtual va real laboratoriya faoliyatini birlashtirgan integratsiyalashgan o‘qitish modelini rivojlantirish istiqbolli yo‘nalish hisoblanadi.

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OYBEK NASRIDA AYOL RUHIYATI VA XARAKTERI TALQINI: HIKOYADAN ROMANGACHA EVOLYUTSIYA

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Annotatsiya:

Ushbu tezisda Oybekning hikoya, qissa va romanlarida ayol obrazlari ruhiyati hamda xarakterining badiiy talqini janrlar kesimida tahlil qilinadi. Ayol obrazining ijtimoiy qaramlikdagi sabrli qahramondan ma’rifat, muhabbat va xalq dardi ta’sirida o‘z taqdiri uchun kurashuvchi faol shaxsga aylanishi yoritiladi. Shuningdek, ichki kechinma, nutq, portret va badiiy detalning qahramon ruhiyatini ochishdagi vazifasi ko‘rsatib beriladi.

Kalit so‘zlar: Oybek, ayol obrazi, ruhiyat, xarakter, ma’rifat, badiiy psixologizm, gender.

Kirish

XX asr o‘zbek nasrida Oybek ayol obrazlarini turli ijtimoiy qatlamlar va tarixiy sharoitlar doirasida tasvirlagan adiblardan biridir. Uning hikoya, qissa va romanlarida ayolning oiladagi o‘rni, ijtimoiy tengsizlikka munosabati, ilm-ma’rifatga intilishi hamda o‘z taqdirini belgilash imkoniyati badiiy talqin etiladi. Oybek nasridagi ayol obrazlarini hikoyadan romangacha yaxlit jarayonda o‘rganish xarakter va ruhiyat tasviridagi o‘zgarishlarni aniqlashga imkon beradi.

Asosiy qism

Oybek hikoyalarida ayol qiyofasi ko‘pincha ruhiy-psixologik tasvir, bola nigohi va ramziy detallar orqali ochiladi. “Gulnor opa” hikoyasida Gulnorning qo‘rquvi, ko‘z yoshlari va erkin qaror qabul qila olmasligi o‘sha davrdagi oilaviy hamda ijtimoiy qaramlikni ifodalaydi. “Singan umid”, “Miskin bolalar” va “Qonli barmoqlar” kabi hikoyalarda esa ona obrazi farzandi uchun fidoyilik ko‘rsatadigan, qashshoqlik va og‘ir turmush sinovlariga duch kelgan inson sifatida gavdalanadi. Bu asarlarda ayolning shaxsiy fojeasi kengroq ijtimoiy muammolar bilan bog‘lanadi.

“Nur qidirib” qissasida ayol xarakterining o‘sishi aniqroq ko‘zga tashlanadi. Iskandaro dastlab oila nazorati va mavjud urf-odatlar ta’sirida o‘z orzu-istaklarini ochiq ifodalashga qiynaladi. Biroq ilmga intilishi, yangi qarashdagi insonlar bilan muloqoti va xalq hayotini anglay borishi uning dunyoqarashini o‘zgartiradi. Asar davomida u shaxsiy qo‘rquvdan jamoat oldida fikr bildirish va xotin-qizlar huquqlarini

himoya qilishga intiluvchi faol qahramonga aylanadi. Oysha obrazi esa ichki norozilikni his qilsa-da, uni oila doirasidan tashqariga olib chiqishda qiynaladigan qiz sifatida Iskandarodan farqlanadi.

“Qutlug‘ qon” romanida ayol obrazlari ijtimoiy mavqe va turmush sharoitiga ko‘ra farqlanadi. Gulnorning fojeali qismati kambag‘allik, zo‘ravonlik va boylar manfaatiga asoslangan munosabatlar oqibatini ochadi. Uning eskirgan kiyimlari va tashqi qiyofasiga oid tafsilotlar ma’naviy poklik bilan moddiy nochorlik o‘rtasidagi ziddiyatni kuchaytiradi. Unsin esa o‘z or-nomusini himoya qilishga va mehnati orqali mustaqillikka erishishga intilishi bilan yangi ayol tipiga yaqinlashadi.

“Ulug‘ yo‘l” romanida Zumrad, Ra’no va Unsin kabi qahramonlar ilm-ma’rifatga, mustaqil fikrlashga va yangicha hayotga intilishlari bilan ajralib turadi. Zumradning kashta tikish jarayonidagi o‘ylari mehnatkash ayolning ijtimoiy tengsizlikni anglashini ko‘rsatadi. Romanda savod olishga to‘sqinlik qiluvchi qarashlar tanqid qilinib, bilim insonni ruhiy qaramlikdan xalos etuvchi omil sifatida talqin qilinadi.

“Navoiy” romanida ayol obrazlari saroy muhiti va siyosiy kurashlar bilan bog‘liq holda tasvirlanadi. Xadichabegim hokimiyatga intilishi va makr-hiylasi bilan, Poyanda Sultonbegim esa oqilaligi va tadbirkorligi bilan ajralib turadi. Dildor obrazi ruhiy sadoqat va erkka intilishning ifodasi bo‘lib, uning voqealarga faol aralashuvi ayolning faqat passiv qurbon emasligini ko‘rsatadi. Shu tariqa roman ayol xarakterining turli ko‘rinishlarini tarixiy-siyosiy muhit bilan bog‘laydi.

Oybek ayol ruhiyatini ochishda ichki kechinma, dialog va monolog, nutq, portret hamda badiiy detaldan samarali foydalanadi. Gulnorning kiyimlari, Zumradning kashta tikishi, Dildorning qilichi kabi detallar qahramonlarning ijtimoiy mavqei va ruhiy holatini ixcham ifodalaydi. “Nur”, “quyosh” va “tun” motivlari esa ayol taqdirini ma’rifat, umid va ozodlik g‘oyalari bilan bog‘laydi.

Xulosa

Tahlil Oybek nasrida ayol obrazining uch bosqichli rivojlanishini ko‘rsatadi: hikoyalarda ijtimoiy qaramlik sharoitidagi sabrli va fidoyi qahramonlar, “Nur qidirib” qissasida uyg‘onish hamda kurash yo‘liga kirgan shaxs, romanlarda esa turli ijtimoiy qatlamlarga mansub va o‘z taqdiri uchun kurashuvchi ayollar tasvirlanadi. Gulnordan Unsin, Zumrad, Ra’no va Dildorgacha bo‘lgan obrazlar qatori ayolning ichki imkoniyatlari, erkinlikka intilishi va jamiyatdagi o‘rnining kengayishini ifodalaydi. Adib talqinida ilm-ma’rifat, mehnat va mustaqil fikr ayol ozodligining muhim omillari

sifatida namoyon bo‘ladi. Ayol ruhiyati esa, avvalo, ichki kechinma, nutq, portret va badiiy detallar orqali ochiladi.

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UROGENITAL MICROBIOCENOSIS OF SEXUAL PARTNERS AND ITS ASSOCIATION WITH ASYMPTOMATIC BACTERIURIA AND PREGNANCY COMPLICATIONS

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Background. Asymptomatic bacteriuria (ASB) during pregnancy is commonly investigated through maternal urine culture. However, the dissertation also considers the urogenital microbiological status of sexual partners as a potential factor relevant to the clinical assessment of couples. The microbiota of the urinary and reproductive tracts may overlap in some circumstances, but observational findings alone cannot establish the direction of transmission or prove causality.

Aim. To describe the dissertation findings on urogenital microbiocenosis in women and their sexual partners and the reported association between male-partner bacteriuria and pregnancy complications.

Materials and methods. The dissertation describes conventional bacteriological examinations, assessment of vaginal microbiocenosis using the Femoflor molecular test system, and assessment of male urogenital microbiota using Androflor. Urine and semen-related samples were considered as part of the couple-oriented evaluation. A subgroup of 30 women was followed for six months after marriage; 23 became pregnant during the observation period. Microbiological findings and pregnancy outcomes were reported descriptively.

Results. Among women assessed during the first three months after marriage, the dissertation reports colpitis in 40.0%, acute cystitis in 36.7%, bacterial vaginosis in 26.7%, chronic cystitis in 23.3%, salpingo-oophoritis in 16.7%, asymptomatic bacteriuria in 16.7%, and pyelonephritis in 13.3%. Among men, asymptomatic bacteriuria was reported in 10.0%, while acute cystitis and nonspecific urethritis were each reported in 6.7%. Among the 23 pregnancies followed, ASB and threatened miscarriage were each reported in 9 cases (39.1%); gestational pyelonephritis and prelabor rupture of membranes were each reported in 3 cases (13.0%). The dissertation reports a positive correlation between male-partner bacteriuria level and gestational pyelonephritis in women ($r=0.65$; $p<0.01$). These findings should be interpreted cautiously because the subgroup was small and the observations do not, by themselves, demonstrate causation.

Conclusion. The reported results suggest that couple-oriented microbiological assessment may provide additional information when evaluating urogenital infections in the context of pregnancy. They support further investigation of associations between partners' microbiological findings and maternal outcomes. Larger prospective studies with clearly defined comparison groups are needed to determine whether systematic partner assessment changes clinical outcomes and to establish the role of partner-directed interventions.

Keywords: urogenital microbiocenosis; asymptomatic bacteriuria; pregnancy; sexual partners; Femoflor; Androflor; gestational pyelonephritis

ABDULLA QAHHORNING “BEMOR ’’ HIKOYASIDA JAHOLAT VA NOÇORLIK FOJEASI

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Annotatsiya :Uşbu maqolada özbek milliy nasrining zabardast vakillaridan biri , özbek hikoyanavisligining otasi Abdulla Qahhorning “ Bemor ” hikoyasida kambağallik , noçorlik , ijtimoiy fojealar tahlil qilinadi . Muallif asar qahramonlari hayoti orqali , ya’ni Sotiboldi va uning oilasi boşiga tuşgan musibatlar orqali öşa davrdagi qaşşoqlik va çorasizlik muammolarini sodda va ta’sirçan tasvir uslubi hamda hikoyaning asosiy mazmuni yoritiladi .

Kalit sözlar : Abdulla Qahhor , Bemor , Sotiboldi , Abduğaniboy , tabib , çilyosin , oq podşo , baxşi , doxtorxona , davr .

Аннотация : В статье анализилуются бедность , нужда и социальные трагедии в рассказе Абдуллы Каххара “Бемор ” (“Болной ”) Абдуллы Каххара – один из выдающихся представителей узбекской прозы и основоположник узбекской новеллистики . На примере жизни героев , в частности испытаный , выйпаших на долно Сотиболди и его семьи , расскрываются проблемы бедности и беспомощности того времени . Также рассмотриваются основная идея рассказа и простой , но выразительный стиль автора .

Ключение слова : Абдуллы Каххар , “Бемор ” (“Болной ”) , Сотиболди , Абдуганибой , народный целитель , обряд чилясин , Белый царь , бахши (народный сказитель) , больница , эпоха . **Abstract :** This article analyzes poverty , hardşip , and social tragedy in Bemor (The Patient) , a şort story by Abdulla Qahhor , one of the leading figures in Uzbek prose and a pioneer of Uzbek şort – story writing . Though the lives of the çaracters – particulary the hardşips faced by Sotiboldi and his family – the article explores the poverty and helplessness of the period . It also examines the story’s central ideas and the author’s simple yet compelling style .

Keywords : Abdulla Qahhor , (The Patient) Bemor , Sotiboldi,Abduğaniboy , traditional healer , çilyosin ritual , Write Tsar , bakhşi (folk storyteller) hospital , historical period .

Abdulla Qahhor özbek adabiyotida , hikoyanavis sifatida alohida öringa ega . Uning asarlarida oddiy insonlarning hayoti , turmuş tarzi va qiyinçiliklari , jamiyatdagi muammolar mahorat bilan tasvirlanadi . Yozuvçining “ Bemor ” hikoyasida XX asr

boşlaridagi özbek jamiyatidagi qaşşoqlik , ilmsizlik , e'tiqodsizlik va inson qadrining poymol bölişini oçib bergan ötkir ijtimoiy – psixologik asardir . Asarda Sotiboldi va uning oilasi boşidan keçirgan oğir , maşaqqatli kunlar orqali kambağallik , noçorlik , iqtisodiy – madaniy qoloqliklarning yana bir fojeali oqibati , johillik quyuq böyoqlarda aks ettiriladi . Hikoya öquvçini inson salomatligi , ilm – ma'rifat va mehr – oqibatning ahamiyati haqida muşohada yuritişga undaydi .

