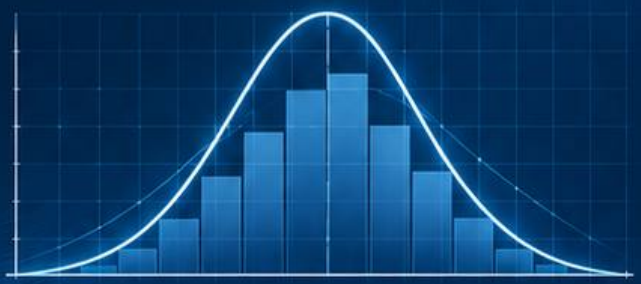
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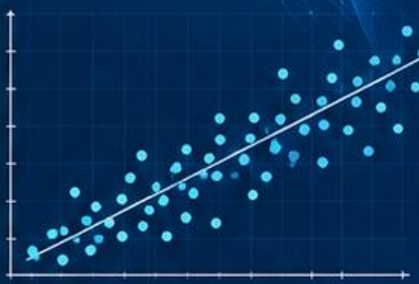
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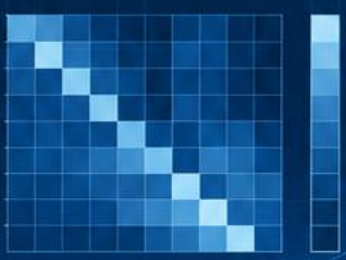
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SERVING THE MOTHERLAND – MY GREAT GOAL

Third-Year Student, Physical Education Program, Faculty of Social and Applied Sciences, Andijan State Pedagogical Institute

Madaminov Egamberdi Marifjon o‘g‘li

Abstract

This article examines the concept of serving the Motherland from social, moral, educational and civic perspectives. Serving the Motherland is presented not only as the performance of specific professional or public duties, but also as a broad commitment to applying one's knowledge, abilities and work for the development of society, the well-being of the people and the future of the country. The article highlights the importance of developing patriotism, civic responsibility, diligence, honesty, initiative and social engagement among young people.

Keywords

Motherland, service to the Motherland, patriotism, civic responsibility, youth, education, spirituality, national values, social engagement, professional responsibility, development, civic position.

VATANGA XIZMAT QILISH - BUYUK MAQSADIM

Andijon davlat pedagogika institute Ijtimoiy va amaliy fanlar fakulteti Jismoniy madaniyat yo‘nalishi 3-bosqich talabasi

Madaminov Egamberdi Marifjon o‘g‘li madaminovegamberdi@icloud.com

Annotatsiya: Mazkur maqolada Vatanga xizmat qilish tushunchasining ijtimoiy, ma’naviy-axloqiy va pedagogik mazmuni tahlil qilinadi. Vatanga xizmat qilish faqat muayyan kasbiy yoki davlat xizmatini bajarish bilangina cheklanmay, balki insonning o‘z bilim va qobiliyatini jamiyat taraqqiyoti, xalq farovonligi hamda yurt kelajagiga yo‘naltirishi bilan bog‘liq keng qamrovli tushuncha sifatida yoritiladi. Maqolada yosh avlodda vatanparvarlik, fuqarolik mas’uliyati, mehnatsevarlik, halollik, tashabbuskorlik va ijtimoiy faollik kabi fazilatlarni shakllantirishning ahamiyati ochib beriladi.

Kalit so‘zlar: Vatan, Vatanga xizmat, vatanparvarlik, fuqarolik mas’uliyati,

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yoshlar, ta’lim, ma’naviyat, milliy qadriyatlar, ijtimoiy faollik, kasbiy mas’uliyat, taraqqiyot, fuqarolik pozitsiyasi.

Аннотация: В статье рассматривается содержание понятия служения Родине с социальной, духовно-нравственной и педагогической точек зрения. Служение Родине раскрывается не только как выполнение определённых профессиональных или государственных обязанностей, но и как стремление человека направлять свои знания, способности и труд на развитие общества, благополучие народа и будущее страны. Особое внимание уделяется формированию у молодёжи патриотизма, гражданской ответственности, трудолюбия, честности, инициативности и социальной активности.

Ключевые слова: Родина, служение Родине, патриотизм, гражданская ответственность, молодёжь, образование, духовность, национальные ценности, социальная активность, профессиональная ответственность, развитие, гражданская позиция.

Kirish. Vatan tushunchasi inson hayotidagi eng yuksak va muhim ma’naviy qadriyatlardan biridir. Insonning tug‘ilib-o‘sgan yurti, uning tili, tarixi, madaniyati, milliy qadriyatlari va xalq bilan bog‘liq ijtimoiy hayoti Vatan tushunchasining mazmunini tashkil etadi. Shu sababli Vatanga munosabat shaxsning ma’naviy qiyofasi va fuqarolik pozitsiyasini belgilovchi muhim omillardan biri hisoblanadi. Bugungi globallashuv va tezkor axborot almashinuvi sharoitida yosh avlodning Vatanga munosabatini ongli ravishda shakllantirish alohida ahamiyat kasb etmoqda. Ilmiy-pedagogik tadqiqotlarda vatanparvarlik tarbiyasi milliy g‘urur, fuqarolik mas’uliyati, ijtimoiy faollik va ma’naviy qadriyatlar bilan uzviy bog‘liq tushuncha sifatida qaraladi. [1]Vatanga xizmat qilish esa ana shu tuyg‘ularning amaliy ifodasidir. Inson o‘z bilimini puxta egallab, halol mehnat qilsa, kasbiga mas’uliyat bilan yondashsa va jamiyatga foyda keltirishga intilsa, u o‘zining kundalik faoliyati orqali Vatanga xizmat qilayotgan bo‘ladi. “Vatanga xizmat qilish” tushunchasini faqat bitta faoliyat turi bilan chegaralash to‘g‘ri emas. Chunki jamiyat taraqqiyoti turli kasb va

1 Abu Ali ibn Sino. Tib qonunlari. -Toshkent: Fan, 1993.

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soha vakillarining o‘z vazifalarini sidqidildan bajarishiga bog‘liq.

O‘qituvchi yosh avlodga bilim va tarbiya beradi. Shifokor inson salomatligini asraydi. Muhandis yangi texnologiyalar va infratuzilmalarni rivojlantiradi. Olim yangi bilimlar yaratadi. Tadbirkor yangi ish o‘rinlari tashkil etadi. San’atkor milliy madaniyatni rivojlantiradi. Talaba esa puxta bilim olish va kelajakdagi kasbiy faoliyatiga tayyorgarlik ko‘rish orqali jamiyatga bo‘lajak hissasini shakllantiradi. Demak, Vatanga xizmat qilishning asosiy mezoni insonning jamiyat uchun foydali faoliyat olib borishi, o‘z vazifasiga mas’uliyat bilan yondashishi va shaxsiy manfaat bilan bir qatorda ijtimoiy manfaatni ham hisobga olishidir. Vatanparvarlik shaxsning o‘z yurtiga bo‘lgan muhabbati, hurmati va sadoqatini ifodalovchi ma’naviy qadriyatdir. Biroq haqiqiy vatanparvarlik faqat hissiy munosabat bilan cheklanib qolmasligi kerak. U amaliy faoliyat, mas’uliyat va foydali tashabbuslarda namoyon bo‘lishi lozim.Fuqarolik mas’uliyati esa insonning jamiyat oldidagi burchlarini anglab, o‘z xatti-harakatlari oqibatiga ongli ravishda munosabat bildirishini anglatadi. Shu ma’noda vatanparvarlik va fuqarolik mas’uliyati bir-birini to‘ldiradi.

Yoshlarni vatanparvarlik ruhida tarbiyalash bo‘yicha zamonaviy tadqiqotlarda ham ta’lim, oila, mahalla va ijtimoiy muhitning o‘zaro hamkorligi muhim omil sifatida ko‘rsatiladi. Yoshlar har qanday davlatning kelajakdagi intellektual, iqtisodiy va ijtimoiy salohiyatini belgilovchi asosiy qatlamlardan biridir. Shu sababli yoshlarning bilim olishi, kasb-hunar egallashi, ilmiy izlanish olib borishi va ijtimoiy faol bo‘lishi mamlakat taraqqiyoti uchun muhim ahamiyatga ega. Bugungi talaba ertangi mutaxassisdir. Uning universitetda olgan bilimi kelajakdagi faoliyatining poydevorini yaratadi. Shuning uchun talabaning darslarga mas’uliyat bilan yondashishi, ilmiy izlanish olib borishi, zamonaviy texnologiyalarni o‘rganishi va mustaqil fikrlash qobiliyatini rivojlantirishi ham Vatanga xizmat qilishning muhim ko‘rinishlaridan biridir. Ayniqsa, yoshlarning ilm-fan va innovatsiyaga qiziqishini oshirish mamlakatning intellektual salohiyatini kuchaytiradi. Shu jihatdan ta’lim muassasalarida yoshlarning tashabbuslarini qo‘llab-quvvatlash va ularning ilmiy loyihalarini rag‘batlantirish muhim vazifalardan biridir. Ta’lim insonning shaxsiy

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rivojlanishi bilan birga jamiyat taraqqiyotiga ham xizmat qiladi. [2]Sifatli ta’lim olgan shaxs o‘z kasbini chuqur egallashi, mustaqil fikrlashi va mavjud muammolarga ilmiy asosda yechim topishi mumkin. Shuning uchun ta’lim jarayonida vatanparvarlik tarbiyasi faqat alohida tadbirlar bilan cheklanmasdan, barcha fanlar va tarbiyaviy faoliyat bilan uyg‘unlashtirilishi maqsadga muvofiq. Masalan, tarix darslarida milliy meros va tarixiy tajriba, adabiyotda ma’naviy qadriyatlar, tabiiy fanlarda mamlakatning tabiiy resurslari va ekologik masalalar, texnik fanlarda esa innovatsion taraqqiyot imkoniyatlari bilan bog‘liq mavzularni o‘rganish yoshlarning Vatan taraqqiyotidagi shaxsiy mas’uliyatini anglashiga yordam beradi.