Abdulla Qahhorning "**Bemor** " hikoyasi 1936 – yil yozilgan bölib , oddiy xalqning oğir ijtimoiy ahvoli, qaşşoqlik, ilmsizlik va loqaydlik oqibatlarini foş etadi . Hikoyaning "Bemor " deb nomlanişi ham mazmunan ahamiyatli . Sarlavha qahramonning ismiga emas , uning holatiga urğu beradi . Ramziy talqinda bemor faqat Sotiboldining xotini emas , balki noçorlik va jaholatdan aziyat çekayotgan butun bir muhitning timsoli sifatida ham körinişi mumkin . Hikoyaning markazida Sotiboldi va uning betob xotini taqdiri turadi . Asarga nazar solsak , Sotiboldining xotiniga ism berilmagan . Bu uning jamiyat uçun ahamiyatsiz inson bölganining aniq dalili sifatida emas , balki oddiy , kambağal ayolning hayoti va dardi köpinça e'tibordan çetda qolganini körsatuvçi badiiy vosita sifatida talqin qiliş mumkin . Qahramonning şaxsiy ismi tilga olinmasligi uni faqat bir oilaning a'zosi sifatida emas , balki oğir turmuş şaroitida yaşayotgan köplab ayollarning umumlaşma timsoli sifatida boşidan keçirayotgan dardi va noçor ahvoliga qaratadi . Sotiboldi obrazini ham biryoqlama baholamaslik kerak . U xotiniga befarq emas . Ayolini davolaş yölini izlaydi , biroq uning imkoniyatlari çeklangan . Sotiboldi o'z oilasini qutqarişga urinadi, lekin ijtimoiy noçorlik, yo'qsizlik va çorasizlik uning qo'l-oyog'ini bog'lab qo'ygan. Şuning uçun ham hikoyadagi asosiy fojea faqat Sotiboldining qarorlarida emas , balki kambağallik va bilim yetişmasligi insonni qanday muşkul ahvolga solişida ham namoyon böladi . Qahhor öquvçini qahramonni ayblaşga emas , uning nega bunday çorasiz qolganini anglaşga undaydi . Guvohi bölganimizdek Sotiboldi , çigit pöçoq va kunjara bilan savdo qiladigan Abduğaniboyning qölida xizmat qiladi . Boy uning mehnati uçun qança haq tölaşi töğrisida hikoyada gapirilmasa - da , buni Sotiboldining qanday turmuş keçirayotganidan ham biliş qiyin emas . Oila kambağalligi va ilmsizligi tufayli malakali şifokorga murojaat qila olmaydi . Axir , kasal xotinini döxtirga körsatiş uçun talab qilinadigan 25 söm pulni u faqat tuşida körişi mumkin , xolos . U o'şa davrdagi oddiy mehnatkaş xalqning og'ir ahvolini, ezilgan va huquqsiz qatlamini ifodalaydi. Do'xtirga ko'rsatiş uçun 25 so'm pul topa olmasligi uning emas, balki jamiyatning fojiasidir . Asardagi davolaşga urinişlar jaholat va ma'rifatsizlik mavzusini oçadi . Uning orttirgan "boyligi " bir marta tabib çaqirişga , bitta tovuq söyişga , kasalni baxşiga öqitişga yetadi – yu tugaydi .

Sotiboldi pul topiş maqsadida savat töqiydi, “Çilyosin ” öqitiş uçun esa özi “ töqigan savatlarni ulgurji oladiga baqqoldan yigirma tanga qarz ” kötarişga majbur böladi . Hali bu ham hammasi emas . Endi ölgan xotinini dafn qilişi , uning turli ma’rakalarini ötkazişi , mahalladagilar , qarindoş uruğlarga dasturxon yozişi lozim . “Bularning hammasi , albatta , pul bilan böladi . Bunday vaqtlarda yöğon çöziladi , ingiçka uziladi … ”

Ilojsizlik , bir tomondan yordam umidining yöqligi Sotiboldi va uning oilasiga qöşib öquvçini ham qiynaydi , qalbimizda odam bolasining naqadar uvol bölayotganidan nadomat tuyğuladi qözğaladi . Boya aytganimdek , Sotiboldining ozgina yordamiga umid qiladigan xöjayini Abduğaniboy edi .. “ Sotiboldi xöjayinining oldiga arzga bordi, ammo bu borişdan muddaosi nima ekanini aniq bilmas edi. Abduğaniboy uning sözini eşitib köp afsuslandi, qölidan kelsa hozir uning xotinini oyoqqa bostirib berişga tayyor ekanini bildirdi, keyin söradi:

- Devonai Baxovaddinga heç narsa kötardingmi? ğavsula’zamga-çi? ”Deya uni jönatib yuboradi . Özi “ omborda qulab ketgan qoplar ostida qolib öladigan bölganida ” markaziy şaharga Simga (hozirgi Farğona şahri) ga borib davolanib kelgan bu bağritoş kimsa xizmatkorining ayoli yoş ölib ketişi mumkinligini bila turib zarraça yordam körsatişga , qarz berişga yaramaydi . (Biz Sotiboldining xotini yoş ekanini uning jajji qizçasi bor – yöği tört yoşga kirganidan anglaşimiz mumkin !) Aksinça , xizmatkoriga uni yana ham çiqimdor qiladigan turli bid’atlarni maslahat beradi . Axir uni boy qilgan , xohlagan joyiga borib davolanişi , dam olişi , istaganiça maişat qilişi uçun yetarli mablağga ega qilgan Sotiboldi va unga öxşagan işçilarning maşaqqatli mehnati emasmidi ? Nahotki , bir ayolning hayotidan “ izvoş va oq podşoning su’rati solingan 25 sömlik pul ” azizroq , qimmatliroq bölsa ?

Bir amallab “tabib ”nomini olgan bir kimsa , yuqorida aytilganidek , ayolning nima kasal bilan oğriyotganini bilmay turib , suriştirmasdan undan qon oladi . Buning oqibatida esa “ betobning közi tinib , boşi aylanadiga bölib ” qoladi . Demak , “ tabib ” bemorga foyda emas , balki zarar yetkazadi . Holbuki , u bunday “ davolaş usuli ” ni birgina Sotiboldining xotini emas , öşa atrofdagi yuzlab beçoralar ustida qöllaydi . Köryapmizki , şunday ilmsiz , e’tiborsiz faqatgina pul uçun inson salomatligi bilan heç ikkilanmasdan öynaşa oladigan tabibni deb qança inson aziyat çekkan . “Tabib”dan keyin xonadonga baxşi kirib keladi . U xotinning joniga , dardiga da’vo böladimi – yöqmi , bu bilan uning işi yöq . Baxşi ham qayerga çaqirilsa , qaysi kasalga röparo kelsa , hammasiga kör – körona yodlab olgan narsalarini öqib , çiqib ketaveradi . Uning uçun köriçak ham , tomoq oğriq ham , ruhiy xastaliklar ham bir – farqi yöq !

Sotiboldiga tavsiya etilgan navbatdagi “najotkor ” ning qiliği hammasidan oşib tuşadi . U (yana kasalning asli nima ekanini suriştirib ötirmay !) betob xotinni “tolning xipçini bilan” savalaydi , “ tovuq söyib ” qonlaydi . Qanday qilib kasal odamga bunday vaxşiylikni qöllaş mumkin .Axir soğlom inson ham buning oğriğiga zörğa çidaydi – ku . Soğlom insonni kasal qiladigan bunday amal bilan qanday qilib betob odamni davolaş mumkin . Nahotki şu haqida öylab körişmasa .Nahotki bu qilgan işi uçun ham unga pul tölansa . Tovuq söyib qonlaşiçi .Qanday qilib bir parrandaning qoni uning kasaliga qanday da’vo böla oladi . Buni aqlga siğdiriş qiyin . Mana qarangki ilmsizlik jamiyatni qanday köylarga solişi mumkin .

Köryapsizki , johillik butun jamiyatni , kişilar ong –u şuurini butunlay band qilib olgan , millat “ tanasidan qon oldirgan bemor ” (Hamza Hakimzoda Niyoziy iborasi) holiga tuşgan edi .

Hikoyaning mazmun mohiyati , ta’sir kuçi hali bu bilan ham tugamaydi . Ölayotgan xotini uçun biror najot yölini topa olmayotgan Sotiboldi endi qöşni kampirning maslahati bilan endi tört yoşga kirgan qizçaning saharlab turib uyqusiragan holda qiladigan duosiga umidvor böladi . Sotiboldining qizi saharda uyqu aralaş “ – Xudoyo ayamdi daydiga davo beygin…” deya duo qilişni buyiradi .Qizça esa şirin uyqudan uyğonişga qiynalib ingraydi , lekin otasining ğazabidan qörqib duo qila boşlaydi . Çilyosinda söng Sotiboldining xotini sal tetik çiqqanday böldi va “ - Xudo qizimning saxarlari qilgan duosini dargohiga qabul qildi. Dadasi, endi tuzukman, qizimni saxarlari uyğotmang. ” , - deydi .

Yana közini yumdi, şu yumgança qaytib oçmadi - saxarga borib uzildi. Sotiboldi qizçasini ölik yonidan olib, boşqa yoqqa yotqizayotganda qizça uyğondi va közini oçmasdan odatdagiça duo qildi:

“- Xudoyo ayamdi daydiga davo beygin....” Qiz hali bilmasdiki onasi vafot qilganini va endigina tört yoşga tölganida onasidan ayrilganini . Qarang , butun boşli jamiyat bor , doxtorxona bor , tabib bor , baxşi bor , qölida pul öynagan boylar bor , har qanday mehnat bölsa qilişga tayyor Sotiboldi bor , biroq najot yöq ! Bor – yöq umid şu tört yaşarlik qizaloqning ojiz duosi . Asar boşlanişida “ Osmon yiroq , yer qattiq ” iborasi epigraf sifatida berilgan . Bu ibora ham asarning qanday mazmunda ekanining yorqin namunasidir . Demak , Bemor faqat Sotiboldining xotini emas . Butun jamiyat bemor – xasta , najotga zor , tuzalişga muhtoj .

Abdulla Qahhorning adabiy mahorati “Bemor ” da realizm , satira va simvolizmning mohirona uyğunligida namoyon böladi . U özbek realistik hikoyaçiligining asosi sifatida voqealarni heç qanday bezaklarsiz , boriça tasvirlaydi . Satira Abdulla

Qahhorning eng kuçli qurollaridan biri bölib , u şaxslarning qilmişlarini kulgili va açinarli tarzda foş etadi .

Xulosa qilib aytganda , “Bemor ” hikoyasi bugungi kunda ham öz dolzarbligini yöqotmagan , çunki u insoniyatning universal muammolari , savodsizlik , firibgarlik va adolatsizlikka qarşi kuraşiş zarurligini eslatib turadi . Asar nafaqat tarixiy davrni tuşiniş , balki har qanday jamiyatdagi ijtimoiy illatlarga qarşi kuraşiş uçun muhim adabiy meros bölib xizmat qiladi . Bor – yöği bir sahifaga jo bölgan “Bemor ” hikoyasi kiçik hajmiga qaramay , mazmunan çuqur va ta’sirçan asardir . Abdulla Qahhor asar voqealarini ortiqça izoh va balandparvoz sözlarsiz , sodda va hayotiy tasvirlar orqali körsatadi . Holbuki , bu mulohazalarni yana davom ettiriş , hikoya mazmun mohiyatiga yanada çuqurroq kirib borişi ham mumkin . Bu bilan esa yozuvçining badiiy olami sirli köz oldimizda yaqqol namoyon böladi . Adibning möjaz hikoyalari bağriga olam – olam mazmun siğdira biliş , har bir söz , jumla ustida çuqur fikr yuritiş mahoratiga tan beramiz .

“ Bemor ” hikoyasi bugungi kunda ham öz ahamiyatini saqlab qolgan . U öquvçini inson salomatligi va qadr – qimmatiga e’tiborli bölişiga ilm – ma’rifatni qadrlaşga , hamda qiynalgan insonlarni qöllab - quvvatlaşga undaydi . Şu sababli bu asar nafaqat bir oilaning fojeasi haqida emas , balki insonparvarlik va jamiyat oldidagi mas’uliyat haqida ham fikr yuritişga çorlaydi . Abdulla Qahhorning muşohadali hayot haqiqatlarini özining kiçik jussasida mujassam qilgan bu kiçik hikoyasi bugungi kunda ham öz salmoği va örnini yöqotmay kelayotganining asosiy sabablaridan biri şuki , undan olinadiga xulosa hozirda ham bir qança insoniy tuyğulardan yiroqlaşib borayotgan yangi davr kişilari uçun ham ibrat vazifasini ötaganidir .

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PEDAGOGICAL TECHNOLOGIES FOR ACTIVATING STUDENTS' COGNITIVE ACTIVITY

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Abstract: This article examines the pedagogical potential of modern educational technologies in stimulating students' cognitive activity and fostering independent thinking. Particular attention is given to interactive learning strategies, problem-based instruction, collaborative activities, and digital educational tools that encourage active intellectual engagement. The study explores how learner-centered approaches contribute to the development of critical thinking, intrinsic motivation, and problem-solving skills. It also highlights the importance of integrating pedagogical innovation with students' individual cognitive needs to create a more dynamic and intellectually stimulating learning environment.

Keywords: pedagogical technologies, cognitive activity, active learning, critical thinking, student engagement, problem-based learning, interactive teaching methods, cognitive development, learner-centered education.

INTRODUCTION

The transformation of contemporary education has brought increasing attention to the development of students' cognitive activity as a fundamental component of meaningful learning. In an educational environment characterized by rapid technological advancement and continuous information exchange, the ability to acquire knowledge is no longer sufficient. Students are expected to interpret information critically, establish logical connections, solve unfamiliar problems, and apply theoretical knowledge in practical situations. These expectations require pedagogical approaches that move beyond traditional knowledge transmission and encourage active intellectual participation. Cognitive activity involves a complex interaction of attention, memory, perception, reasoning, motivation, and independent decision-making. Its development depends not only on students' individual abilities but also on the learning conditions created by teachers. Traditional instructional models, particularly those dominated by passive listening and mechanical memorization, may limit opportunities for intellectual exploration. In contrast, interactive pedagogical technologies provide opportunities for learners to question established ideas, construct personal interpretations, and participate directly in the learning process. Problem-based learning, collaborative instruction, digital simulations, and inquiry-oriented activities offer different pathways for stimulating cognitive engagement. Their educational value lies not merely in

introducing innovative tools but in creating situations where students become active participants in knowledge construction. However, the effectiveness of these technologies depends on their methodological relevance, appropriate implementation, and alignment with learners' cognitive characteristics. The present study focuses on the pedagogical mechanisms through which modern teaching technologies can activate students' cognitive activity. It examines the relationship between instructional strategies, intellectual motivation, and independent learning, emphasizing the importance of creating educational environments that encourage curiosity, analytical reasoning, and meaningful participation.

MAIN BODY

The development of students' cognitive activity largely depends on teaching approaches that encourage independent thinking, intellectual curiosity, and active participation. Modern pedagogical technologies create opportunities for learners to move beyond passive memorization and engage in meaningful knowledge construction. Their effectiveness is determined not by technological complexity but by their ability to stimulate reasoning, exploration, and practical application. Problem-based learning plays an important role in strengthening cognitive engagement. When students encounter challenging situations, they are encouraged to analyze information, formulate hypotheses, and identify possible solutions. Such activities develop critical thinking and decision-making skills while connecting theoretical knowledge with real-life experiences. Interactive methods, including discussions, debates, and collaborative projects, promote intellectual exchange and deeper understanding. Through communication, students learn to evaluate different perspectives, justify their opinions, and reconsider existing assumptions. These processes contribute to cognitive flexibility and independent judgment. Digital educational technologies further enhance learning opportunities through interactive simulations, multimedia resources, and adaptive platforms. They allow students to visualize complex concepts and explore information independently. However, their effectiveness depends on purposeful integration into instructional activities rather than frequent technological use. Another significant factor is the development of metacognitive skills. Self-assessment, reflective tasks, and constructive feedback help students recognize learning difficulties and regulate their intellectual efforts. Meanwhile, authentic tasks and opportunities for independent choice strengthen motivation and encourage sustained cognitive engagement. The successful application of pedagogical technologies requires consideration of students' individual abilities, prior knowledge, and learning needs. Combining interactive instruction, digital resources, and reflective practices creates conditions for meaningful

cognitive development, enabling learners to become more analytical, independent, and responsible participants in the educational process.

CONCLUSION

The activation of students' cognitive activity requires a purposeful integration of pedagogical technologies that encourage independent reasoning, intellectual curiosity, and meaningful participation. Problem-based learning, interactive methods, and digital educational tools contribute to cognitive development when they are aligned with learners' individual needs and educational objectives. Their effectiveness lies not in technological innovation itself but in creating opportunities for critical reflection, creative problem-solving, and knowledge application. Therefore, the thoughtful implementation of learner-centered approaches can transform students from passive recipients of information into active, self-directed participants capable of continuous intellectual growth.

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AI-POWERED PERSONALIZED LEARNING: ENHANCING STUDENT ENGAGEMENT AND LANGUAGE ACQUISITION IN ENGLISH CLASSROOMS

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Abstract: This article explores the pedagogical potential of artificial intelligence-driven personalized learning in enhancing student engagement and language acquisition in English language classrooms. Particular attention is given to the ways adaptive learning systems, intelligent feedback mechanisms, and AI-supported interactive activities address individual linguistic needs, learning preferences, and proficiency levels. The discussion examines how personalized instructional experiences can foster learner autonomy, strengthen communicative competence, and encourage active participation in language learning. It also considers the challenges of algorithmic dependency, unequal technological access, and the changing role of teachers in AI-integrated classrooms. The article emphasizes the importance of balancing technological innovation with meaningful human interaction to create inclusive, responsive, and pedagogically effective English learning environments.

Keywords: artificial intelligence, personalized learning, English language teaching, student engagement, language acquisition, adaptive learning, learner autonomy, intelligent feedback, communicative competence, educational technology.

INTRODUCTION

English language classrooms bring together learners with different linguistic abilities, learning speeds, and levels of motivation, making uniform teaching approaches increasingly insufficient. While some students acquire new vocabulary and grammatical structures quickly, others require additional explanation, practice, and encouragement. Artificial intelligence offers opportunities to address these differences by creating learning experiences that respond to individual progress rather than following a fixed instructional pattern. AI-powered platforms can identify linguistic weaknesses, provide immediate feedback, and generate contextually relevant activities that encourage active language use. Beyond improving grammatical accuracy, such tools may help learners develop confidence, communicative flexibility, and greater responsibility for their progress. However, personalization becomes educationally meaningful only when it stimulates independent thinking and genuine interaction rather than dependence on automated responses. This article examines how AI-supported personalized learning can strengthen student engagement and English language

acquisition, emphasizing the importance of combining technological adaptability with purposeful teaching and authentic communication.

MAIN BODY

The difficulty of teaching English to a mixed-ability classroom is not simply that students learn at different speeds. They also struggle with different aspects of the language. A learner who confidently participates in discussions may repeatedly misuse grammatical structures, while another who performs well in written exercises may hesitate to speak. AI-powered personalization offers a way to address these uneven learning patterns without reducing the entire class to a single proficiency standard. Consider a classroom activity in which students are asked to discuss whether social media improves human communication. An AI-supported system can provide simpler questions and vocabulary prompts for less confident learners while challenging advanced students to defend their arguments, recognize opposing viewpoints, and use more sophisticated expressions. Although the topic remains the same, the linguistic demands vary. This flexibility allows students to participate in a shared learning experience without being restricted by identical expectations. A particularly valuable feature of AI-assisted instruction is the possibility of revisiting language difficulties at the moment they occur. When a student repeatedly confuses conditional structures or struggles to organize an argument, an intelligent system can generate additional examples within a relevant communicative context. Instead of memorizing isolated rules, learners encounter grammatical patterns while attempting to express meaningful ideas. Such contextualized practice may strengthen retention and encourage the transfer of linguistic knowledge into spontaneous communication. Personalization also changes the relationship between mistakes and motivation. In conventional classroom discussions, some students remain silent because they fear negative evaluation. Practicing with an AI conversational partner may provide a less intimidating environment where learners can reformulate responses, request clarification, and experiment with unfamiliar expressions. Yet confidence developed through digital interaction must eventually be tested through communication with classmates and teachers, where emotional responses, cultural expectations, and conversational unpredictability become more complex. The influence of artificial intelligence on student engagement should not be confused with the novelty of technology. An interactive platform may initially attract attention without producing lasting intellectual involvement. Meaningful engagement emerges when students make decisions, question information, and recognize their own linguistic progress. For this reason, teachers might ask learners to identify weaknesses in AI-generated responses, compare

alternative interpretations, or reconstruct a dialogue using their own vocabulary. Such activities transform artificial intelligence from a source of ready-made answers into an object of critical linguistic exploration. The greatest challenge is maintaining the learner's intellectual ownership of the learning process. If automated systems continuously select vocabulary, organize arguments, and correct every sentence, students may produce polished language without developing the ability to communicate independently. Effective personalization should therefore gradually reduce technological assistance as competence increases. The ultimate measure of success is not how accurately students interact with artificial intelligence, but how confidently and appropriately they use English when that assistance is no longer available.

CONCLUSION

AI-powered personalized learning offers a meaningful shift in English language education by recognizing that linguistic development follows individual rather than uniform patterns. Its educational value lies in identifying specific learning difficulties, encouraging purposeful participation, and creating opportunities for students to experiment with language beyond conventional classroom limitations. However, technological responsiveness should not be mistaken for genuine language acquisition. Lasting progress depends on learners' ability to transform guided practice into independent communication, critical thinking, and contextual language use. When thoughtfully integrated into classroom instruction, artificial intelligence can support a more inclusive and intellectually engaging learning environment while preserving the essential role of human interaction in developing authentic communicative competence.

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PATHOMORPHOLOGICAL CHANGES IN THE EPIDERMIS AND DERMIS IN VARIOUS STAGES AND SEVERITIES OF VULGAR PSORIASIS

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Abstract. This thesis highlights the characteristics of pathomorphological changes observed in the epidermis and dermis at various clinical stages and degrees of severity of vulgar psoriasis. Increased keratinocyte proliferation, impaired epidermal differentiation, inflammatory infiltration, and microcirculatory changes in the dermis are of great importance in the mechanism of the disease's development.

Relevance of the topic. Vulgar psoriasis is a chronic, recurrent immune-inflammatory skin disease whose morphological manifestations vary depending on the stage and severity of the disease. A comprehensive assessment of changes in the epidermis and dermis allows for a deeper understanding of the pathogenesis of the disease, the identification of clinical and morphological features, and the improvement of diagnostic quality.

Purpose of the research. Characterization of pathomorphological changes in the epidermis and dermis at various stages and degrees of severity of vulgar psoriasis, as well as assessment of their correlation.

Materials and methods. The object of the study is the study of skin biopsy samples from patients with vulgar psoriasis. Histological examination evaluates the thickness of the epidermis, hyperkeratosis, parakeratosis, acanthosis, elongation of epidermal processes, the state of the granular layer, inflammatory infiltration in the dermis, and the state of blood vessels. Morphological results are compared based on the progressive, inpatient, and regressive stages of the disease, as well as clinical severity levels.

Results and discussion. In vulgar psoriasis, changes in the epidermis are observed, such as hyperkeratosis, parakeratosis, acanthosis, reduction or disappearance of the granular layer, and elongation of epidermal processes. In some cases, Munro microabscesses can be identified as a result of the accumulation of neutrophils in the superficial layers of the epidermis. In the dermis, dilation of capillaries, increased vascular permeability, and inflammatory infiltration consisting of lymphocytes are noted.