[3] Alisher Navoiy ona tilimizning imkoniyatlarini yuksak badiiy darajada namoyon etib, xalqimiz ma’naviy xazinasini boyitgan. Ularning barchasini birlashtirib turadigan jihat shundaki, ular o‘z hayotlarini faqat shaxsiy manfaatlari uchun emas, ilm, ma’rifat va insoniyat taraqqiyoti uchun bag‘ishlaganlar. Bugungi yoshlar uchun ajdodlarimizning eng katta merosi faqat ularning nomi yoki tarixiy shuhrati emas. Eng katta meros - ularning ilmga bo‘lgan munosabati, izlanishga bo‘lgan intilishi, mashaqqatdan qo‘rqmasligi va kelajak avlod uchun foydali ish qilishga bo‘lgan harakatidir. Agar biz ajdodlarimiz bilan faxrlansak-u, lekin ularning ilmga intilishidan o‘rnak olmasak, bu faxrning amaliy qiymati kamayadi. Haqiqiy hurmat esa ularning ishlarini davom ettirish, yangi bilim yaratish va Vatan taraqqiyotiga munosib hissa qo‘shish orqali namoyon bo‘ladi. Yoshlar - Bugungi yoshlar ertangi kunning mutaxassislari, olimlari, pedagoglari, shifokorlari, muhandislari, tadbirkorlari va davlat boshqaruvi vakillaridir. Shuning uchun yosh avlodning bugungi bilim va tarbiyasi mamlakatning ertangi qiyofasini belgilaydi. Yosh insonning eng katta boyligi - uning bilimidir. Mol-mulk kamayishi yoki yo‘qolishi mumkin, ammo inson egallagan bilim va tajriba uning butun hayoti davomida unga xizmat qiladi. Shu sababli men yoshlarning Vatanga xizmat qilishdagi eng muhim vazifalaridan biri - puxta bilim olish, zamonaviy kasblarni

2 Alisher Navoiy. Mahbub ul-qulub. - Toshkent: G‘afur G‘ulom nomidagi nashriyot, 2011.
3 Beruniy, Abu Rayhon. Tanlangan asarlar. -Toshkent: Fan, 1968.

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egallash va doimiy ravishda o‘z ustida ishlash, deb hisoblayman. Bugungi dunyo juda tez o‘zgarmoqda. Kecha mavjud bo‘lmagan texnologiyalar bugun hayotimizning ajralmas qismiga aylanmoqda. Sun’iy intellekt, raqamli texnologiyalar, biotexnologiya, zamonaviy tibbiyot, kosmik tadqiqotlar, ekologik innovatsiyalar kabi yo‘nalishlar insoniyat kelajagini belgilamoqda. Bunday sharoitda Vatanga xizmat qilishning yangi shakllari paydo bo‘lmoqda. Bugungi yosh olimning laboratoriyadagi tadqiqoti, dasturchining yaratgan dasturi, muhandisning yangi texnologik yechimi, pedagogning zamonaviy ta’lim usuli yoki tadbirkorning innovatsion loyihasi mamlakat taraqqiyotiga xizmat qilishi mumkin. Shu sababli yoshlar o‘z oldiga katta maqsadlar qo‘yishi kerak. “Men kim bo‘laman?” degan savol bilan bir qatorda “Men o‘z kasbim orqali Vatanimga qanday foyda keltira olaman?” degan savolni ham o‘ziga berishi muhim. Har qanday davlatning kuchi uning tabiiy boyliklari bilangina emas, balki inson kapitali, ilmiy salohiyati va ma’rifatli avlodi bilan belgilanadi. Shu jihatdan ta’lim Vatanga xizmat qilishning eng muhim yo‘llaridan biridir.Ta’lim olgan inson nafaqat o‘z hayotini, balki atrofidagi muhitni ham o‘zgartira oladi. Bilimli inson muammoni ko‘radi, uning sababini tushunadi va yechim izlaydi. Ilmli avlod esa mamlakat taraqqiyotining yangi yo‘nalishlarini yaratadi. Menimcha, Vatanga xizmat qilishni istagan yosh “men yurtim uchun nima qila olaman?” degan savolni o‘z hayotining muhim mezoniga aylantirishi kerak. Bu savol insonni harakatga undaydi.Agar talaba yaxshi o‘qisa, bu faqat uning shaxsiy yutug‘i emas. Kelajakda u egallagan bilimlarini jamiyatga tatbiq etishi mumkin. Agar yosh tadqiqotchi ilmiy muammo ustida ishlasa, uning tadqiqoti kelajakda yangi texnologiya yoki amaliy yechimga aylanishi ehtimoldan xoli emas. Agar bo‘lajak pedagog o‘z kasbini puxta egallasa, u kelajakdagi yuzlab yoshlarning taqdiriga ijobiy ta’sir ko‘rsatishi mumkin.

Shu ma’noda bir insonning bilim olishi ham Vatan kelajagiga qo‘yilgan sarmoyadir. Vatanga xizmat qilish haqida gapirganda yana bir muhim fazilatni unutmaslik kerak. Bu - halollik. Jamiyat taraqqiyotini faqat bilim va texnologiya bilan ta’minlab bo‘lmaydi. Bilimli, ammo mas’uliyatsiz inson jamiyatga foydadan ko‘ra zarar keltirishi mumkin. Shuning uchun bilim bilan birga axloq, vijdon va

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mas’uliyat ham bo‘lishi zarur. Halol mehnat qilgan inson o‘zining ham, jamiyatning ham kelajagini mustahkamlaydi. O‘z vazifasini vijdonan bajargan har bir fuqaro mamlakat taraqqiyotiga ko‘rinmas, ammo muhim hissa qo‘shadi. Men uchun Vatanga sadoqat - faqat bayram kunlarida Vatan haqida chiroyli so‘zlar aytish emas. Vatanga sadoqat oddiy kunlarda, hech kim kuzatmayotgan paytda ham to‘g‘ri ishni qilishdir. Imtihonda halol bilim bilan qatnashish, topshiriqni o‘z mehnating bilan bajarish, ish joyida o‘z vazifangni sidqidildan ado etish, birovning haqqiga xiyonat qilmaslik - bularning barchasi insonning fuqarolik madaniyatini namoyon etadi. Chunki Vatan deganda faqat katta hududni emas, shu hududda yashayotgan millionlab insonlarning umumiy hayotini tasavvur qilishimiz kerak. Vatanga xizmat qilish haqida o‘ylaganda yurt tinchligining qadriga yetish ham juda muhim. Tinchlik bor joyda ta’lim olish, mehnat qilish, ilmiy izlanish olib borish, yangi loyihalarni amalga oshirish va kelajak haqida rejalar tuzish mumkin. [4]Tinchlik - oddiy so‘z emas. U ortida insonlarning xotirjam hayoti, farzandlarning kulgisi, maktabga borayotgan bolalar, ilm olayotgan talabalar, o‘z mehnati bilan oilasini boqayotgan insonlar va ertangi kunga ishonch turadi. Shuning uchun tinchlikni qadrlash, uni asrash va jamiyatda o‘zaro hurmat muhitini shakllantirish har bir fuqaroning vazifasidir. Yoshlar esa bu borada alohida mas’uliyatga ega. Chunki yosh avlod qanday fikrlasa, kelajakdagi jamiyat ham shunga mos shakllanadi. O‘zaro hurmat, bag‘rikenglik, turli fikrlarga xolis munosabat, ilm va muloqotga intilish -barqaror jamiyatning muhim asoslaridir. Ba’zan inson Vatan taraqqiyotini juda katta va uzoq tushuncha sifatida tasavvur qiladi. Go‘yo mamlakat rivoji faqat yirik tashkilotlar yoki katta loyihalar orqali amalga oshadigandek tuyuladi. Aslida esa taraqqiyot har bir insonning kundalik faoliyatidan boshlanadi. Men yaxshi o‘qisam - bu Vatan kelajagiga qo‘shilgan hissam. Kasbimni yaxshi egallasam -bu Vatan kelajagiga qo‘shilgan hissam. Halol mehnat qilsam - bu Vatan kelajagiga qo‘shilgan hissam. Yangi g‘oya yaratsam - bu Vatan kelajagiga qo‘shilgan hissam. Bir insonga yaxshilik qilsam -bu jamiyatdagi

4 O‘zbekiston Respublikasi Konstitutsiyasi. Yangi tahrir. - Toshkent, 2023. Yangi tahrirdagi Konstitutsiya 2023-yil 30-apreldagi referendum orqali qabul qilingan.

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ezgulikning ko‘payishiga qo‘shilgan hissam. [5] Atrof-muhitni asrasam -bu kelajak avlod uchun Vatanimizni asrashga qo‘shilgan hissam. Demak, Vatanga xizmat qilish kelajakda boshlanadigan ish emas. U bugundan boshlanadi. Hozirgi harakatlarimiz kelajakdagi natijalarimizni belgilaydi. Men kelajakda qanday kasb egasi bo‘lishimdan qat’i nazar, o‘z ishimning jamiyat uchun foydali bo‘lishini istayman. Chunki insonning haqiqiy qadri faqat o‘zining erishgan yutuqlari bilan emas, balki boshqalarga bergan foydasi bilan ham belgilanadi. Men shuni anglaymanki, Vatanga xizmat qilish uchun albatta mashhur inson bo‘lish shart emas. Tarixda nomi yozilmagan, ammo o‘z mehnati bilan oilasini, mahallasini, jamoasini va jamiyatini obod qilgan minglab insonlar bor. Ularning fidokorona mehnati ham Vatan taraqqiyotining bir qismidir. Shu sababli men o‘z oldimga oddiy, ammo mazmunli maqsad qo‘yaman: qaysi sohada faoliyat yuritmay, o‘z ishimning eng yaxshi mutaxassisi bo‘lish va egallagan bilimlarimni Vatanim manfaatiga yo‘naltirish. Buning uchun bugundan boshlab ko‘proq o‘qishim, izlanishim, tajriba orttirishim, xatolarimdan xulosa chiqarishim va o‘z ustimda tinimsiz ishlashim kerak. Vatanga xizmat qilish - balandparvoz gaplardan emas, kundalik hayotdagi halol mehnatdan boshlanadi. U yaxshi o‘qishdan, bilim olishdan, kasbni sevishdan, ota-onani qadrlashdan, ustozni hurmat qilishdan, jamiyatga foydali inson bo‘lishga intilishdan boshlanadi. Bizning buyuk ajdodlarimiz o‘z davrida ilm, ma’rifat, adabiyot, tibbiyot, astronomiya va boshqa sohalarda ulkan iz qoldirganlar. Endi navbat bizniki. Ularning nomi bilan faxrlanishning eng yaxshi yo‘li - ularning ilmga bo‘lgan muhabbatini davom ettirish, yangi yutuqlar yaratish va o‘z Vatanimizga munosib farzand bo‘lishdir. Men uchun Vatanga xizmat qilish - kelajakdagi kasbimning bir qismi emas, balki hayotiy qarashimdir. Chunki men Vatanimni faqat undan nima olishim mumkinligi bilan emas, unga nima bera olishim mumkinligi bilan qadrlashni istayman. Men bugun olgan bilimim ertaga kimningdir hayotini yaxshilashiga, mening mehnatim jamiyatga foyda keltirishiga, mening g‘oyam mamlakat taraqqiyotiga xizmat qilishiga ishonaman.

5 Ibn Sino, Abu Ali. Donishnoma. -Toshkent: O‘zbekiston milliy ensiklopediyasi

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FOYDALANILGAN ADABIYOTLAR

1. Abu Ali ibn Sino. Tib qonunlari. - Toshkent: Fan, 1993.

2. Alisher Navoiy. Mahbub ul-qulub. - Toshkent:G‘afur G‘ulom nomidagi nashriyot, 2011.

3. Beruniy, Abu Rayhon. Tanlangan asarlar. -Toshkent: Fan, 1968.

4. 4. Bobur, Zahiriddin Muhammad. Boburnoma. -Toshkent: Sharq, 2002.