In the progressive stage of the disease, signs of inflammation and keratinocyte proliferation may be clearly evident. In the inpatient stage, epidermal changes such as acanthosis, parakeratosis, and hyperkeratosis remain stable. In the regressive stage, a

decrease in inflammatory infiltration and epidermal hyperplasia may be observed. Morphological changes may be more pronounced in patients with high severity, but their severity is individual in each patient.

Conclusion. In vulgar psoriasis, pathomorphological changes in the epidermis and dermis are key indicators reflecting the clinical stage and severity of the disease. A comprehensive assessment of epidermal hyperplasia, parakeratosis, granular layer changes, inflammatory infiltration of the dermis, and microcirculatory disorders is important in determining the morphological characteristics of the disease.

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TALABALAR MA’NAVIYATINI RIVOJLANTIRIŞGA DOIR TARBIYAVIY TADBIRLARNI LOYIHALAŞ VA REJALAŞTIRIŞ

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Annotatsiya: Mazkur tezisda oliy ta’lim muassasalari talabalarining ma’naviyatini rivojlantirişga qaratilgan tarbiyaviy tadbirlarni loyihalaş va rejalaştirişning nazariy-pedagogik asoslari, tashkiliy-metodik mexanizmlari hamda samaradorlik omillari tahlil qilinadi. Tarbiyaviy tadbirlarning maqsad va vazifalarini belgilash, ularning mazmunini talabalarning individual xususiyatlari va ma’naviy ehtiyojlariga moslaştiriş, innovatsion pedagogik texnologiyalardan foydalanış hamda natijadorlikni baholaş mezonlarini işlab çiqiş masalalari yoritiladi. Şuningdek, tarbiyaviy faoliyatni loyihalaşda kompetensiyaviy, şaxsga yönaltirilgan va tizimli yondaşuvlarning pedagogik imkoniyatlari asoslanadi. Talabalarning ijtimoiy faolligi, mustaqil fikrlaşi, axloqiy mas’uliyati va milliy qadriyatlarga hurmatini rivojlantirişga xizmat qiluvçi tarbiyaviy tadbirlarni samarali taşkil etiş yuzasidan ilmiy-metodik tavsiyalar ilgari suriladi.

Kalit sözlar: talabalar ma’naviyati, tarbiyaviy tadbirlar, pedagogik loyihalaş, rejalaştiriş, ma’naviy-axloqiy tarbiya, kompetensiyaviy yondaşuv, innovatsion pedagogik texnologiyalar, milliy qadriyatlar, ijtimoiy faollik, tarbiyaviy faoliyat samaradorligi.

ПРОЕКТИРОВАНИЕ И ПЛАНИРОВАНИЕ ВОСПИТАТЕЛЬНЫХ МЕРОПРИЯТИЙ, НАПРАВЛЕННЫХ НА РАЗВИТИЕ ДУХОВНОСТИ СТУДЕНТОВ

Аннотация: В данном тезисе рассматриваются теоретико-педагогические основы, организационно-методические механизмы и факторы эффективности проектирования и планирования воспитательных мероприятий, направленных на развитие духовности студентов высших образовательных учреждений. Анализируются вопросы определения целей и задач воспитательных мероприятий, адаптации их содержания к индивидуальным особенностям и духовным потребностям студентов, применения инновационных педагогических технологий и разработки критериев оценки результативности. Особое внимание уделяется педагогическим возможностям компетентностного, личностно-ориентированного и системного подходов к проектированию воспитательной деятельности. Предлагаются научно-методические рекомендации по эффективной организации воспитательных мероприятий, способствующих

развитию социальной активности, самостоятельного мышления, нравственной ответственности студентов и уважения к национальным ценностям.

Ключевые слова: духовность студентов, воспитательные мероприятия, педагогическое проектирование, планирование, духовно-нравственное воспитание, компетентностный подход, инновационные педагогические технологии, национальные ценности, социальная активность, эффективность воспитательной деятельности.

DESIGNING AND PLANNING EDUCATIONAL ACTIVITIES AIMED AT DEVELOPING STUDENTS' SPIRITUALITY

Abstract: This thesis examines the theoretical and pedagogical foundations, organizational and methodological mechanisms, and factors influencing the effectiveness of designing and planning educational activities aimed at developing students' spirituality in higher education institutions. The study analyzes the identification of educational goals and objectives, the adaptation of activity content to students' individual characteristics and spiritual needs, the application of innovative pedagogical technologies, and the development of criteria for evaluating educational outcomes. Particular attention is paid to the pedagogical potential of competency-based, learner-centered, and systematic approaches to designing educational activities. The thesis also proposes scientific and methodological recommendations for effectively organizing educational activities that promote students' social engagement, independent thinking, moral responsibility, and respect for national values.

Keywords: students' spirituality, educational activities, pedagogical design, planning, spiritual and moral education, competency-based approach, innovative pedagogical technologies, national values, social engagement, effectiveness of educational activities.

KIRIŞ

Zamonaviy oliy ta'lim tizimida talabalar ma'naviyatini rivojlantiriş, ularni milliy va umuminsoniy qadriyatlar ruhida tarbiyalaş, ijtimoiy mas'uliyat va fuqarolik faolligini şakllantiriş dolzarb pedagogik vazifalardan biri hisoblanadi. Globallaşuv, raqamli transformatsiya va ijtimoiy-madaniy özgarişlar şaroitida yoshlarning ma'naviy-axloqiy dunyoqaraşini mustahkamlaş, mustaqil fikrlaş qobiliyatini rivojlantiriş hamda jamiyat hayotida faol iştirok etişini ta'minlaşga yönaltirilgan tarbiyaviy faoliyatni ilmiy asosda taşkil etiş zarurati ortib bormoqda. Oliy ta'lim muassasalarida tarbiyaviy tadbirlar talabalar ma'naviyatini rivojlantirişning muhim pedagogik vositalaridan biri hisoblanadi. Biroq ularning samaradorligi tadbirlar soni yoki iştirokçilar miqdori bilan emas, balki aniq maqsadga yönaltirilganligi, mazmunining dolzarbligi, talabalarning

faol iştiroki va erişilgan tarbiyaviy natijalar bilan belgilanadi. Şu bois tarbiyaviy tadbirlarni loyihalaş va rejalaştirişda tizimli, kompetensiyaviy hamda şaxsga yönaltirilgan yondaşuvlardan foydalanış alohida ahamiyat kasb etadi. Pedagogik loyihalaş tarbiyaviy faoliyatning maqsadi, vazifalari, mazmuni, metodlari, vositalari va kutilayotgan natijalarini oldindan belgilash jarayonidir. Rejalaştiriş esa belgilangan maqsadlarga erişiş uçun zarur bölgan faoliyat türlari, muddatlar, mas'ullar va resurslarni muvofiqlaştirişni nazarda tutadi. Mazkur jarayonlarning özaro uyğunligi tarbiyaviy faoliyatning izçilligi va uzluksizligini ta'minlaydi.

Talabalar ma'naviyatini rivojlantirişga doir tarbiyaviy tadbirlarni loyihalaş pedagogik jarayonning muhim tarkibiy qismi bölib, u tarbiyaviy faoliyatni tasodifiy va bir martalik tadbirlar majmuasidan aniq maqsad va natijalarga yönaltirilgan tizimga aylantiriş imkonini beradi. Tarbiyaviy tadbirlarni loyihalaşda, avvalo, talabalarning ma'naviy ehtiyojlari, qiziqişlari, ijtimoiy tajribasi va mavjud muammolarini aniqlash muhim hisoblanadi. Bunda suhbat, anketa, pedagogik kuzatuv va guruhli muhokama usullaridan foydalanış mumkin. Olingan ma'lumotlar asosida tarbiyaviy faoliyatning ustuvor yönalişlari belgilanadi. Tarbiyaviy tadbirlarni samarali loyihalaş quyidagi bosqiçlarni qamrab oladi:

1. Diagnostik bosqiç - talabalarning ma'naviy ehtiyojlari va tarbiyaviy muammolarini aniqlash.
2. Maqsadli bosqiç - tadbirning maqsadi, vazifalari va kutilayotgan natijalarini belgilash.
3. Mazmuniy bosqiç - tadbir mavzusi, mazmuni va pedagogik metodlarini tanlaş.
4. Tashkiliy-amaliy bosqiç - tadbirni ötkaziş, talabalar faolligini ta'minlaş va hamkorlikni yo'lga qöyiş.
5. Refleksiv-baholaş bosqiçi - tadbir natijalarini tahlil qiliş, fikr-mulohazalarni umumlaştiriş va keyingi faoliyatni takomillaştiriş.

Mazkur bosqiçlar tarbiyaviy tadbirlarni tizimli taşkil etiş, ularning mazmuniy yaxlitligini ta'minlaş va natijadorligini baholaşga xizmat qiladi.

Tarbiyaviy tadbirlarni loyihalaş va rejalaştiriş bosqiçlari

Bosqiçlar	Asosiy vazifalar	Kutilayotgan natijalar
Diagnostik	Ma'naviy ehtiyojlarni örganiş	Tarbiyaviy ustuvorliklarni aniqlash
Maqsadli	Maqsad va vazifalarni belgilash	Aniq pedagogik natijalarni rejalaştiriş
Mazmuniy	Mavzu, metod va vositalarni tanlaş	Mazmunli tarbiyaviy dastur

Tashkiliy-amaliy	Tadbirni amalga oşiriş	Talabalarning faol iştiroki
Refleksiv-baholaş	Natijalarni tahlil qiliş	Tarbiyaviy faoliyatni takomillaştiriş

Manba: muallif tomonidan taklif etilgan pedagogik model.

Tarbiyaviy tadbirlarni rejalaştirişda ularning mazmunini milliy qadriyatlar, ma'naviy-axloqiy madaniyat, fuqarolik mas'uliyati, vatanparvarlik, axborot madaniyati va kasbiy etika kabi yönalişlar asosida şakllantiriş maqsadga muvofiqdir. Bunda har bir tadbirning umumiy tarbiyaviy maqsad bilan boğliqligi, talabalarning individual xususiyatlariga mosligi va amaliy ahamiyati hisobga olinişi lozim. Ayniqsa, tarbiyaviy tadbirlarni kompetensiyaviy yondaşuv asosida rejalaştiriş muhimdir. Ushbu yondaşuv tadbir iştirokçilarida faqat ma'naviy bilimlarni şakllantiriş emas, balki ularni hayotiy vaziyatlarda qöllay oliş, axloqiy qarorlar qabul qiliş, ijtimoiy munosabatlarda mas'uliyatli harakat qiliş va öz faoliyatini mustaqil baholaş kompetensiyalarini rivojlantirişni nazarda tutadi. Şu nuqtayi nazardan, tarbiyaviy tadbirlarning mazmunini talabalar faol iştirok etadigan interfaol metodlar asosida taşkil etiş zarur. Jumladan, debat, keys-stadi, ijtimoiy loyiha, ijodiy uçraşuv, davra suhbati, rolli öyinlar va könğillilik faoliyati talabalarning mustaqil fikrlaşi, hamkorlik könikmalari va ijtimoiy taşabbuskorligini rivojlantirişga yordam beradi.

Talabalar ma'naviyatini rivojlantirişga qaratilgan tarbiyaviy tadbirlarning namunaviy rejasi

Tarbiyaviy yönaliş	Tadbir şakli	Rivojlantiriladigan kompetensiya
Milliy qadriyatlar	Ma'naviy-ma'rifiy uçraşuv	Milliy özlikni anglaş
Axloqiy madaniyat	Muammoli vaziyatlar muhokamasi	Axloqiy qaror qabul qiliş
Fuqarolik tarbiyasi	Debat va ijtimoiy loyiha	Fuqarolik mas'uliyati
Axborot madaniyati	Media savodxonlik treningi	Tanqidiy fikrlaş
Kasbiy etika	Keys-stadi maşğuloti	Kasbiy-axloqiy kompetensiya

Manba: muallif tomonidan tuzilgan namunaviy reja.