5. Ibn Sino, Abu Ali. Donishnoma. -Toshkent: O‘zbekiston milliy ensiklopediyasi, 2008.

6. Mirzo Ulug‘bek. Ziji jadidi Ko‘ragoniy.- Toshkent: Fan, 1994.

7. O‘zbekiston Respublikasi Konstitutsiyasi.Yangi tahrir. - Toshkent, 2023. Yangi tahrirdagi Konstitutsiya 2023-yil 30-apreldagi referendum orqali qabul qilingan.

8. O‘zbekiston Respublikasi Qonuni. Ta’lim to‘g‘risida. O‘RQ-637-son, 2020-yil 23-sentabr.

9. O‘zbekiston Milliy Ensiklopediyasi.-Toshkent: O‘zbekiston Milliy Ensiklopediyasi davlat ilmiy nashriyoti.

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REDESIGNING ASSESSMENT IN HIGHER EDUCATION IN THE DIGITAL ERA: THE “IZLI” MODEL OF PROCESS-TRACE-BASED ASSESSMENT

Usmanova Shoira Djumabekovna

Associate Professor of the Department of "Educational Technologies" Branch (Regional) Center for Retraining and Advanced Training of Pedagogical Staff under the National University of Uzbekistan

Annotation

This article argues that product-based assessment in higher education is losing validity under generative artificial intelligence (AI) and proposes IZLI, a model based on process traces. The model combines four components – process trace, accountability declaration, evaluative-judgement capacity and interactive defence – with an authorship congruence coefficient that measures agreement between product and defence scores.

Keywords

higher education; assessment; generative artificial intelligence; assessment validity; academic integrity; process-based assessment; evaluative judgement; IZLI model.

Annotasiya: Maqolada generativ sun'iy intellekt (SI) sharoitida oliy ta'limda yakuniy mahsulotga tayanuvchi an'anaviy baholashning validligi pasayayotgani asoslanib, jarayon izlariga tayanuvchi «IZLI» modeli taklif etiladi. Model to'rt komponentni – jarayon izi, zimmadorlik deklaratsiyasi, baholovchi mulohaza layoqati va interaktiv himoyani – hamda mahsulot va himoya natijalarining mosligini o'lchovchi mualliflik muvofiqligi koeffitsientini birlashtiradi.

Kalit so'zlar: oliy ta'lim; baholash; generativ sun'iy intellekt; baholash validligi; akademik halollik; jarayonli baholash; baholovchi mulohaza; IZLI modeli.

Аннотация: В статье обосновывается снижение валидности традиционного оценивания в высшем образовании, опирающегося на итоговый

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продукт, в условиях генеративного искусственного интеллекта (ИИ), и предлагается модель «IZLI», основанная на следах учебного процесса. Модель объединяет четыре компонента – след процесса, декларацию ответственности, способность к оценочному суждению и интерактивную защиту – а также коэффициент авторского соответствия, измеряющий согласованность результатов по продукту и защите.

Ключевые слова: высшее образование; оценивание; генеративный искусственный интеллект; валидность оценивания; академическая честность; процессуальное оценивание; оценочное суждение; модель IZLI.

INTRODUCTION

Since the end of 2022, widely available generative artificial intelligence (AI) tools have called into question the core premise of assessment practice in higher education – that a product submitted by a student (an essay, an abstract, program code, a report) is a direct expression of that student's mastery of the subject.

Today, large language models can generate, within seconds, text that is coherently structured, academic in style and often satisfactory in content. This situation has produced a polarised response in the field of assessment: on the one hand, the path of prohibition and detection (detectors, strict supervision); on the other, the path of integrating AI into the learning process.

The weakness of the first approach is that the technical means of reliably establishing the authorship of a text are limited, while errors can seriously damage a student's academic reputation. The second approach, in turn, requires a rethinking of the logic of assessment itself. In our view, the essence of the problem is not "cheating" but a question of **validity**: as Messick noted, what is evaluated in assessment is not the test or task itself but the interpretation and use of the scores derived from it. If it is unclear who or what created the product, the interpretation of the score is weakened.

This issue is also pertinent to higher education in Uzbekistan. Decree of the President of the Republic of Uzbekistan No. PF-6079 of 5 October 2020 on the

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"Digital Uzbekistan–2030" Strategy[1] and Resolution of the President No. 358 of 14 October 2024 on approving the "Strategy for the Development of Artificial Intelligence Technologies until 2030" and measures for its effective implementation [2][2] establish the digitalisation of the education system as a priority task. At the same time, the use of AI tools in higher education institutions (HEIs) is expanding rapidly, while assessment procedures have not kept pace with this change. From a scholarly perspective, the development of a holistic model of assessment under AI conditions that encompasses process, evidence and defence has not been sufficiently studied.

The aim of this study is to develop a practically applicable model for preserving the validity of assessment in higher education under conditions of generative AI.

Literature Review

Evolution of Assessment Paradigms

Modern assessment theory distinguishes between assessment of learning, assessment for learning and assessment as learning. Black and Wiliam (1998) synthesised the evidence that formative assessment has a significant positive effect on learning outcomes; Sadler (1989), in turn, showed that the effectiveness of formative assessment depends on students' understanding of quality criteria. Nicol and Macfarlane-Dick (2006) interpreted feedback from the perspective of self-regulated learning, while Hattie and Timperley (2007) demonstrated that the power of feedback depends on its content. Through the idea of constructive alignment, Biggs (1996) calls for coherence among learning outcomes, teaching activities and assessment. Wiggins (1990) and Sambell et al. (2013) developed authentic assessment, emphasising that tasks should be close to real professional contexts.

However, even authentic tasks are not inherently protected against generative AI: a case analysis or project report grounded in a real situation can also be prepared to a high standard with the help of AI. For this reason, in assessment design, not only

[1]On approving the "Digital Uzbekistan–2030" Strategy and measures for its effective implementation. Decree of the President of the Republic of Uzbekistan PF-6079, 5 October 2020.
[2]On approving the "Strategy for the Development of Artificial Intelligence Technologies until 2030" and measures for its effective implementation. Resolution of the President of the Republic of Uzbekistan PQ-358, 14 October 2024.

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the nature of the task but also the **type of evidence** is becoming decisive.

Generative AI and Assessment

Zawacki-Richter et al. (2019), in systematising research on AI in higher education, identified assessment and monitoring as one of the principal areas of application. Once generative models appeared, research focused on two issues: the threat to academic integrity (Cotton et al., 2024) and the pedagogical opportunities and risks (Kasneci et al., 2023). Swiecki et al. (2022) stressed the need to reconsider assessment design in the AI era, and Lodge et al. (2023) emphasised that assessment reform must take human–AI collaboration into account. Dawson (2021) proposes viewing assessment security in the digital environment as a multi-layered defence.

The AI Assessment Scale (AIAS) proposed by Perkins et al. (2024) helps to specify, step by step, the level of AI use permitted in an assignment. Such scales ensure transparency; however, they typically do not measure the relationship between the declared level of use and **actual learning**. It is precisely this gap that is at the centre of the present article.

Evaluative Judgement and Self-Regulation

Tai et al. (2018) defined evaluative judgement as the capacity to understand the quality of work and to make decisions based on that understanding; Boud et al. (2018) regard it as one of the central goals of higher education. In the AI era, this capacity acquires new significance: the student must now be not merely a producer of text but an expert who evaluates the quality, errors and reliability of AI output. Carless and Boud (2018) developed the concept of feedback literacy, and Zimmerman (2002) the model of self-regulated learning; both provide a theoretical basis for assessing process traces.

Methodology

The study is design-based and conceptual-methodological in nature and was carried out in three stages.

In the first stage, a thematic synthesis of sources on assessment, AI and validity

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was conducted, and the validity inferences that are being weakened were identified (RQ1).

In the second stage, design principles were formulated on the basis of the synthesis, from which the model components and measurement rules were derived (RQ2).

In the third stage, a validity argument was constructed following the logic of Kane (2013), and a protocol for empirical validation was developed (RQ3).

An important note: the article does not report the results of empirical experiments. The numerical examples are illustrative in nature, intended to show how the model works, and should not be interpreted as real data. The proposed weights and threshold values are initial values that require calibration.

RESULTS: THE "IZLI" ASSESSMENT MODEL

Design Principles

Five principles were formulated on the basis of the synthesis:

- **P1. Priority of validity.** Assessment design is directed towards protecting the interpretation of scores before penalising cheating.
- **P2. Transparency and collaboration with AI.** The use of AI is not concealed; it is declared at graded levels.
- **P3. Multi-source evidence.** Conclusions rest not on a single artefact but on the triad of product, process and defence.
- **P4. Proportionality.** Additional evidence is kept to a reasonable volume for students and instructors (cognitive load).
- **P5. Equity and human oversight.** An algorithmic signal is never the final decision; all students have access to the same tools.

Structure of the Model

The name of the model derives from the Uzbek words *iz* (process trace) and *izli* (having a trace; traceable), and is also formed from the initial letters of its four components: **I**z (Trace), **Z**immadorlik (Accountability), **L**ayoqat (Capacity) and **I**nteraktiv himoya (Interactive defence). The product itself is also assessed; however,

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it is no longer the sole evidence but the "core" that is complemented by the four components (Table 1).

Table 1. Components of the IZLI model and initial weights

Component	Essence	Evidence (artefact)	Proposed weight
P – Product (core)	Quality of the content and form of the assignment	Final work	30%
I – Trace	Observable traces of the learning process	Version history, drafts, prompt log, short diary	15%
Z – Accountability	Open and precise declaration of AI use	Record of the Z-level (0–4), list of sources	10%
L – Capacity	Critical evaluation of AI output, identifying errors and correcting them with justification	"AI error map", annotated corrections	20%
D – Interactive defence	Short (5–7-minute) oral or online question-and-answer session on the work	Defence rubric, record of the session	25%

The overall index is calculated as follows:

$$IZLI = 0.30 \cdot S_P + 0.15 \cdot S_I + 0.10 \cdot S_Z + 0.20 \cdot S_L + 0.25 \cdot S_D \quad (1)$$

where S is the score on the corresponding component on a 0–100 scale. The weights shift depending on the Z-level (Table 2): the deeper the involvement of AI, the greater the share of the L and D components, because it is precisely these that show the student's personal contribution.

Accountability: Five Levels of AI Use

Table 2. Levels of AI use, mandatory evidence and weight shifts (to be calibrated)

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Level	Permitted use	Mandatory trace and evidence	Weight shifts (proposed)
Z-0	AI is not used (supervised environment)	Supervision record	Standard (L and I may be reduced; D ≥ 30%)
Z-1	AI for idea generation and planning	Draft plan, 2–3 sample prompts	Standard
Z-2	AI for language and style editing	Versions before and after editing	Standard
Z-3	Co-creation with AI	Full prompt log, versions, statement of own contribution	L = 25%, D = 30%, P = 20%
Z-4	AI-centred task (AI output is the object of analysis)	AI output, critical analysis, corrected version	L = 35%, D = 30%, P = 10%

The level is set in advance by the instructor for each assignment and is linked to the learning outcomes. For example, Z-0 or Z-1 is logically sound for an assignment that tests language skills, whereas Z-3 or Z-4 is appropriate for an assignment that tests competence in working with AI. For us, this approach is a continuation of Biggs's (1996) constructive alignment in the AI era.

Capacity Component: Rubric

The L component examines the student's evaluative judgement. The student is given 3–5 judgements or citations produced by AI and must verify them, identify the errors and correct them with justification. Table 3 presents a three-criterion rubric for L.

Table 3. Rubric for the L (Capacity) component

Criterion	High (80–100)	Medium (50–79)	Low (0–49)
Identifying errors	All major factual and logical errors in the AI output have been identified	Some of the errors have been identified	No errors have been identified, or a non-existent error has been reported

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Criterion	High (80–100)	Medium (50–79)	Low (0–49)
Verifying sources	All claims have been confirmed against independent sources	Claims have been partially confirmed	No verification has been carried out
Justified correction	Corrections are based on evidence and criteria	Corrections are present, but the justification is weak	No corrections, or the corrections are unfounded

Authorship Congruence Coefficient

The central novelty of the model is a coefficient that measures the difference between the product (P) and defence (D) scores. It is not suspicious for a student to perform better in the defence than in the product (the student may have reconsidered the work); therefore, the coefficient is defined as **one-sided**:

$$\Delta^{+} = \max(0; S_P - S_D) / 100 \qquad (2)$$

Interpretation rule (initial thresholds): $\Delta^{+} \leq 0.15$ – congruence is sufficient; $0.15 < \Delta^{+} \leq 0.30$ – 2–3 additional clarifying questions; $\Delta^{+} > 0.30$ – the final score is temporarily withheld and a second interview is held with the student. Importantly, the coefficient is **never an automatic basis for a penalty**: it is merely a signal that triggers additional human verification. So that factors such as defence anxiety, language barriers or health conditions can be taken into account, the student is offered an alternative format (written or online).

Illustrative Scenario

Let us consider the model using the example of a scientific mini-review assignment (Z-3 level) in the course “Information Technologies”. The student submits a 1,200-word review (P), provides a prompt log and version history (I), declares the use of AI (Z), completes an “error map” by verifying the authenticity of five citations generated by AI (L), and, in a 6-minute defence, explains the key

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decisions made in the work (D). The figures below are given solely for illustrative calculation (Table 4).

Table 4. Calculation of the IZLI index and Δ^+ (illustrative example; standard weights for the Z-3 level)

Student (hypothetical)	**S_P**	**S_I**	**S_Z**	**S_L**	**S_D**	**IZLI index**	**Δ^+ and decision**
A	88	70	90	65	52	71.9	0.36 – withhold; second interview
B	80	78	85	82	79	80.4	0.01 – congruent

Student A's product is of high quality (88), but in the defence (52) the student was unable to explain the logic of the work and showed a low result on the error map. Because $\Delta^+ = (88 - 52)/100 = 0.36 > 0.30$, the score is withheld. This does not mean that Student A cheated: the situation is clarified in a second interview. By contrast, Student B's product and defence are congruent, and the scores are supported by process traces. Calculation: for A, $0.30 \cdot 88 + 0.15 \cdot 70 + 0.10 \cdot 90 + 0.20 \cdot 65 + 0.25 \cdot 52 = 71.9$; for B, $0.30 \cdot 80 + 0.15 \cdot 78 + 0.10 \cdot 85 + 0.20 \cdot 82 + 0.25 \cdot 79 = 80.35$.

Validity Argument

Following the logic of Kane (2013), the validity argument for the model is constructed through four inferences (Table 5).

Table 5. Form of the validity argument for IZLI

Inference	**Basis (claim)**	**Method of evidence collection**
Scoring	Rubrics ensure a clear link between the score and the observed performance	Expert evaluation; inter-rater agreement (ICC)
Generalisation	Scores are stable across tasks, raters and time	Repeated measurement; Cronbach's α; G-study
Extrapolation	Scores reflect real academic and professional competence	Correlation with results in other courses and with portfolios

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Implication	The consequences of decisions are fair and beneficial for learning	Student and instructor surveys; equity analysis

Analytical Comparison with Alternative Approaches

Table 6 compares the IZLI model with three widely used approaches. The ratings are the author's analytical judgement and are not based on empirical measurement.

Table 6. Analytical comparison of approaches

Approach	Protection of validity	Collaboration with AI	Scalability	Fairness and security
AI detectors	Low	None	High	Low (risk of false signals)
Declaration-only scale	Medium	High	High	Medium
Traditional supervised examination	High	None	Medium	Medium
IZLI	High	High	Medium (high through selective defence)	High (human oversight)

Discussion

The proposed model changes the object of assessment: the question "What did the student submit?" gives way to "Is there evidence of what the student has learned and how?" This is a direct application of the validity logic of Messick (1995) and Kane (2013) and, at the same time, a development, in the AI era, of the idea of evaluative judgement put forward by Tai et al. (2018): the student uses AI, but the capacity to evaluate its output and to take responsibility for it is also assessed.

The practical risks of the model and ways of mitigating them are as follows:

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• **Workload.** A long oral defence for all students may not be feasible. Solution: a 5–7-minute micro-defence for each student; in large groups, random written questions in the learning management system (LMS) and an oral interview only in cases where Δ^+ signals a problem.

• **Equity.** If access to AI tools is unequal, Z-3 and Z-4 assignments may be unfair. Solution: institutional licences or the inclusion of free alternative tools in the list of permitted tools.

• **Privacy.** Prompt logs may contain personal data. Solution: student consent, a limited retention period and access restricted to the instructor.

• **Defence anxiety and language barriers.** Solution: the one-sided Δ^+, alternative formats, and orienting the defence rubric towards assessing content rather than personal expression.

• **Falsification of traces.** A prompt log can be "fabricated" after the fact. Solution: triangulating the traces from three sources rather than one (LMS version history, log, defence).

For HEIs in Uzbekistan, the following sequence is proposed as a practical path: (1) a one-semester pilot in one course and one type of assignment; (2) incorporating the Z-levels, the Δ^+ rule and the appeals procedure into internal regulations (a statute or guidelines); (3) teaching the L and D rubrics in professional development courses for instructors; (4) calibrating the weights on the basis of the pilot results.

Limitations and Future Research

The main limitation of the article is the absence of empirical validation: the weights and threshold values rest on theoretical reasoning and expert judgement. In addition, the model has been developed primarily for text-based and analytical assignments; adaptation is required for laboratory, creative or applied clinical disciplines. The following protocol is proposed for future research:

• **Delphi study (two rounds).** 15–20 experts in assessment and educational technology; agreement on the weights and thresholds to be assessed using Kendall's W coefficient.

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- **Quasi-experiment.** At least two groups (IZLI and traditional assessment), each with approximately 60 students; measures: the correlation between S_P and S_D, the stability of repeated measurements, and the time spent by instructors.
- **Psychometric analysis.** Criteria of ICC(2,k) ≥ 0.75 between raters and Cronbach's α ≥ 0.70 for internal consistency; testing the structure of the components by confirmatory factor analysis.
- **Qualitative study.** Semi-structured interviews with students and instructors on perceptions of fairness, anxiety and workload.

The expected **hypotheses** are as follows: H1 – under IZLI, the correlation between S_P and S_D in Z-3/Z-4 assignments will be higher than in the control group; H2 – the selective-defence strategy will keep instructor workload at an acceptable level; H3 – students will perceive the assessment procedure as sufficiently fair. If the hypotheses are not confirmed, the model will be redesigned.

CONCLUSION

Generative AI poses a direct threat to the validity of product-based assessment; however, the answer lies not in prohibition but in enriching the evidence for assessment. The proposed "IZLI" model protects the interpretation of scores by integrating the process trace, accountability, the capacity for evaluative judgement and interactive defence with the product, while the one-sided authorship congruence coefficient serves as a fair signal that triggers human oversight. The scholarly value of the model lies in its being grounded in the form of a validity argument and in its having testable hypotheses. The next step is pilot testing and psychometric validation. The results will contribute to shaping an assessment policy in HEIs that is suited to the AI era, fair and scientifically grounded.

REFERENCES

1. Decree of the President of the Republic of Uzbekistan No. PF-6079 of 5 October 2020. On approving the "Digital Uzbekistan–2030" Strategy and measures for its effective implementation.

https://creativecommons.org/licenses/by/4.0/

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PUBLISHED: 07.10.2026

2. Resolution of the President of the Republic of Uzbekistan No. 358 of 14 October 2024. On approving the “Strategy for the Development of Artificial Intelligence Technologies until 2030” and measures for its effective implementation.

3. Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education, 32*(3), 347–364.

4. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*(1), 7–74.

5. Boud, D., Ajjawi, R., Dawson, P., & Tai, J. (Eds.). (2018). *Developing evaluative judgement in higher education.* Routledge.

6. Boud, D., & Falchikov, N. (Eds.). (2007). *Rethinking assessment in higher education.* Routledge.

7. Carless, D., & Boud, D. (2018). The development of student feedback literacy: Enabling uptake of feedback. *Assessment & Evaluation in Higher Education, 43*(8), 1315–1325.

8. Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International, 61*(2), 228–239.

https://creativecommons.org/licenses/by/4.0/

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AN ARTIFICIAL INTELLIGENCE-BASED VIRTUAL MODEL FOR THE CREATIVE ORGANIZATION OF TEACHING AND LEARNING ACTIVITIES IN HIGHER EDUCATION

Musayeva Muhabbat Eshbayevna

Associate Professor of the Department of "Educational Technologies" Branch (Regional) Center for Retraining and Advanced Training of Pedagogical Staff under the National University of Uzbekistan

Annotation

Higher education institutions increasingly need instructional models that sustain student engagement during extended, 80-minute academic periods and that integrate emerging technologies in a pedagogically coherent way. This article presents SMART-80, a virtual and interactive instructional model that combines artificial intelligence (AI), 3D visualization (including augmented and virtual reality, AR/VR), gamification and formative assessment within a single time-structured lesson. Following a design-based approach, the model was derived from a synthesis of research on active learning, cognitive load, multimedia learning, retrieval practice, self-determination theory and learning analytics. SMART-80 organizes an 80-minute class into seven stages — START (5 min), RECALL (10), DISCOVER (20), INTERACT (15), CHALLENGE (15), CHECK (10) and REFLECT (5) — embedded in a nine-step algorithm that begins with diagnostics and ends with AI-supported analytics used to adapt the next lesson. The article specifies the functions of AI, the game mechanics (XP, badges, group rankings, challenges), the teacher and student dashboards, and examples of application in medicine, engineering, mathematics, law, informatics and pedagogy. A quasi-experimental evaluation framework with measurable indicators of engagement, achievement, motivation, cognitive load and feasibility is proposed. The paper offers lecturers a transferable lesson blueprint and researchers an agenda for validating technology-enhanced lesson design; empirical validation is the next stage of the work.

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Keywords

higher education; instructional model; SMART-80; artificial intelligence; gamification; formative assessment; 3D visualization; digital generation.