Tarbiyaviy tadbirlarni loyihalaş jarayonida ularning tashkiliy jihatlariga ham alohida e'tibor qaratilişi lozim. Tadbirning ötkaziliş vaqti, joyi, iştirokçilar tarkibi, zarur moddiy-texnik vositalar va mas'ul şaxslar oldindan belgilanadi. Şuningdek, tadbirning maqsadiga mos ravişda talabalar, professor-öqituvçilar, tyutorlar, jamoat taşkilotlari va

boshqa hamkorlarning vazifalari muvofiqlaştiriladi. Tarbiyaviy faoliyat samaradorligini ta'minlaşda monitoring va baholaş muhim örin tutadi. Bunda iştirokçilar soni, tadbirga jalb etiliş darajasi, talabalar tomonidan ilgari surilgan taşabbuslar va amalga oşirilgan amaliy işlar bilan bir qatorda, ularning ma'naviy-axloqiy fikrlaşi, ijtimoiy mas'uliyati va refleksiv könikmalaridagi özgarişlar ham tahlil qilinişi zarur. Baholaş jarayonida anketa, suhbat, pedagogik kuzatuv, portfolio va refleksiv topshiriqlardan foydalanış mumkin. Biroq alohida tadbir natijasida talabaning ma'naviy rivojlaniş darajasini töliq aniqlash qiyin. Şu sababli baholaşni uzluksiz pedagogik kuzatuv va turli manbalardan olingan ma'lumotlar asosida amalga oşiriş maqsadga muvofiqdir. Tarbiyaviy tadbirlarni loyihalaş va rejalaştirişda raqamli texnologiyalardan foydalanış ham muhim ahamiyatga ega. Elektron kalendarlar, onlayn sörövnoma, multimedia taqdimotlari, raqamli portfolio va interfaol platformalar tadbirlarni taşkil etiş, iştirokçilar bilan muloqot qiliş va natijalarni tahlil etiş imkoniyatlarini kengaytiradi. Şuningdek, tarbiyaviy tadbirlar samaradorligini oşirişda talabalarning özlarini loyihalaş va rejalaştiriş jarayoniga jalb etiş zarur. Talabalar tomonidan ilgari surilgan taşabbuslar, mustaqil ishlab çiqilgan loyihalar va jamoaviy faoliyat şakllari ularda mas'uliyat, liderlik, ijodkorlik va özini özi başqapuш könikmalarini rivojlantirişga xizmat qiladi.

XULOSA

Talabalar ma'naviyatini rivojlantirişga doir tarbiyaviy tadbirlarni loyihalaş va rejalaştiriş oliy ta'lim muassasalarida ma'naviy-axloqiy tarbiya samaradorligini oşirişning muhim pedagogik şertlaridan biri hisoblanadi. Tarbiyaviy faoliyatni diagnostik, maqsadli, mazmuniy, tashkiliy-amaliy va refleksiv-baholaş bosqiçlari asosida taşkil etiş uning tizimliligi, izçilligi va natijaga yönaltirilganligini ta'minlaydi. Kompetensiyaviy va şaxsga yönaltirilgan yondaşuvlardan foydalanış, interfaol pedagogik texnologiyalarni joriy etiş hamda talabalarni tarbiyaviy tadbirlarning bevosita taşkilotçisiga aylantiriş ularning ma'naviy-axloqiy kompetensiyalari, ijtimoiy faolligi va mustaqil fikrlaşini rivojlantiriş uçun qulay imkoniyatlar yaratadi. Şu bois oliy ta'lim muassasalarida tarbiyaviy tadbirlarni faqat tashkiliy faoliyat sifatida emas, balki talabalarning ma'naviy kamolotiga xizmat qiluvçi yaxlit pedagogik jarayon sifatida loyihalaş va rejalaştiriş maqsadga muvofiqdir.

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МЕТОДЫ РАЗВИТИЯ ПРОФЕССИОНАЛЬНОЙ КОМПЕТЕНЦИИ БУДУЩИХ УЧИТЕЛЕЙ ХИМИИ

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Аннотация. В тезисе приведены авторские соображения о конкретных приёмах обучения, применяемых при подготовке учителя химии, и об их влиянии на профессиональную компетентность. Сначала разграничены термины «метод», «приём» и «средство», затем приёмы объединены в четыре группы: интерактивные приёмы на теоретических занятиях, лабораторно-практические приёмы, приёмы, моделирующие деятельность учителя, а также приёмы самостоятельной работы и работы над собой. Возможности каждого приёма показаны на материале определённой темы школьного курса химии. В заключение даны предложения о том, на что опираться при выборе приёма и по каким показателям определять уровень компетентности.

Ключевые слова: профессиональная компетентность, учитель химии, приём обучения, интерактивное обучение, кластер, экспериментальная задача, ролевая игра, критерии диагностики.

Abstract. The paper presents the author’s reflections on specific teaching techniques used in training chemistry teachers and on their effect on professional competence. We first distinguish the terms “method”, “technique” and “teaching aid”, and then arrange the techniques in four groups: interactive techniques for theoretical classes, laboratory and practical techniques, techniques that model a teacher’s work, and techniques for independent study and self-improvement. The potential of each technique is shown through a particular topic of the school chemistry course. Finally, suggestions are made on what to consider when choosing a technique and which indicators can be used to establish the level of competence.

Keywords: professional competence, chemistry teacher, teaching technique, interactive learning, cluster, experimental problem, role play, diagnostic criteria.

Введение. Квалификация преподавателя измеряется не количеством имеющихся у него знаний, а тем, насколько хорошо он умеет применять эти знания перед классом. Это особенно очевидно в случае химии: специалист, знающий формулы наизусть, но не способный объяснить ученику простые эксперименты, не может считаться хорошим учителем. Закон «Об образовании» [1] и Постановление № ПК-4805 от 12 августа 2020 г. [2], посвященные повышению качества

образования в области химии и биологии, также подчеркивают эту практическую подготовку. На наш взгляд, решение задачи, поставленной в этих документах, во многом зависит от методов работы со студентами в педагогическом высшем учебном заведении.

У нас есть основания так говорить. Человек, как правило, стремится учить других так, как учили его самого. Трудно ожидать от ученика, который четыре года в основном слушал лекции, урока, активно использующего учеников в школе. Напротив, студент, сформировавший группу, обдумавший экспериментальную задачу и проведший урок перед одноклассниками, естественно, перенесет этот опыт в свою аудиторию. Исходя из этого, мы ценим метод двояко: с его помощью студент учится сегодня, а завтра тот же метод станет его рабочим инструментом. При этом нельзя игнорировать один недостаток. Интерактивные методы часто преподаются под видом «педагогических технологий», оторванных от содержания химии. В результате выпускник может назвать десятки методов, но не может сказать, какой из них и как будет использоваться при изучении темы «Электролитическая диссоциация» или «Углеводороды». На наш взгляд, проблема не в недостатке методов, а в их отсутствии связи с содержанием предмета.

В вопросе профессиональной компетентности мы считаем главной особенностью взаимодействие знаний, навыков, опыта и личностных качеств при решении профессиональной задачи; эта концепция широко освещена в работах авторов во главе с И.А. Зимняей и Н.А. Муслимовым [5; 6]. А.В. Хуторской различает компетентность и компетенцию: первая — это заранее установленное требование к специалисту, а вторая — степень, в которой человек может выполнить это требование [7]. Это различие важно и в практическом плане: государственный образовательный стандарт перечисляет компетенции, но их трансформация в компетентность у ученика зависит от методов работы в классе.

Применительно к учителю химии мы выделяем четыре области компетенции: глубокое знание предмета; владение методикой его преподавания; умение безопасно и наглядно организовать химический эксперимент; анализ и совершенствование собственной работы. В учебниках и методических пособиях по методике преподавания химии эти аспекты также указываются как основа подготовки учителей [8; 9]. Л. Шульман выделил способность обрабатывать содержание науки для обучения как отдельный тип знаний, специфичный для учителя [11]; первые две области, которые мы перечислили, связаны с этими

знаниями. В следующем разделе мы рассмотрим описанные методы с точки зрения того, как они служат этим четырем областям.

Методы первой группы выполняют сразу две задачи: они организуют знания ученика по химии и дают ему представление о том, как этот метод выглядит «изнутри». Большинство из них подробно описаны в литературе по педагогическим технологиям [10; 4]; здесь мы остановимся на их применении в содержании химии.

– «Кластер». В середине записывается основное понятие, от которого отходят смежные понятия. По теме «Кислоты» ветви охватывают состав, классификацию, химические свойства, способы получения и применения. Ученик, формирующий кластер, замечает, какая ветвь «неполна», то есть чего он плохо знает.

– «БГБ» (Я знаю – Я хочу знать – Я узнал). Перед началом темы «Электролитическая диссоциация» заполняются первые два столбца, а третий – в конце темы. На наш взгляд, этот метод дает будущему преподавателю очень необходимый навык: спрашивать, что знает ученик, прежде чем переходить к новой теме.

– «Диаграмма Венна». Сходные и различные аспекты двух понятий помещены в два пересекающихся круга. Это удобный способ сравнения ионной связи с ковалентной связью, алканов с алкенами, окисления с восстановлением.

– «Вставка». При чтении текста на полях ставятся условные пометки: «Я знаю», «мне это новое», «я не понял», «не совпало с моими мыслями». Ученик, работавший таким образом с текстом «Периодический закон и периодическая таблица», привыкнет читать школьные учебники критическим взглядом.

– «ФГМУ» (Мысль - Разум - Пример - Обобщение). Ответ на спорный вопрос строится в четыре этапа. Например, на вопрос «Следует ли ограничивать использование минеральных удобрений?». Ученик сначала излагает свою точку зрения, затем обосновывает её, подкрепляет примером и делает окончательный вывод. Метод учит использовать химические знания в качестве доказательства.

– «Рыбий скелет». Проблема изложена в «головной» части рисунка, а её причины и решения — в «ребрах». По теме «Коррозия металлов» причины коррозии расположены в верхнем ряду — влага, кислород, электролитная среда, а методы защиты — в нижнем ряду.

– «Синквейн». Понятие содержится в компактном тексте из пяти строк. Чтобы написать синквейн для слова «катализатор», ученик должен выбрать его наиболее важные знаки — это проверка истинного понимания понятия.

При использовании этих методов мы придерживаемся одного правила. После завершения метода ученикам задаётся ещё один вопрос: «В каком предмете и в какой части урока вы бы использовали этот метод в 8 классе?» Этот метод без вопросов остаётся лишь средством повторения химии; с вопросами он становится средством подготовки к профессии.

Химию невозможно преподавать без опыта. Поэтому мы считаем подготовку к эксперименту уникальной частью компетенции учителя химии, которой нет у учителей других предметов [8; 9].

– Подготовка и защита демонстрационного эксперимента. Ученик готовит один из экспериментов, предусмотренных школьной программой, демонстрирует и объясняет его перед группой. Одноклассники оценивают три аспекта: был ли эксперимент виден с обратной стороны, была ли обеспечена безопасность и было ли объяснение понятным.

– Решение экспериментальных задач. Например, три пронумерованные пробирки содержат растворы хлорида натрия, сульфата натрия и карбоната натрия; необходимо определить, в какой пробирке что находится. Ученик составляет план работы, подбирает необходимые реагенты и подтверждает свои наблюдения уравнениями реакций.

– Эксперименты в малом масштабе (капельные). Реакция проводится на пластине с одной или двумя каплями раствора. На наш взгляд, этот метод особенно ценен в школьных условиях: экономятся реактивы, снижаются риски, и, что наиболее важно, даже в плохо оборудованной школе каждый ученик может провести эксперимент самостоятельно.

– Работа в виртуальной лаборатории. Токсичные, взрывоопасные или длительно протекающие процессы наблюдаются в компьютерной модели. Мы предпочитаем использовать виртуальный эксперимент в качестве подготовки к реальному эксперименту или анализа после него, а не в качестве его замены.

– Составление инструкций по технике безопасности. Для каждого эксперимента ученик записывает возможные опасности, средства защиты и порядок оказания первой помощи. Ученик, составивший собственные инструкции, будет лучше осведомлен о правилах, чем если бы он читал их в готовом виде.