ВИРТУАЛЬНАЯ МОДЕЛЬ КРЕАТИВНОЙ ОРГАНИЗАЦИИ УЧЕБНЫХ ЗАНЯТИЙ В СИСТЕМЕ ВЫСШЕГО ОБРАЗОВАНИЯ НА ОСНОВЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА

Мусаева Мухаббат Эшбаевна

доцент кафедры “Технологии образования”

Сетевого (регионального) центра переподготовки и повышения квалификации педагогических кадров при Национальном университете Узбекистана

Аннотация: Вузам всё чаще требуются модели обучения, которые поддерживают вовлечённость студентов на протяжении длительных 80-минутных академических занятий и согласованно, с педагогической точки зрения, интегрируют новые технологии. В статье представлена модель SMART-80 — виртуальная интерактивная модель занятия, объединяющая искусственный интеллект (ИИ), 3D-визуализацию (включая дополненную и виртуальную реальность, AR/VR), геймификацию и формирующее оценивание в рамках одного структурированного по времени занятия. Модель разработана на основе дизайн-ориентированного подхода и синтеза исследований по активному обучению, когнитивной нагрузке, мультимедийному обучению, практике извлечения знаний, теории самодетерминации и аналитике обучения. SMART-80 делит 80-минутное занятие на семь этапов — START (5 мин), RECALL (10), DISCOVER (20), INTERACT (15), CHALLENGE (15), CHECK (10) и REFLECT (5) — и встраивает их в девятишаговый алгоритм, который начинается с диагностики и завершается аналитикой на основе ИИ, позволяющей адаптировать следующее занятие. Описаны функции ИИ, игровые механики (XP, бейджи, групповые рейтинги, челленджи), панели преподавателя и студента, а также примеры применения в медицине, инженерии, математике, юриспруденции, информатике и педагогике.

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Предложена квазиэкспериментальная схема оценки эффективности с измеримыми показателями вовлечённости, успеваемости, мотивации, когнитивной нагрузки и реализуемости. Статья предлагает преподавателям переносимый план занятия, а исследователям — программу проверки технологически насыщенного дизайна занятий; эмпирическая верификация составляет следующий этап работы.

Ключевые слова: высшее образование; модель обучения; SMART-80; искусственный интеллект; геймификация; формирующее оценивание; 3D-визуализация; цифровое поколение.

OLIY TA’LIM TIZIMIDA MASHG‘ULOTLARNI KREATIV TASHKIL ETISHNING SUN’IY INTELLEKTGA ASOSLANGAN VIRTUAL MODELI

Musayeva Muhabbat Eshbayevna

O‘zbekiston Milliy Universiteti huzuridagi pedagog kadrlarni qayta tayyorlash va ularning malakasini oshirish tarmoq (mintaqaviy) markazi "Ta’lim texnologiyalari" kafedrasi dotsenti

Annotatsiya. Oliy ta’lim muassasalarida uzoq davom etadigan 80 daqiqalik akademik mashg‘ulotlar davomida talabalar faolligini ushlab turadigan va yangi texnologiyalarni pedagogik jihatdan izchil integratsiya qiladigan o‘qitish modellariga ehtiyoj ortib bormoqda. Maqolada SMART-80 modeli taqdim etiladi: bu sun’iy intellekt (SI), 3D vizualizatsiya (jumladan, AR/VR), gamifikatsiya va formativ baholashni yagona, vaqt bo‘yicha tuzilgan mashg‘ulotda birlashtiruvchi virtual va interaktiv dars modelidir. Model dizayn-yo‘naltirilgan yondashuv asosida faol o‘qitish, kognitiv yuklama, multimedia orqali o‘qitish, bilimni qayta eslash amaliyoti, o‘z-o‘zini belgilash nazariyasi va o‘qitish analitikasi bo‘yicha tadqiqotlar sintezidan ishlab chiqilgan. SMART-80 80 daqiqalik mashg‘ulotni yetti bosqichga ajratadi — START (5 daqiqa), RECALL (10), DISCOVER (20), INTERACT (15), CHALLENGE (15), CHECK (10) va REFLECT (5) — hamda ularni diagnostikadan boshlanib, keyingi darsni moslashtirishga xizmat qiluvchi SI tahlili bilan yakunlanadigan to‘qqiz qadamli algoritmga joylaydi. Maqolada SI vazifalari, o‘yin

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mexanizmlari (XP, badge, guruhlar reytingi, challenge), o‘qituvchi va talaba dashboardlari hamda tibbiyot, muhandislik, matematika, huquq, informatika va pedagogikada qo‘llash namunalari bayon etilgan. Faollik, o‘zlashtirish, motivatsiya, kognitiv yuklama va amaliy joriy etish imkoniyatini o‘lchaydigan kvazieksperimental baholash sxemasi taklif qilinadi. Maqola o‘qituvchilarga ko‘chirib qo‘llash mumkin bo‘lgan dars loyihasini, tadqiqotchilarga esa texnologiyalar bilan boyitilgan dars dizaynini tekshirish dasturini taqdim etadi; empirik tasdiqlash ishning keyingi bosqichi hisoblanadi.

Kalit so‘zlar: oliy ta’lim; ta’lim modeli; SMART-80; sun’iy intellekt; gamifikatsiya; formativ baholash; 3D vizualizatsiya; raqamli avlod.

1. Introduction

Universities worldwide are redesigning how scheduled contact time is used. Students entering higher education today have grown up with mobile devices, video platforms and, increasingly, generative AI, and they bring corresponding expectations of immediacy, interactivity and visual communication to the classroom. The popular label “digital natives” should nevertheless be treated with caution: Kirschner and van Merriënboer (2013) showed that the assumption that younger learners are inherently skilled multitaskers who know best how to learn with technology is not supported by evidence. The practical implication is that technology cannot simply be added to teaching in the hope of engaging students; it has to be built into a deliberate instructional design.

The problem is particularly visible in long academic periods. Many universities organize teaching in double periods of about 80 minutes. Attention during lectures does not follow a simple “10–15 minute rule” but fluctuates over time (Wilson & Korn, 2007), and an extended period dominated by one-way exposition leaves little room for practice, feedback or reflection. The evidence for alternatives is strong. A meta-analysis of 225 studies in science, engineering and mathematics found that active learning raised examination performance by about 0.47 standard deviations

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and reduced failure rates relative to traditional lecturing (Freeman et al., 2014). Earlier syntheses reached similar conclusions (Prince, 2004).

At the same time, the repertoire of tools available to the university lecturer has expanded rapidly: AI assistants that generate questions and analyze answers, 3D models and AR/VR environments, game-based motivation systems and real-time learning dashboards. Each of these has an evidence base of its own, but in practice they are usually introduced as isolated tools. Lecturers lack a time-structured, transferable model that shows what to do in which minute of a lesson, which technology serves which pedagogical purpose, and how the data produced in one lesson feed the design of the next. This gap is consistent with reviews showing that research on AI in higher education has been only weakly connected to pedagogical theory and has seldom involved educators or critically examined risks (Zawacki-Richter et al., 2019), and that immersive virtual reality applications are often not explicitly grounded in learning theory (Radianti et al., 2020).

The purpose of this article is to present and theoretically ground SMART-80, a virtual and interactive instructional model for 80-minute university classes. The article addresses three research questions:

RQ1. Which design principles from the learning sciences should underpin a technology-enhanced 80-minute university class?

RQ2. How can these principles be organized into a time-structured model that integrates AI, 3D/AR/VR visualization, gamification and formative assessment?

RQ3. How should the effectiveness and feasibility of such a model be evaluated?

The contribution is threefold: (a) a seven-stage, minute-level lesson structure and a nine-step cycle that links diagnostics, instruction and AI-based analytics; (b) an explicit specification of the roles of AI, gamification and dashboards, with human oversight; and (c) an evaluation framework that allows the model to be tested empirically in different disciplines.

2. Theoretical background and related work

2.1. Active learning and constructive alignment

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Active learning engages students in doing things and thinking about what they are doing, and it has been repeatedly associated with better outcomes than passive exposition (Prince, 2004; Freeman et al., 2014). Two further frameworks are relevant for lesson design. First, Biggs' (1996) constructive alignment requires that intended learning outcomes, learning activities and assessment tasks be mutually consistent. Second, Gagné's (1985) events of instruction describe a sequence — gaining attention, recalling prior learning, presenting content, guiding and eliciting performance, providing feedback and assessing — that closely anticipates the order of activities in a well-organized lesson. Kolb's (1984) experiential learning cycle and Vygotsky's (1978) emphasis on social interaction support the inclusion of hands-on and group-based stages. The flipped classroom (Bergmann & Sams, 2012) shows how diagnostic and preparatory work can be moved outside the contact hours, freeing in-class time for application.

2.2. Cognitive load, multimedia and immersive learning

Cognitive load theory holds that working memory is limited and that instructional design should avoid unnecessary processing demands (Sweller, 1988). Mayer's (2009) principles of multimedia learning — such as segmenting content, combining words with pictures and removing extraneous material — provide concrete guidance for the explanation of new content. Three-dimensional models, animations and AR/VR can make spatial, dynamic or inaccessible phenomena visible, from anatomical structures to mechanical assemblies (Dede, 2009). However, immersion is not automatically beneficial. The Cognitive Affective Model of Immersive Learning (Makransky & Petersen, 2021) proposes that immersive media increase presence and agency, which can enhance interest, motivation and self-efficacy, but that they may also raise extraneous cognitive load. For lesson design, this implies that immersive resources should be short, purposeful and followed by sense-making activities.

2.3. Gamification and motivation

Gamification is defined as the use of game design elements in non-game contexts (Deterding et al., 2011). Early reviews reported mixed results that depended on

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context and on users (Hamari et al., 2014). A later meta-analysis of gamified learning found small to moderate positive effects on cognitive (g = 0.49), motivational (g = 0.36) and behavioral (g = 0.25) outcomes, with effects depending on how the game elements were designed and combined (Sailer & Homner, 2020). Self-determination theory explains why design matters: motivation is sustained when activities support autonomy, competence and relatedness (Ryan & Deci, 2000). Game elements that merely reward speed or foster purely competitive comparison may undermine rather than support these needs. This is the theoretical basis for the principle, adopted in SMART-80, that gamification supports activity and motivation but does not replace assessment.

2.4. Retrieval practice, formative assessment and feedback

Retrieving information from memory strengthens later retention more than restudying it (Roediger & Karpicke, 2006), and practice testing is among the learning techniques rated as having high utility (Dunlosky et al., 2013). Formative assessment, in turn, has been associated with substantial learning gains when it generates information that is actually used to adjust teaching and learning (Black & Wiliam, 1998). The effect of feedback depends on its content: feedback that tells learners where they are going, how they are progressing and what to do next is most effective (Hattie & Timperley, 2007). These findings motivate the placement of a short retrieval stage at the opening of the lesson, a dedicated assessment stage near its end, and a reflection stage that closes the feedback loop.