Заключение. На основании вышеизложенных соображений мы пришли к следующим выводам. Метод является практическим этапом метода. Для будущего учителя его ценность удваивается: благодаря методу ученик сам получает знания и одновременно приобретает опыт их дальнейшего применения. Целесообразно разделить методы, развивающие профессиональную

компетентность, на четыре группы: интерактивные методы на теоретических занятиях, лабораторно-практические методы, методы моделирования педагогической деятельности, методы самостоятельного обучения и саморазвития. Эти группы не заменяют друг друга, а дополняют. Интерактивный метод способствует профессиональной подготовке только в том случае, если он связан с содержанием химии. Поэтому после каждого метода обязательным шагом должно быть обсуждение возможности его использования на школьном уроке. При выборе метода необходимо учитывать цель, содержание, готовность ученика, возможность переноса в школу и временные рамки; решающее значение имеет не количество методов, а их актуальность. В качестве практического предложения мы рекомендуем в рамках предмета методики преподавания химии совместно со студентами составить «методическую карту» — перечень методов, соответствующих каждому разделу школьного курса химии. В будущем планируется проверить эффективность предложенных в данной работе методов экспериментальным путем.

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YOSHLAR BANDLIGINI TA’MINLASHDA TADBIRKORLIKNING ROLI

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Annotatsiya. Mazkur maqolada yoshlar bandligini ta’minlashda tadbirkorlik faoliyatining iqtisodiy va ijtimoiy ahamiyati, yoshlarning mehnat bozoriga kirib kelishida uchraydigan muammolar hamda ularni bartaraf etish yo‘llari tahlil qilingan. O‘zbekistonda yoshlar tadbirkorligini qo‘llab-quvvatlashga qaratilgan dasturlar va rasmiy statistik ma’lumotlar asosida tadbirkorlikning yangi ish o‘rinlarini yaratish, aholi daromadlarini oshirish va yoshlarning iqtisodiy faolligini kuchaytirishdagi o‘rni yoritilgan. Shuningdek, yoshlarning moliyaviy resurslardan foydalanish imkoniyatlarini kengaytirish, kasbiy va tadbirkorlik ko‘nikmalarini rivojlantirish, oliy ta’lim muassasalari bilan biznes sektori hamkorligini mustahkamlash hamda startap loyihalarni qo‘llab-quvvatlash bo‘yicha amaliy takliflar ishlab chiqilgan.

Kalit so‘zlar: yoshlar bandligi, tadbirkorlik, yoshlar tadbirkorligi, mehnat bozori, ish o‘rinlari, iqtisodiy faollik, inson kapitali, startap, moliyaviy qo‘llab-quvvatlash, raqamli iqtisodiyot, aholi daromadlari.

Kirish

Yoshlar bandligini ta’minlash har qanday mamlakatning ijtimoiy-iqtisodiy rivojlanishida muhim ahamiyatga ega. Yoshlarning bilim va salohiyatidan samarali foydalanish, ularni munosib ish o‘rinlari bilan ta’minlash hamda iqtisodiy mustaqilligini mustahkamlash iqtisodiy o‘sishning muhim shartlaridan hisoblanadi. Ayniqsa, mehnat bozoriga ilk bor kirib kelayotgan yoshlar uchun ish tajribasining yetishmasligi, kasbiy malaka bilan ish beruvchilar talablari o‘rtasidagi nomuvofiqlik va moliyaviy imkoniyatlarning cheklanganligi bandlik masalasini yanada dolzarb qiladi.

Tadbirkorlik yoshlarning iqtisodiy faolligini oshirish, yangi daromad manbalarini shakllantirish va qo‘shimcha ish o‘rinlarini yaratishning muhim vositasidir. Yoshlarning o‘z biznesini tashkil etishi nafaqat ularning shaxsiy bandligini ta’minlaydi, balki biznes kengaygan sari boshqa fuqarolar uchun ham ish imkoniyatlarini yaratishi mumkin. Shu bilan birga, tadbirkorlik tashabbuslarini muvaffaqiyatli amalga oshirish uchun biznes g‘oyaning o‘zi yetarli emas. Moliyalashtirish, kasbiy bilim, bozorni o‘rganish, maslahat xizmatlari va barqaror infratuzilma ham zarur.

O‘zbekistonda yoshlarni ijtimoiy-iqtisodiy qo‘llab-quvvatlash, kasb-hunarga o‘rgatish va tadbirkorlik faoliyatiga jalb qilish davlat siyosatining muhim yo‘nalishlaridan biri hisoblanadi. Xususan, 2026–2030-yillarga mo‘ljallangan “Yangi O‘zbekiston yoshlari — 2030” strategiyasida yoshlar bandligini ta’minlash va tadbirkorligini qo‘llab-quvvatlash ustuvor vazifalar sifatida belgilangan [1].

Maqolaning maqsadi yoshlar bandligini ta’minlashda tadbirkorlikning iqtisodiy va ijtimoiy rolini o‘rganish, mavjud muammolarni aniqlash hamda yoshlar tadbirkorligini rivojlantirishga qaratilgan amaliy takliflarni ishlab chiqishdan iborat.

Mavzuning nazariy asoslari

Iqtisodiy nazariyada tadbirkorlik ishlab chiqarish omillarini birlashtirish, tavakkalchilikni o‘z zimmasiga olish, yangi mahsulot va xizmatlarni yaratish hamda bozor talabiga mos ravishda iqtisodiy faoliyatni tashkil etish jarayoni sifatida izohlanadi. Yoshlar tadbirkorligi esa yoshlarning bilimlari, tashabbuskorligi, kasbiy salohiyati va innovatsion g‘oyalarini iqtisodiy faoliyatga yo‘naltirishni anglatadi.

Tadbirkorlikning yoshlar bandligiga ta’sirini uchta asosiy yo‘nalishda ko‘rib chiqish mumkin.

Birinchidan, tadbirkorlik yoshlarning o‘zini o‘zi band qilish imkoniyatini kengaytiradi. Yoshlar xizmat ko‘rsatish, hunarmandchilik, qishloq xo‘jaligi, ishlab chiqarish, elektron tijorat va raqamli xizmatlar orqali mustaqil daromad manbaini yaratishi mumkin.

Ikkinchidan, tadbirkorlik subyektlarining rivojlanishi qo‘shimcha ish o‘rinlarini yaratadi. Kichik korxona faoliyati kengaygan sari yangi xodimlarga ehtiyoj paydo bo‘ladi. Shu tariqa bir tadbirkorning biznes tashabbusi boshqa yoshlarning ham bandligiga ijobiy ta’sir ko‘rsatishi mumkin.

Uchinchidan, tadbirkorlik yoshlarning inson kapitalini rivojlantiradi. Biznesni tashkil etish va boshqarish jarayonida moliyaviy savodxonlik, marketing, muzokara olib borish, raqamli texnologiyalardan foydalanish, muammolarni hal qilish va qaror qabul qilish ko‘nikmalari shakllanadi.

Biroq tadbirkorlikni barcha yoshlar uchun yagona bandlik yechimi sifatida ko‘rish to‘g‘ri emas. Har bir yoshning qiziqishi, kasbiy tayyorgarligi va shaxsiy imkoniyatlari turlicha. Shu sababli tadbirkorlikni rivojlantirish ishga joylashtirish, kasb-hunarga o‘qitish, amaliyot va kasbiy maslahat xizmatlari bilan birgalikda olib borilishi lozim.

O‘zbekistonda yoshlar tadbirkorligi va bandligining holati

O‘zbekistonda yoshlar tadbirkorligini qo‘llab-quvvatlash bo‘yicha turli moliyaviy va tashkiliy mexanizmlar amalga oshirilmoqda. Yoshlar ishlari agentligining 2026-yil yanvar oyida e’lon qilingan ma’lumotlariga ko‘ra, 2025-yilda “Yoshlar biznesi” dasturi doirasida “Aloqabank” tomonidan 9 240 ta loyihaga 1 trillion 177 milliard so‘m imtiyozli kredit ajratilgan. Ushbu loyihalar orqali 12,5 ming nafar ishsiz yoshning bandligi ta’minlangan. “Kelajakka qadam” dasturi doirasida esa 4 489 nafar talabaning 199,4 milliard so‘mlik biznes loyihalari moliyalashtirilgan [2].

Mazkur ma’lumotlar tadbirkorlikni moliyaviy qo‘llab-quvvatlash yoshlarning iqtisodiy faoliyatga kirib kelishida muhim vosita ekanini ko‘rsatadi. Biroq ajratilgan kreditlar va moliyalashtirilgan loyihalar soni yakuniy natijani to‘liq ifodalamaydi. Dasturlarning samaradorligini baholashda korxonalarning qancha muddat faoliyat yuritayotgani, yaratilgan ish o‘rinlarining doimiyligi, tadbirkorlarning daromadlari va kreditlarni qaytarish ko‘rsatkichlarini ham hisobga olish zarur.

2026-yil 20-aprelda qabul qilingan PF-66-son Farmon bilan tasdiqlangan “Yangi O‘zbekiston yoshlari — 2030” strategiyasida 2030-yilga qadar tadbirkorlik faoliyati bilan shug‘ullanayotgan yoshlar sonini 2026-yilga nisbatan 30 foizga oshirish maqsadi belgilangan. Shuningdek, davlat ko‘magida faoliyat boshlagan yosh tadbirkorlarning uch yil ichida barqaror daromad manbaiga ega bo‘lgan ulushini 70 foizga yetkazish ko‘zda tutilgan [1].

Ushbu maqsadlar yoshlar tadbirkorligini faqat boshlang‘ich moliyalashtirish bilan cheklamasdan, biznesning barqaror faoliyat yuritishi va uzoq muddatli natijalariga e’tibor qaratish zarurligini ko‘rsatadi.

Yoshlar bandligini ta’minlashda tadbirkorlikning asosiy imkoniyatlari

Yoshlar tadbirkorligi bandlik muammosini hal etishda bir nechta muhim imkoniyatlarni yuzaga keltiradi.

Birinchidan, yangi ish o‘rinlarini yaratadi. Ishlab chiqarish, xizmat ko‘rsatish, savdo va qishloq xo‘jaligi sohalarida yangi biznes subyektlarining tashkil etilishi mahalliy mehnat resurslariga talabni oshiradi. Ayniqsa, hududlarda kichik korxonalar va oilaviy biznesning rivojlanishi yoshlarning o‘z yashash joyida ish topish imkoniyatini kengaytiradi.

Ikkinchidan, yoshlarning iqtisodiy mustaqilligini mustahkamlaydi. O‘z biznesiga ega bo‘lgan yosh o‘z daromad manbaini shakllantirish, xarajatlarini boshqarish va kelajakdagi iqtisodiy rejalarini mustaqil belgilash imkoniyatiga ega bo‘ladi. Biroq buning uchun biznesning real bozor talabiga asoslanishi va moliyaviy jihatdan barqaror bo‘lishi muhim.

Uchinchidan, innovatsiyalarni rag‘batlantiradi. Yoshlar raqamli texnologiyalar, mobil ilovalar, onlayn savdo, dasturiy mahsulotlar va zamonaviy xizmatlar sohasida yangi biznes g‘oyalarini amalga oshirish imkoniyatiga ega. Raqamli tadbirkorlik ayrim hollarda katta boshlang‘ich infratuzilma xarajatlarisiz bozorga kirish imkonini yaratadi.

To‘rtinchidan, hududiy iqtisodiy faollikni kuchaytiradi. Qishloq joylarda qishloq xo‘jaligi mahsulotlarini qayta ishlash, logistika, turizm, hunarmandchilik va maishiy xizmatlar bo‘yicha biznes loyihalarini rivojlantirish yoshlar bandligini oshirishi mumkin. Bunday loyihalar mahalliy resurslardan samarali foydalanishga ham yordam beradi.

Beshinchidan, kasbiy ko‘nikmalarni rivojlantiradi. Tadbirkorlik jarayonida yoshlar nazariy bilimlarini amaliyotda qo‘llash, mijozlar bilan ishlash, bozor talabini o‘rganish va jamoani boshqarish tajribasini egallaydi. Bu ko‘nikmalar kelajakda boshqa ish joylarida ham foyda beradi.

Yoshlar tadbirkorligini rivojlantirishdagi muammolar

Yoshlar tadbirkorligi uchun yaratilayotgan imkoniyatlarga qaramay, bir qator muammolar mavjud.

Birinchi muammo — boshlang‘ich moliyaviy resurslarning cheklanganligi. Biznesni tashkil etish uchun mablag‘, asbob-uskunalar, xomashyo va ish joyi talab etiladi. Yoshlarning doimiy daromadi yoki garov ta’minoti yetarli bo‘lmaganda kredit olish qiyinlashishi mumkin. Natijada istiqbolli biznes g‘oyalari amalga oshmay qoladi.

Ikkinchi muammo — amaliy biznes bilimlarining yetishmasligi. Ayrim yoshlar mahsulot yoki xizmat yaratish g‘oyasiga ega bo‘lsa-da, bozor hajmini aniqlash, xarajat va daromadlarni hisoblash, narx belgilash, marketing va soliq majburiyatlarini bajarish bo‘yicha yetarli tajribaga ega bo‘lmasligi mumkin.

Uchinchi muammo — bozor va infratuzilmaga kirish imkoniyatlarining notekisligi. Hududlar o‘rtasida internet sifati, logistika, ishlab chiqarish maydonlari va maslahat xizmatlaridan foydalanish imkoniyatlari farq qilishi mumkin. Bu holat ayrim hududlardagi yosh tadbirkorlarning raqobatbardoshligini cheklaydi.

To‘rtinchi muammo — biznesning barqarorligini ta’minlash. Tadbirkorlikni boshlash bilan uni uzoq muddat davom ettirish bir xil jarayon emas. Talabning o‘zgarishi, xarajatlarning ortishi, raqobat, pul oqimlarini noto‘g‘ri boshqarish va

mijozlar bazasining torligi yangi korxonalar faoliyatiga salbiy ta’sir ko‘rsatishi mumkin.

Beshinchi muammo — ta’lim va mehnat bozori talablari o‘rtasidagi nomuvofiqlik. Ta’lim muassasalarida olingan bilimlar amaliy biznes ehtiyojlariga mos kelmasa, yoshlar biznes g‘oyalarini hayotga tatbiq etishda qiyinchilikka duch kelishi mumkin. Shu sababli ta’lim, ishlab chiqarish va tadbirkorlik sektori o‘rtasidagi hamkorlikni kuchaytirish talab etiladi.

Yoshlar bandligini oshirish bo‘yicha amaliy takliflar

Yoshlar tadbirkorligini rivojlantirish va uning bandlikka ta’sirini kuchaytirish maqsadida quyidagi takliflarni amalga oshirish maqsadga muvofiq.

1. Tadbirkorlikka o‘qitishni amaliyot bilan birlashtirish. Oliy ta’lim muassasalari va professional ta’lim tashkilotlarida biznes-reja tuzish, bozorni tahlil qilish, moliyaviy hisob-kitob, soliq savodxonligi, elektron savdo va raqamli marketing bo‘yicha amaliy mashg‘ulotlarni kengaytirish lozim. Ta’lim yakunida yoshlar faqat nazariy bilim emas, balki amalga oshirish mumkin bo‘lgan biznes loyihasiga ham ega bo‘lishi kerak.

2. Boshlang‘ich moliyalashtirishni maslahat xizmatlari bilan birgalikda tashkil etish. Kredit yoki subsidiya ajratishdan oldin biznes g‘oyaning bozor salohiyati, xarajatlari, kutilayotgan daromadi va tavakkalchiliklari baholanishi zarur. Moliyalashtirishdan keyin esa yosh tadbirkorlarga buxgalteriya, marketing va moliyaviy boshqaruv bo‘yicha maslahatlar berilishi maqsadga muvofiq.

3. Yoshlar biznes-inkubatorlarini rivojlantirish. Oliy ta’lim muassasalari, texnoparklar va hududiy tadbirkorlik markazlari qoshida biznes-inkubatorlar tashkil etish yoki mavjudlarini kengaytirish mumkin. Ular yoshlarning biznes g‘oyalarini sinovdan o‘tkazish, mentor topish, investorlar bilan uchrashish va bozorga chiqishiga ko‘maklashishi kerak.

4. Ish beruvchilar va ta’lim muassasalari hamkorligini kuchaytirish. Talabalar uchun ishlab chiqarish amaliyoti, haq to‘lanadigan stajirovkalar va

korxonalarda mentorlik dasturlarini kengaytirish zarur. Bu yoshlarning kasbiy tajribasini oshiradi, ish beruvchilarga esa bo‘lajak xodimlarni tayyorlash imkonini beradi.

5. Raqamli va masofaviy tadbirkorlikni qo‘llab-quvvatlash. Dasturlash, grafik dizayn, raqamli marketing, tarjima, onlayn ta’lim va elektron tijorat kabi yo‘nalishlarda yoshlarning malakasini oshirish lozim. Bunday faoliyat, ayniqsa, an’anaviy ish o‘rinlari cheklangan hududlarda qo‘shimcha daromad manbalarini yaratishi mumkin.

6. Hududiy ixtisoslashuv asosida biznes loyihalarini rivojlantirish. Yoshlar tadbirkorligini qo‘llab-quvvatlashda hududning tabiiy resurslari, mahalliy xomashyo, turistik salohiyati va iste’mol talabi hisobga olinishi kerak. Masalan, qishloq hududlarida mahsulotlarni qayta ishlash, saqlash va qadoqlash; turistik hududlarda mehmonxona xizmatlari, gidlik va hunarmandchilik; shaharlarda esa raqamli xizmatlar va zamonaviy servis yo‘nalishlarini rivojlantirish mumkin.

7. Tadbirkorlik dasturlari natijalarini uzoq muddatli mezonlar asosida baholash. Davlat ko‘magida tashkil etilgan bizneslarning 12, 24 va 36 oydan keyingi holatini o‘rganish zarur. Bunda faoliyatini davom ettirayotgan korxonalar ulushi, barqaror daromad, yaratilgan doimiy ish o‘rinlari, xodimlarning ish haqi va kreditlarni qaytarish ko‘rsatkichlari hisobga olinishi lozim. Bu mexanizm mablag‘lardan foydalanish samaradorligini aniqlashga yordam beradi.

8. Yosh ayollar va imkoniyati cheklangan yoshlar uchun qulay sharoitlar yaratish. Tadbirkorlik bo‘yicha maslahatlar, moslashtirilgan o‘quv dasturlari, raqamli xizmatlar va zarur infratuzilmani rivojlantirish orqali mehnat bozorida imkoniyatlari cheklangan guruhlarning iqtisodiy faolligini oshirish mumkin.

Xulosa

Yoshlar bandligini ta’minlashda tadbirkorlik muhim iqtisodiy va ijtimoiy vosita hisoblanadi. U yoshlarning o‘zini o‘zi band qilishiga, yangi ish o‘rinlari yaratishiga, daromad manbalarini kengaytirishiga va kasbiy ko‘nikmalarini rivojlantirishiga xizmat

qiladi. O‘zbekistonda yoshlar tadbirkorligini qo‘llab-quvvatlash dasturlari orqali amalga oshirilayotgan moliyaviy va tashkiliy chora-tadbirlar ushbu yo‘nalishning amaliy ahamiyatini ko‘rsatmoqda.

Tahlillar asosida quyidagi xulosalarga kelish mumkin.

Birinchidan, yoshlar tadbirkorligini rivojlantirishda faqat kredit ajratish bilan cheklanib qolmasdan, biznesni rejalashtirish, boshqarish va bozorga olib chiqish bo‘yicha kompleks ko‘makni ta’minlash zarur.

Ikkinchidan, ta’lim muassasalari, banklar, davlat tashkilotlari va xususiy sektor o‘rtasidagi hamkorlikni kuchaytirish yoshlarning biznes tashabbuslarini amaliy natijaga aylantirish imkoniyatlarini kengaytiradi.

Uchinchidan, raqamli texnologiyalar, elektron tijorat va zamonaviy xizmatlar yoshlar uchun yangi bandlik imkoniyatlarini yaratadi. Shu bois raqamli savodxonlik va amaliy kasbiy ko‘nikmalarni rivojlantirishga alohida e’tibor qaratish lozim.

To‘rtinchidan, yoshlar tadbirkorligini baholashda tashkil etilgan loyihalar soni bilan bir qatorda ularning barqarorligi, daromadliligi va yaratgan doimiy ish o‘rinlari ham asosiy mezon sifatida qo‘llanishi kerak.

Umuman olganda, yoshlar bandligini ta’minlashda tadbirkorlikni rivojlantirish inson kapitaliga investitsiya kiritish, hududiy iqtisodiy faollikni oshirish va mamlakatning uzoq muddatli iqtisodiy salohiyatini mustahkamlashga xizmat qiladi. Bu jarayonda davlat ko‘magi, ta’lim sifati, moliyaviy imkoniyatlar va bozor talabiga mos biznes tashabbuslarning uyg‘unligi hal qiluvchi ahamiyat kasb etadi.

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"TAJRIBAVIY GIPOTIREOZ MODELIDA RIVOJLANGAN AVLOD UMURTQALARARO DISKLAR MORFOLOGIK O‘ZGARISHLARIGA GIPODINAMIYANING TA’SIRI".

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ANNOTATSIYA: Ushbu maqolada tajribaviy gipotireoz sharoitida rivojlangan avlod umurtqalararo disklarining morfologik xususiyatlariga gipodinamiyaning ta’siri o‘rganiladi. Qalqonsimon bez gormonlari yetishmovchiligi va jismoniy faollikning cheklanishi natijasida umurtqalararo disklarning strukturaviy tuzilishi, tog‘ay to‘qimasi, hujayraviy tarkibi hamda hujayralararo matriksida yuzaga kelishi mumkin bo‘lgan o‘zgarishlar tahlil qilinadi. Tadqiqotda gipotireoz va gipodinamiyaning birgalikdagi ta’sirini morfologik hamda morfometrik ko‘rsatkichlar asosida baholashga alohida e’tibor qaratiladi. Mazkur yondashuv umurtqalararo disklarda degenerativ jarayonlarning shakllanish mexanizmlarini chuqurroq tushunishga xizmat qiladi.

Kalit so‘zlar: tajribaviy gipotireoz, gipodinamiya, umurtqalararo disk, morfologik o‘zgarishlar, avlod, tog‘ay to‘qimasi, hujayralararo matriks, degenerativ jarayonlar, morfometriya.

KIRISH

Umurtqalararo disklar umurtqa pog‘onasining harakatchanligi, elastikligi va mexanik barqarorligini ta’minlovchi muhim anatomik tuzilmalar hisoblanadi. Ularning normal shakllanishi va funksional holati organizmdagi endokrin muvozanat, moddalar almashinuvi hamda jismoniy faollik darajasi bilan chambarchas bog‘liq. Ayniqsa, qalqonsimon bez gormonlari suyak va tog‘ay to‘qimalarining rivojlanishi, hujayralarning differensiyalanishi hamda hujayralararo matriks sintezini boshqarishda muhim ahamiyat kasb etadi. Gipotireoz sharoitida qalqonsimon bez gormonlarining yetishmovchiligi biriktiruvchi to‘qimalarda metabolik jarayonlarning sekinlashishiga, tog‘ay hujayralari faoliyatining o‘zgarishiga va umurtqalararo disklarning strukturaviy rivojlanishida buzilishlar yuzaga kelishiga sabab bo‘lishi mumkin. Ayniqsa, homila rivojlanishi davrida kuzatiladigan tireoid gormonlar tanqisligi avlodning tayanch-harakat tizimi shakllanishiga uzoq muddatli ta’sir ko‘rsatishi ehtimoli bilan alohida ilmiy ahamiyatga ega. Gipodinamiya, ya’ni harakat faolligining cheklanishi, umurtqalararo disklarga tushadigan fiziologik mexanik yuklamaning o‘zgarishiga olib keladi. Natijada disk to‘qimalarida oziq moddalar almashinuvi, hujayralararo matriksning yangilanishi va strukturaviy moslashuv jarayonlari izdan chiqishi

mumkin. Gipotireoz va gipodinamiyaning birgalikdagi ta’siri esa umurtqalararo disklarning morfologik holatiga yanada murakkab ta’sir ko‘rsatishi mumkin. Shu nuqtayi nazardan, tajribaviy gipotireoz modelida rivojlangan avlod umurtqalararo disklarida gipodinamiya ta’sirida yuzaga keladigan morfologik va morfometrik o‘zgarishlarni o‘rganish dolzarb ilmiy masala hisoblanadi. Tadqiqotning asosiy maqsadi gipotireoz sharoitida rivojlangan avlod umurtqalararo disklarining strukturaviy xususiyatlarini baholash, gipodinamiyaning ularga ta’sirini aniqlash hamda ushbu omillarning birgalikdagi ta’siri bilan bog‘liq morfologik o‘zgarishlarni qiyosiy tahlil qilishdan iborat.