2.5. AI and learning analytics in higher education

AI in education spans intelligent tutoring, automated assessment, adaptive systems and, more recently, large language models (Holmes et al., 2019; Luckin et al., 2016; Kasneci et al., 2023). Reviews stress both potential and risk: the opportunities include personalized support and reduced teacher workload, while the challenges include bias, inaccurate output, over-reliance, privacy and threats to academic integrity (Kasneci et al., 2023). UNESCO's (2023) guidance on generative AI in education calls for a human-centred approach and for safeguards for data privacy. Learning

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analytics — the measurement, collection, analysis and reporting of data about learners and their contexts in order to understand and optimize learning (Siemens & Long, 2011) — provides the methodological base for dashboards and data-informed adaptation. At the level of the teacher, the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) reminds us that effective technology integration depends on the interplay of technology, pedagogy and subject content rather than on tools alone.

2.6. Research gap

The literature thus offers strong support for each ingredient — active learning, multimedia and immersive visualization, gamification, retrieval practice, formative feedback and learning analytics — but little guidance on how to combine them within the temporal constraints of one concrete academic period. SMART-80 is proposed to fill this gap by translating the evidence into a minute-by-minute, discipline-independent lesson architecture.

3. Methodology

The study follows a design-based research logic at its first, model-development phase (design, theoretical grounding and specification), with empirical testing planned as subsequent phases. Development proceeded in five steps: (1) a narrative synthesis of the research summarized in Section 2; (2) derivation of design principles; (3) allocation of lesson time to stages in line with these principles; (4) specification of the roles of AI, gamification and dashboards; and (5) formulation of an evaluation framework. The article is therefore conceptual and does not report empirical results; claims about effectiveness are stated as hypotheses to be tested.

Seven design principles (DP) guided the model:

DP1. Rhythm and variation. Activity types should alternate at short intervals to counter attention fluctuation in extended periods (Wilson & Korn, 2007).

DP2. Retrieval before instruction. Prior knowledge is activated through low-stakes retrieval before new content is introduced (Roediger & Karpicke, 2006; Gagné, 1985).

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DP3. Managed multimodal explanation. New content is presented visually and in segments, with immersive media used purposefully (Mayer, 2009; Makransky & Petersen, 2021).

DP4. Learning by doing. Theory is connected to practice through simulations, virtual laboratories and cases (Kolb, 1984; Freeman et al., 2014).

DP5. Frequent formative assessment. Short checks produce immediate feedback and data for the next lesson (Black & Wiliam, 1998; Hattie & Timperley, 2007).

DP6. Autonomy-supportive motivation and human-centred AI. Game elements support participation without replacing grades, and AI assists but does not replace the instructor's judgment (Ryan & Deci, 2000; UNESCO, 2023).

DP7. Constructive alignment. Every stage is tied to an intended outcome and to an assessment indicator (Biggs, 1996).

4. The SMART-80 model

4.1. Overview

SMART-80 (the name signals a technology-enhanced, "smart" design for an 80-minute academic period) is a virtual and interactive lesson model that integrates AI, 3D/AR/VR visualization, gamification and formative assessment. It structures the class into seven stages whose durations are 5, 10, 20, 15, 15, 10 and 5 minutes (Figure 1, Table 1). Only one stage, DISCOVER (25% of the period), is predominantly instructor-led; in the remaining 60 minutes (75%) students are engaged in retrieval, application, problem solving, assessment or reflection. This allocation operationalizes DP1 and DP4.



Figure 1. Time structure of the SMART-80 model (80 minutes, seven stages).

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4.2. The seven stages

Table 1. Stages of the SMART-80 model

Stage and time	Pedagogical purpose	Digital tools and activities
START, 5 min	Attendance; psychological and cognitive readiness	QR-code attendance, quick poll, AI assistant
RECALL, 10 min	Fast question–answer on the previous topic (retrieval)	Interactive quiz, trivia, AI-generated questions
DISCOVER, 20 min	Explanation of the new topic	Presentation, 3D model, animation, video, AR/VR
INTERACT, 15 min	Practical and interactive activity	Virtual laboratory, simulation, case
CHALLENGE, 15 min	Problem task and group assignment	Gamification, AI-generated tasks
CHECK, 10 min	Test and formative assessment	Online test, automatic results and analysis
REFLECT, 5 min	Reflection and closing thought	Exit ticket, AI feedback

START (5 min). The opening stage minimizes administrative time and prepares students psychologically and cognitively. Attendance is recorded automatically by QR code, a one-question poll gauges readiness or mood, and the AI assistant can display the lesson goals and timeline. A short, predictable ritual helps students switch into the learning mode and gives the instructor a first signal about the group.

RECALL (10 min). Students answer rapid questions on the previous topic through an interactive quiz or game-like format. The AI assistant can propose question variants, which the instructor reviews before use. This stage applies retrieval practice and prepares the cognitive ground for new content (Roediger & Karpicke, 2006; Dunlosky et al., 2013).

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DISCOVER (20 min). The new topic is explained through a combination of presentation, 3D models, animation, video and, where appropriate, AR/VR. To respect cognitive load limits, the 20 minutes are best divided into two or three segments, each followed by a one-question check or a brief student–student exchange (Mayer, 2009). Immersive elements should be short and accompanied by a clear task, in line with Makransky and Petersen (2021).

INTERACT (15 min). Students apply what they have just seen in a virtual laboratory, a simulation or a case. The purpose is to link theoretical knowledge with visual and interactive experience, as in Kolb's (1984) cycle. The instructor circulates, observes the dashboard and offers targeted support.

CHALLENGE (15 min). Groups work on a problem-based task. Gamification elements (points, badges, group rankings, mini-quizzes) support participation, while AI can generate tasks of differing complexity so that students with different preparation levels are appropriately challenged. Group work draws on the social dimension of learning (Vygotsky, 1978).

CHECK (10 min). An online test provides immediate results and an automatic analysis of mastery by topic. The stage is formative: its main purpose is to produce information for feedback and for the next lesson rather than to assign a final grade (Black & Wiliam, 1998).

REFLECT (5 min). Students complete an exit ticket stating what they have mastered and what remains unclear, and receive AI-supported feedback. Reflection consolidates learning and returns qualitative information to the instructor.

4.3. The nine-step virtual working algorithm

The seven in-class stages are embedded in a larger nine-step cycle: (1) **Diagnostics** of initial knowledge; (2) **START**; (3) **RECALL**; (4) **DISCOVER**; (5) **INTERACT**; (6) **CHALLENGE**; (7) **CHECK**; (8) **REFLECT**; and (9) **AI analytics** of results with recommendations for the next lesson. Diagnostics and AI analytics lie outside the 80 minutes of contact time and form a pre-class and post-class loop: the analytics produced at step 9 inform the diagnostics and the design of the following lesson. The

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cycle thus turns a single lesson into an adaptive sequence, consistent with the logic of formative assessment (Black & Wiliam, 1998) and of learning analytics (Siemens & Long, 2011). The pre-class diagnostic can be delivered through the learning management system, as in flipped-classroom designs (Bergmann & Sams, 2012).

4.4. Roles of artificial intelligence

In SMART-80, AI is an assistant to the instructor, not a substitute. The model assigns AI seven functions (Table 2). For each, the final pedagogical decision remains with the instructor, in line with the human-centred approach advocated by UNESCO (2023).

Table 2. Functions of AI in SMART-80 and required human oversight

AI function	Pedagogical purpose	Human oversight
Recording attendance and participation	Saves time; documents engagement	Instructor checks anomalies and respects privacy rules
Forming diagnostic questions	Identifies the starting level	Instructor verifies accuracy and alignment with outcomes
Rapid analysis of answers	Immediate picture of understanding	Instructor interprets patterns
Tasks of different complexity	Differentiation and appropriate challenge	Instructor approves task sets
Individual and group feedback	Timely, specific guidance	Instructor reviews tone and correctness
Identifying mastery gaps	Targets reteaching	Instructor decides on remedial action
Recommendations for the next lesson	Closes the adaptation loop	Instructor accepts, modifies or rejects

4.5. Gamification mechanism

SMART-80 uses four game mechanics: experience points (XP), badges, group rankings and challenges with mini-quizzes. The guiding statement is that gamification

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does not replace assessment; it supports activity and motivation. Grounded in self-determination theory (Ryan & Deci, 2000) and in the evidence that gamification effects depend on design (Sailer & Homner, 2020; Hamari et al., 2014), the following implementation guidelines are proposed: (a) award XP for participation, progress and mastery of learning goals rather than only for speed; (b) prefer group rankings to individual rankings to strengthen relatedness and reduce social comparison; (c) link badges to explicit learning objectives; (d) keep XP separate from official grades; and (e) allow pseudonyms or opt-out from public leaderboards.

4.6. Teacher and student dashboards

Two interfaces provide real-time information. The **teacher dashboard** displays attendance, real-time quiz results, student activity, group results, mastery analysis by topic and individual recommendations. The **student dashboard** shows lesson stages and a time indicator, interactive materials, personal tasks, the XP and badge system, test results, and reflection and feedback. For the instructor, the dashboard supports in-lesson decisions (for example, repeating an explanation when RECALL results are poor); for the student, it supports self-regulation by making goals, time and progress visible.

4.7. Application across disciplines

The stage structure is discipline-independent, while the content of virtual activities is discipline-specific (Table 3). This is consistent with the TPACK view that technology integration must be fitted to subject content and pedagogy (Mishra & Koehler, 2006).

Table 3. Examples of virtual activities by discipline

Discipline	Virtual activity	Typical stages
Medicine	3D human body, virtual anatomy, clinical simulation	DISCOVER; INTERACT
Engineering	3D mechanisms, virtual laboratory, technical simulator	DISCOVER; INTERACT
Mathematics	3D geometric models, graphs, AI-supported problems	DISCOVER; CHALLENGE

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Discipline	Virtual activity	Typical stages
Law	Virtual trial, case study, role-based situations	INTERACT; CHALLENGE
Informatics	Coding environment, algorithmic challenges, AI assistant	INTERACT; CHALLENGE
Pedagogy	Virtual classroom, pedagogical situations, reflection	INTERACT; REFLECT

5. Proposed evaluation framework

To answer RQ3, a mixed-methods quasi-experimental study is proposed. Intact groups taught the same course content over one academic semester would be assigned to a SMART-80 condition or to a comparison condition using the instructor's usual methods. Because random assignment of students is rarely possible in universities, a pretest–posttest nonequivalent-groups design is appropriate. Students are nested in groups, so multilevel modelling should be used where the number of groups permits; otherwise analysis of covariance with the pretest as covariate, together with effect sizes (Hedges' g) and confidence intervals, is recommended. Ethical approval, informed consent and data-protection arrangements are prerequisites.

The five expected outcomes of the model — active participation, linkage of theory and experience, rapid assessment, real-time information for the instructor, and an individual approach — are translated into testable hypotheses and indicators (Table 4).