ASOSIY QISM

Umurtqalararo disklarning morfologik tuzilishi organizmning o‘sish va rivojlanish davrida kechadigan metabolik, gormonal hamda mexanik jarayonlarga bevosita bog‘liq. Diskning markaziy qismida joylashgan pulpoz yadro (nucleus pulposus) yuqori darajada gidratlangan hujayralararo matriksdan tashkil topgan bo‘lib, umurtqa pog‘onasiga tushadigan bosimni bir tekis taqsimlash vazifasini bajaradi. Uni o‘rab turuvchi fibroz halqa (annulus fibrosus) kollagen tolalarning qatlamli joylashuvi orqali diskning mexanik mustahkamligini ta’minlaydi. Tog‘ayli chegaralovchi plastinkalar esa disk va umurtqa tanasi o‘rtasidagi moddalar almashinuvida muhim ahamiyatga ega. Qalqonsimon bez gormonlari tog‘ay to‘qimasining yetilishi, xondrotsitlarning proliferatsiyasi va differensiyalanishi hamda hujayralararo matriks komponentlarining sintezida ishtirok etadi. Tajribaviy gipotireoz sharoitida ushbu jarayonlarning buzilishi umurtqalararo disklarning normal rivojlanishiga salbiy ta’sir ko‘rsatishi mumkin. Xususan, proteoglikanlar va kollagen almashinuvining o‘zgarishi pulpoz yadroning gidratatsiya darajasi, fibroz halqaning strukturaviy yaxlitligi hamda tog‘ayli plastinkalarning morfologik xususiyatlariga ta’sir etishi ehtimoli mavjud. Ona organizmida tireoid gormonlar yetishmovchiligi kuzatilganda homilaning skelet tizimi rivojlanishi uchun zarur bo‘lgan gormonal muhit o‘zgaradi. Bu holat avlod umurtqalararo disklarining shakllanishida hujayralar soni, ularning joylashuvi va matriks tarkibining me’yoriy rivojlanishiga ta’sir qilishi mumkin. Bunday o‘zgarishlarning darajasi gipotireozning og‘irligi, davomiyligi va rivojlanishning qaysi bosqichida yuzaga kelganiga bog‘liq. Shu sababli tajribaviy modelda avlodning yosh xususiyatlarini hisobga olish morfologik natijalarni to‘g‘ri talqin etishda muhim hisoblanadi. Gipodinamiya sharoitida umurtqa pog‘onasiga tushadigan dinamik yuklamaning kamayishi disk to‘qimalarining fiziologik moslashuv mexanizmlariga ta’sir ko‘rsatadi. Umurtqalararo disklar qon tomirlari bilan cheklangan darajada ta’minlanganligi sababli oziq moddalar va metabolitlarning almashinuvi asosan

diffuziya orqali amalga oshadi. Me’yoriy harakat va o‘zgaruvchan mexanik yuklama ushbu jarayonlar uchun qulay sharoit yaratadi. Harakat faolligining uzoq muddat cheklanishi esa matriks metabolizmi va diskning mexanik xususiyatlarini o‘zgartirishi mumkin. Gipotireoz fonida rivojlangan avlodda gipodinamiyaning ta’siri alohida ahamiyatga ega. Chunki gormonal yetishmovchilik tufayli tog‘ay to‘qimasining rivojlanish va yangilanish jarayonlari o‘zgargan bo‘lishi mumkin. Bunday sharoitda mexanik stimulyatsiyaning kamayishi disk tuzilmalarining moslashuv imkoniyatlarini yanada cheklashi ehtimoldan xoli emas. Biroq bu ikki omilning o‘zaro ta’siri har doim ham bir xil yo‘nalishda kechmaydi va uni eksperimental tekshiruvlar orqali aniqlash talab etiladi. Umurtqalararo disklarning morfologik holatini baholashda pulpoz yadro va fibroz halqaning o‘zaro nisbati, diskning umumiy balandligi, kollagen tolalarning joylashish tartibi, xondrotsitlarning soni hamda hujayralararo matriksning bo‘yalish xususiyatlari muhim ko‘rsatkichlar hisoblanadi. Gistologik tekshiruvlarda gematoksilin-eozin usuli umumiy to‘qima arxitektonikasini baholash imkonini bersa, altsian ko‘ki yoki safranin O bilan bo‘yash proteoglikanlarga boy matriks komponentlarini aniqlashda qo‘llanilishi mumkin. Morfometrik tahlilda disk balandligi, pulpoz yadro maydoni, fibroz halqa qalinligi va hujayralarning zichligini o‘lchash orqali turli tajriba guruhlari o‘rtasidagi farqlarni miqdoriy baholash mumkin. Ayniqsa, nazorat guruhi, faqat gipotireoz ta’sirida rivojlangan avlod, faqat gipodinamiya sharoitidagi avlod hamda ikkala omil birgalikda ta’sir etgan guruhlarni taqqoslash har bir omilning mustaqil va o‘zaro bog‘liq ta’sirini aniqlash imkonini beradi. Disk to‘qimalarida kuzatilishi mumkin bo‘lgan strukturaviy o‘zgarishlar faqat hujayralar sonining kamayishi yoki kollagen tolalarning tartibsiz joylashuvi bilan cheklanmaydi. Hujayralararo matriks tarkibidagi o‘zgarishlar diskning suvni ushlab turish qobiliyatiga, elastikligiga va mexanik yuklamalarga chidamliligiga ham ta’sir qilishi mumkin. Shu bois gistologik belgilarni morfometrik ko‘rsatkichlar bilan birgalikda o‘rganish diskning strukturaviy holati haqida to‘liqroq tasavvur beradi. Tajribaviy gipotireoz va gipodinamiya sharoitida rivojlangan avlod umurtqalararo disklarini kompleks o‘rganish endokrin buzilishlar bilan mexanik faollik o‘rtasidagi murakkab bog‘liqlikni aniqlashga xizmat qiladi. Bunda aniqlangan morfologik farqlarni degenerativ jarayonlarning bevosita isboti sifatida emas, balki to‘qima rivojlanishi va moslashuvidagi ehtimoliy o‘zgarishlar sifatida baholash muhimdir. Ushbu yondashuv tajriba natijalarining ilmiy asoslangan talqinini ta’minlaydi hamda umurtqalararo disklar patologiyasining rivojlanish mexanizmlarini o‘rganish uchun nazariy asos yaratadi.

XULOSA

Tajribaviy gipotireoz sharoitida rivojlangan avlod umurtqalararo disklarining morfologik holati tireoid gormonlar yetishmovchiligi va harakat faolligining cheklanishi bilan bog‘liq o‘zgarishlarga moyil bo‘lishi mumkin. Gipotireoz tog‘ay to‘qimasining shakllanishi, hujayralar differensiyalanishi va hujayralararo matriks metabolizmiga ta’sir ko‘rsatsa, gipodinamiya disklarning mexanik moslashuv jarayonlarini o‘zgartirishi mumkin. Ushbu omillarning birgalikdagi ta’siri pulpoz yadro, fibroz halqa va tog‘ayli plastinkalarning strukturaviy xususiyatlarida namoyon bo‘lishi ehtimoli mavjud. Umurtqalararo disklarning gistologik va morfometrik ko‘rsatkichlarini qiyosiy baholash mazkur o‘zgarishlarning xususiyati hamda darajasini aniqlash imkonini beradi. Tadqiqot yo‘nalishi endokrin buzilishlar va gipodinamiya o‘rtasidagi o‘zaro bog‘liqlikni chuqurroq tushunish, shuningdek, umurtqalararo disklarda degenerativ jarayonlarning rivojlanishiga ta’sir etuvchi omillarni ilmiy jihatdan asoslash uchun muhim ahamiyat kasb etadi.

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MODERN CLOTHING: NATIONAL VALUES AND NEW TRENDS

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Abstract. This article examines how modern clothing in Uzbekistan combines national values with global fashion trends. It analyzes traditional garments such as the chopon, kamzul, kaltacha and do'ppi, and shows how their cuts, ornaments and fabrics are reinterpreted in contemporary design. The study concludes that national heritage is not an obstacle to modern fashion but a source of originality and competitiveness for young designers.

Keywords: national costume, modern fashion, trend, tradition, ikat, atlas, adras, embroidery, identity, clothing design.

Introduction

Clothing has always been more than protection from cold or heat. It shows who a person is, where they come from and which values they share. In the twenty-first century, globalization has made fashion almost universal: the same jeans, T-shirts and sneakers can be seen in Tashkent, Paris and Tokyo. At the same time, many nations are looking for ways to keep their cultural identity visible. Uzbekistan, with its rich textile and embroidery traditions, is a vivid example of this search.

The aim of this article is to show how national values can be preserved and developed through modern clothing, and which trends make this possible today.

Main part

1. National values in Uzbek clothing. Traditional Uzbek dress expressed modesty, respect for elders, hospitality and harmony with nature. Long, loose silhouettes, layered garments and covered shoulders reflected ideas of decency. Colors and ornaments carried meaning: pomegranate motifs symbolized abundance, almond (bodom) shapes stood for life and protection, and floral patterns expressed the beauty of the garden. Each region had its own style. Surkhandarya, and especially Boysun, is known for bright embroidery and archaic ornaments; the Cultural Space of Boysun District is recognized by UNESCO as part of the Intangible Cultural Heritage of Humanity.

2. Global trends in modern fashion. Several trends shape fashion today:

- *Sustainability* — consumers prefer durable, natural and locally made garments over fast fashion.

- *Ethnic and folk inspiration* — world designers borrow ornaments, cuts and techniques from traditional cultures.
- *Comfort and versatility* — oversized silhouettes, layering and garments that suit both work and leisure.
- *Individuality* — handmade details and limited collections are valued more than mass production.

Many of these trends are surprisingly close to traditional Uzbek clothing. The loose chopon resembles today's oversized coat; layering was a basic principle of national dress; and handwoven atlas and adras are natural, long-lasting materials.

3. How tradition meets trend. Contemporary Uzbek designers use several methods to unite the two:

1. *Transforming the cut*: a traditional chopon becomes a short jacket, a kimono-style cardigan or a lightweight summer coat.
2. *Using national fabrics in modern forms*: atlas and adras are used for evening dresses, skirts, blazers, bags and even sneakers.
3. *Applying ornaments selectively*: instead of covering the whole garment, a single embroidered or ikat panel is placed on a collar, sleeve or pocket.
4. *Combining materials*: ikat silk is combined with denim, leather or knitwear, which makes national motifs suitable for everyday wear.
5. *Modernizing accessories*: the do'ppi pattern appears on scarves, caps and jewelry.

The international attention to Uzbek ikat, the activity of the Margilan silk workshops and festivals such as Atlas Bayrami show that this direction is in demand both at home and abroad.

4. The role of young designers. For students of art schools, national heritage is an inexhaustible source of ideas. Studying museum collections, ethnographic albums and the work of local craftswomen helps young designers understand the meaning of each ornament. This knowledge protects them from using national motifs superficially and allows them to create designs that are both modern and respectful.

Conclusion

Modern clothing does not have to choose between tradition and innovation. National values — modesty, harmony, respect for craft — can be expressed through new cuts, technologies and combinations. Global trends such as sustainability and interest in ethnic style even give Uzbek clothing a new advantage. The task of the new generation of designers is to study heritage deeply and present it in a language that today's world understands.

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