Table 4. Expected outcomes, indicators and data sources

Expected outcome	Indicators	Data sources / instruments
H1. Active participation	Engagement scores; platform activity; attendance	Course Engagement Questionnaire (Handelsman et al., 2005); dashboard logs

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Expected outcome	Indicators	Data sources / instruments
H2. Theory linked with experience	Achievement on application-type items; pretest–posttest gain	Course-specific tests aligned with outcomes
H3. Rapid, systematic formative assessment	Feedback latency; proportion of students receiving feedback in the lesson	Platform logs; student survey
H4. Real-time information for the instructor	Instances of in-lesson adaptation; instructor-perceived usefulness	Instructor interviews; System Usability Scale (Brooke, 1996)
H5. Individual approach	Subgroup gains; intrinsic motivation; cognitive load	Intrinsic Motivation Inventory (McAuley et al., 1989); cognitive load scale (Leppink et al., 2013)

Feasibility should be evaluated alongside effectiveness: instructor preparation time, technical problems, adherence to the 80-minute schedule and student perceptions of workload. Process data from dashboards and short interviews with instructors would indicate which stages are most and least transferable across disciplines.

6. Discussion

6.1. Position of SMART-80 relative to existing approaches

SMART-80 shares its logic with Gagné's events of instruction, constructive alignment and the flipped classroom, but differs in three respects. First, it fixes an explicit time budget for each stage, which makes it directly usable as a lesson template. Second, it embeds an AI-supported analytics loop — diagnostics before and analytics after the lesson — so that each lesson adapts the next. Third, it pairs two dashboards (teacher and student) with the stages, which makes formative information visible to both parties in real time. Whether these features produce better outcomes than comparable active-learning designs is an empirical question for the evaluation outlined above.

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6.2. Implications for practice

For instructors, the model reduces the design problem to a manageable sequence: decide the intended outcome, choose one activity per stage, select a tool that serves that activity, and define the data to be collected. Not every stage requires every technology; a principle of "tool minimalism" is advisable, because adding technologies without a pedagogical reason increases extraneous cognitive load (Sweller, 1988; Makransky & Petersen, 2021). For institutions, adoption requires a learning management system or equivalent platform, reliable connectivity, access to 3D/AR/VR content, and professional development that builds the integrated technological, pedagogical and content knowledge described by Mishra and Koehler (2006).

6.3. Risks and conditions

Several risks must be managed. (1) **Data privacy and ethics:** dashboards and AI analytics process personal learning data; collection should be limited to what is necessary, comply with national personal-data regulation and institutional policy, and be transparent to students (UNESCO, 2023). (2) **Accuracy and bias of AI output:** generated questions, tasks and feedback may contain errors or bias and must be verified by the instructor (Kasneci et al., 2023). (3) **Over-reliance and academic integrity:** assessment tasks should require reasoning and application that cannot be satisfied by copying AI output. (4) **Equity:** not all students have equal devices and connectivity; low-bandwidth or offline alternatives, shared devices and printed materials should be prepared for each stage. (5) **Gamification side effects:** competitive elements can reduce motivation for some students, hence the recommendation to emphasize group and mastery-based mechanics (Ryan & Deci, 2000). (6) **Novelty effects and workload:** initial gains may reflect novelty, and preparation time may be high at first; longitudinal evaluation and reusable content banks are therefore recommended.

6.4. Limitations

This article has limitations. It is a conceptual model-development study and presents no empirical results; the expected outcomes are hypotheses. The time allocations

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reflect a design rationale rather than an optimum validated by experiments and may need adjustment by discipline, class size and learning objectives. The literature synthesis was narrative rather than systematic. Finally, the model assumes a minimum level of digital infrastructure and instructor digital competence.

7. Conclusion

This article proposed SMART-80, a virtual and interactive instructional model that organizes an 80-minute university class into seven stages — START, RECALL, DISCOVER, INTERACT, CHALLENGE, CHECK and REFLECT — within a nine-step cycle that links diagnostics, instruction and AI-based analytics. The model translates evidence on active learning, cognitive load, immersive media, gamification, retrieval practice and formative feedback into a minute-level template, specifies the role of AI as a supervised assistant, and pairs the template with teacher and student dashboards. A quasi-experimental framework with explicit hypotheses and instruments was proposed to test the model.

Future work should include (a) pilot implementations in several disciplines (for example, informatics, mathematics and medicine); (b) comparison of SMART-80 with other active-learning designs; (c) adaptation to other period lengths such as 60 or 90 minutes; (d) validation of the accuracy and usefulness of AI-generated analytics; and (e) instructor training programmes. If supported empirically, SMART-80 could provide universities with a practical and transferable model for designing creative, data-informed classes for the digital generation.

Declarations

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References

1. Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International Society for Technology in Education.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 06.10.2026
PUBLISHED: 07.10.2026

2. Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education, 32*(3), 347–364.

3. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*(1), 7–74.

4. Brooke, J. (1996). SUS: A "quick and dirty" usability scale. In P. W. Jordan, B. Thomas, B. A. Weerdmeester, & I. L. McClelland (Eds.), *Usability evaluation in industry* (pp. 189–194). Taylor & Francis.

5. Dede, C. (2009). Immersive interfaces for engagement and learning. *Science, 323*(5910), 66–69.

6. Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". In *Proceedings of the 15th International Academic MindTrek Conference* (pp. 9–15). ACM.

7. Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques. *Psychological Science in the Public Interest, 14*(1), 4–58.

8. Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111*(23), 8410–8415.

9. Gagné, R. M. (1985). *The conditions of learning and theory of instruction* (4th ed.). Holt, Rinehart & Winston.

10. Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. In *Proceedings of the 47th Hawaii International Conference on System Sciences* (pp. 3025–3034). IEEE.

11. Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *The Journal of Educational Research, 98*(3), 184–191.

12. Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 06.10.2026
PUBLISHED: 07.10.2026

13. Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

14. Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., … Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, *103*, 102274.

15. Kirschner, P. A., & van Merriënboer, J. J. G. (2013). Do learners really know best? Urban legends in education. *Educational Psychologist*, *48*(3), 169–183.

16. Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

17. Leppink, J., Paas, F., Van der Vleuten, C. P. M., Van Gog, T., & Van Merriënboer, J. J. G. (2013). Development of an instrument for measuring different types of cognitive load. *Behavior Research Methods*, *45*(4), 1058–1072.

18. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.

19. Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. *Educational Psychology Review*, *33*(3), 937–958.

20. Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press.

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SYNTHESIS AND PROPERTIES OF HYALURONIC ACID

Alieva Shakhzodakhon Tokhirjon kizi

Tashkent Institute of Chemical Technology, Uzbekistan

Abstract.

The article deals with the preparation of hyaluronic acid from chicken eggshell, an available waste of the food industry. The product was isolated by aqueous extraction in the presence of sodium chloride at 100 °C for 12 hours; the yield of the dry product was 6.2 % of the raw material mass. Its IR spectrum contains bands typical of hyaluronic acid as well as bands of the carbonate ion. According to thermal analysis, the organic part of the product is about 25 %, the rest being mineral impurities, so the product requires additional purification.

Keywords

hyaluronic acid, glycosaminoglycan, eggshell, extraction, IR spectroscopy, thermogravimetric analysis, yield.

Аннотация. В статье рассмотрено получение гиалуроновой кислоты из скорлупы куриных яиц – доступного отхода пищевой промышленности. Продукт выделяли водной экстракцией в присутствии хлорида натрия при 100 °C в течение 12 часов, выход сухого продукта составил 6,2 % от массы сырья. В его ИК-спектре найдены полосы, характерные для гиалуроновой кислоты, а также полосы карбонат-иона. По данным термического анализа органическая часть продукта составляет около 25 %, остальное приходится на минеральные примеси, поэтому продукт нужно дополнительно очищать.

Ключевые слова: гиалуроновая кислота, гликозаминогликан, яичная скорлупа, экстракция, ИК-спектроскопия, термогравиметрический анализ, выход продукта.

Гиалуроновая кислота (ГК) относится к несульфатированным гликозаминогликанам. Её макромолекула построена из повторяющихся дисахаридных звеньев D-глюкуроновой кислоты и N-ацетил-D-глюкозамина, соединённых β-(1→3)- и β-(1→4)-гликозидными связями. Впервые этот

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полисахарид выделили К. Мейер и Дж. Палмер из стекловидного тела глаза быка в 1934 году [1]. В организме ГК входит в состав внеклеточного матрикса кожи, хрящей и синовиальной жидкости [2].

Карбоксильные, гидроксильные и ацетамидные группы делают полимер сильно гидрофильным: он растворяется в воде и в растворах хлорида натрия, но практически не растворим в органических растворителях [4]. Молекулярная масса ГК достигает нескольких миллионов дальтон, от неё зависят вязкость растворов и биологическое действие полимера [2, 3]. ГК применяют в офтальмологии, ортопедии и косметологии, а на основе её производных получают гидрогели и носители лекарств [3, 5].

В промышленности ГК получают экстракцией из животного сырья (петушиные гребни) и микробиологическим синтезом с помощью бактерий рода *Streptococcus* [6]. В первом случае продукт долго очищают от белков, во втором нужны стерильные условия и дорогие питательные среды, поэтому растёт интерес к более дешёвому сырью. Одним из таких источников является скорлупа куриных яиц с подскорлупной мембраной, содержащей ГК [7]. При ферментативном гидролизе мембраны выход ГК составляет 4–4,5 % от массы сухой мембраны [8].

Цель данной работы – получить ГК из скорлупы куриных яиц водной экстракцией и изучить состав и термические свойства продукта.

МАТЕРИАЛЫ И МЕТОДЫ

Работа выполнена в Ташкентском химико-технологическом институте. Скорлупу 30 куриных яиц промывали водой, сушили и измельчали, масса порошка составила 150 г. Порошок помещали в двугорлую колбу с обратным холодильником и верхнеприводной мешалкой, добавляли 400 мл дистиллированной воды и 4,05 г хлорида натрия и кипятили при перемешивании 12 часов. Через 9 часов доливали ещё 45 мл воды взамен испарившейся, так что концентрация NaCl была близка к 0,9 %. Затем смесь

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отделяли от нерастворившейся скорлупы и фильтровали, продукт на фильтре сушили при комнатной температуре.

ИК-спектры снимали на ИК-Фурье-спектрометре BRUKER ALPHA с приставкой НПВО. Термогравиметрический анализ (ТГ/ДСК) выполняли на термоанализаторе LINSEIS в интервале 30–1000 °C при скорости нагревания 10 °C/мин, масса навесок 15,9 и 30,2 мг.

РЕЗУЛЬТАТЫ И ОБСУЖДЕНИЕ

В результате экстракции получено 9,3 г сухого продукта белого (молочного) цвета. Нерастворившийся остаток скорлупы составил 130,5 г, потери при фильтровании и сушке – 10,2 г (таблица 1). Выход 6,2 % относится к неочищенному продукту и рассчитан на всю массу скорлупы, поэтому напрямую сравнивать его с данными по выходу ГК из мембраны [7, 8] нельзя.

Таблица 1. Показатели процесса получения продукта из яичной скорлупы

Показатель	**Значение**
Масса исходной скорлупы, г	150,0
Объём воды, мл / масса NaCl, г	445 / 4,05
Температура, °C / продолжительность, ч	100 / 12
Нерастворимый остаток скорлупы, г	130,5
Масса сухого продукта, г / выход, %	9,3 / 6,2

В ИК-спектре продукта наблюдаются широкая слабая полоса при 3280 $см^{-1}$ (группы O–H и N–H), полосы 2978 и 2919 $см^{-1}$ (C–H), 1744 $см^{-1}$ (C=O), 1644 и 1506 $см^{-1}$ (амид I и амид II), 1241 и 1051 $см^{-1}$ (связи C–O и C–O–C пиранозного кольца). Такой набор полос согласуется с литературными данными для ГК и гиалуроната натрия [4, 9]. Однако самыми интенсивными в спектре являются полосы при 1406 и 871 $см^{-1}$. Около 1400–1410 $см^{-1}$ поглощает и карбоксилат-ион ГК, но сочетание сильной полосы в этой области с узкой полосой при 871 $см^{-1}$ характерно для карбонат-иона, то есть в продукт переходит и карбонат

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кальция скорлупы. Полосы амид I и амид II дают также белки подскорлупной мембраны, поэтому по одному ИК-спектру судить о чистоте ГК нельзя.

Эти выводы подтверждает термический анализ. До 150 °C образец теряет около 5 % массы (удаление влаги). Органическая часть разлагается при 250–550 °C: потеря массы составляет около 25 %, на кривой ДСК ей отвечает тепловой эффект с максимумом при 354 °C. При 700–850 °C образец теряет ещё 36 %. Этой стадии соответствует эффект противоположного знака при 819 °C, и её можно отнести к разложению карбоната кальция. Остаток при 1000 °C равен 32 % от исходной массы. Второй образец оказался ещё более минерализованным: при 250–600 °C он теряет лишь около 5 % массы, а при 700–900 °C – 43 %, что близко к теоретической потере массы при разложении $CaCO_3$ (44 %).

Таким образом, при простой водной экстракции получается не чистая ГК, а органо-минеральный продукт. Если принять долю органических веществ равной 25 %, то из 9,3 г продукта на них приходится около 2,3 г, то есть примерно 1,5 % от массы скорлупы. Для выделения ГК нужны удаление карбоната кальция разбавленной кислотой, отделение белков и осаждение полисахарида спиртом или ацетоном.

ЗАКЛЮЧЕНИЕ

Из скорлупы куриных яиц водной экстракцией в 0,9 %-ном растворе хлорида натрия (100 °C, 12 часов) получен продукт, содержащий гиалуроновую кислоту, с выходом 6,2 % от массы сырья. В его ИК-спектре присутствуют полосы, характерные для ГК, и полосы карбонат-иона. По данным термического анализа органическая часть составляет около 25 % продукта и разлагается при 250–550 °C, остальное приходится на карбонат кальция. Для получения чистой ГК продукт нужно деминерализовать и очищать от белков. В дальнейшем планируется отработать стадию очистки и изучить модификацию полученной ГК аминокислотами.

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СПИСОК ИСПОЛЬЗОВАННОЙ ЛИТЕРАТУРЫ

1. Meyer K., Palmer J.W. The polysaccharide of the vitreous humor // Journal of Biological Chemistry. – 1934. – Vol. 107. – P. 629–634.

2. Necas J., Bartosikova L., Brauner P., Kolar J. Hyaluronic acid (hyaluronan): a review // Veterinarni Medicina. – 2008. – Vol. 53, № 8. – P. 397–411.

3. Fallacara A., Baldini E., Manfredini S., Vertuani S. Hyaluronic acid in the third millennium // Polymers. – 2018. – Vol. 10, № 7. – Art. 701.

4. Амандусова А.Х., Савельева К.Р., Морозов А.В. и др. Физико-химические свойства и методы количественного определения гиалуроновой кислоты (обзор) // Разработка и регистрация лекарственных средств. – 2020. – Т. 9, № 4. – С. 136–140.

5. Сигаева Н.Н., Колесов С.В., Назаров П.В., Вильданова Р.Р. Химическая модификация гиалуроновой кислоты и её применение в медицине // Вестник Башкирского университета. – 2012. – Т. 17, № 3. – С. 1220–1241.

6. Liu L., Liu Y., Li J., Du G., Chen J. Microbial production of hyaluronic acid: current state, challenges, and perspectives // Microbial Cell Factories. – 2011. – Vol. 10. – Art. 99.

7. Long F.D., Adams R.G., DeVore D.P. Preparation of hyaluronic acid from eggshell membrane: Patent US 6946551 B2. – 2005.

8. Ürgeová E., Vulganová K. Comparison of enzymatic hydrolysis of polysaccharides from eggshells membranes // Nova Biotechnologica et Chimica. – 2016. – Vol. 15, № 2. – P. 133–141.

9. Gilli R., Kačuráková M., Mathlouthi M. et al. FTIR studies of sodium hyaluronate and its oligomers in the amorphous solid phase and in aqueous solution // Carbohydrate Research. – 1994. – Vol. 263, № 2. – P. 315–326.

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IMPROVING METHODS FOR THE DIAGNOSIS AND SURGICAL TREATMENT OF THYROID DISEASES

Butaboev Jasurbek Mahmudjonovich

Karimov Nurillo Nodirbek ugli

Juraev Ganijon Gulomovich

Andijan State Medical Institute

Abstract

Since malignant thyroid tumors almost always, including in the early stages of development, present as nodular goiter, the problem of nodular thyroid diseases has traditionally been associated with cancer. In most cases, thyroid cancer is diagnosed during the examination of patients with nodular goiter and is generally detected at the age of 40–50 years, while it is rarely found in children and adolescents [1,2]. Many researchers report a frequent association (55–63%) between thyroid cancer and multinodular goiter. It should be noted that there is still no unified therapeutic algorithm for early differential diagnosis in patients with multinodular thyroid disease.

Keywords

thyroid gland, diffuse toxic goiter, subtotal resection, biochemical blood analysis.

СОВЕРШЕНСТВОВАНИЕ МЕТОДОВ ДИАГНОСТИКИ И ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ ЗАБОЛЕВАНИЙ ЩИТОВИДНОЙ ЖЕЛЕЗЫ

Бутабоэв Жасурбек Маҳмуджонович Каримов Нурилло Нодирбек угли

Жураев Ганижон Гуломович

Андижанский государственный медицинский институт

Резюме. *Поскольку злокачественные опухоли ЩЖ практически всегда, в том числе и на ранних стадиях развития, протекают под маской узлового зоба, то сама проблема узловых тиреоидных заболеваний традиционно ассоциируется с раком. В большинстве случаев рак ЩЖ диагностируется при обследовании пациентов с узловым зобом и, как правило, выявляется в возрасте 40-50 лет, редко у детей и подростков [1,2]. О частом сочетании (55 - 63%) рака ЩЖ и многоузлового зоба сообщают многие исследователи. Приходиться*

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констатировать, что отсутствует и единый лечебный алгоритм ранней дифференциальной диагностики при многоузловом поражении ЩЖ.

Ключевые слова: *щитовидная железа, диффузно токсический зоб, субтотальная резекция, биохимический анализ крови*

ҚАЛҚОНСИМОН БЕЗ КАСАЛЛИКЛАРИНИ ТАШХИСЛАШ ВА ЖАРРОҲЛИК ЙЎЛИ БИЛАН ДАВОЛАШ УСУЛИНИ ТАКОМИЛЛАШТИРИШ

Резюме. *Қалқонсимон безнинг хавфли ўсмалари деярли ҳар доим, шу жумладан ривожланишнинг дастлабки босқичларида ҳам, тугунли буқоқ ниқоби остида кечгани сабабли, тугунли тиреоид касалликлар муаммосининг ўзи анъанавий равишда саратон билан боғлиқ. Кўп ҳолларда қалқонсимон без саратони тугунли буқоқли беморларни текширишда аниқланади ва одатда 40-50 ёшда, камдан-кам ҳолларда болалар ва ўсмирларда аниқланади[1,2]. Қалқонсимон без раки билан кўп тугунли буқоқнинг бирга учраши (55-63%) тўғрисида кўпгина тадқиқотчилар хабар берадилар. Шуни таъкидлаш керакки, қалқонсимон безнинг кўп тугунли шикастланишида эрта дифференциал ташхислашнинг ягона даволаш алгоритми мавжуд эмас.*

Калит сўзлар: *қалқонсимон без, диффуз токсик буқоқ, субтотал резекция, қоннинг биокимёвий таҳлили*

Актуальность проблемы. Заболевания ЩЖ занимают первое место среди эндокринной патологии, поражая 10-15% населения Земли. Несмотря на всю историю изучения проблемы и научных поисков, проблема эффективного лечения узловых доброкачественных образований ЩЖ до настоящего момента имеет весьма актуальное значение и не может считаться полностью решенной[3].

Острую социально-экономическую значимость приобретает также постепенное увеличение числа пациентов, страдающих ДТЗ. В экономически развитых странах, согласно статистике, ДТЗ страдают почти 5-6 человек на 100000 населения, при этом пик заболеваемости приходится в основном на самый активный и трудоспособный возраст - 20-40 лет [4]. Согласно

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современным литературным данным, хирургическое вмешательство пока остается одним из основных методов лечения диффузного токсического зоба в России, Европе, Китае и Японии, а медикаментозная терапия служит лишь подготовительным этапом к оперативному лечению[5]. В то же время результаты хирургического лечения пациентов с ДТЗ нельзя признать удовлетворительными, а операции традиционно относят к одним из самых сложных в эндокринной хирургии.

Многие вопросы эффективной диагностики, хирургического лечения и профилактики интра- и послеоперационных осложнений продолжают оставаться дискутабельными и требующими своего решения. В связи с вышеизложенным, представляется актуальным дальнейший поиск и разработка новых путей улучшения результатов хирургического лечения заболеваний ЩЖ.

Цель исследования: оптимизировать диагностику и результаты хирургического лечения больных с заболеваниями щитовидной железы.

Материал и методы

Работа основана на анализе результатов обследования 139 больных с заболеваниями ЩЖ, находившихся на стационарном лечении с 2020 по 2026 в хирургических клиниках и на базе кафедры общей хирургии Андижанского государственного медицинского института.

Для объективной оценки результатов хирургического лечения заболеваний ЩЖ все пациенты были разделены на две группы. В первую, основную группу, вошли 71 больных, пролеченных в период с 2024 по 2026гг. с применением новых современных подходов к диагностике и предоперационному и послеоперационному ведению, а также операции из минидоступа.

Среди 71 больных основной группы 40 пациентов находились с диагнозом узловой или многоузловой зоб (26 пациентов с эутиреоидным зобом; 10 - с токсическим зобом; 8 - с узловой формой АИТ); 27 пациентов - с ДТЗ.

Во вторую контрольную группу включены 68 больных, находившихся под наблюдением в период с 2020 по 2024 гг, которым выполняли традиционные

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методы предоперационной подготовки и хирургические вмешательства. Из них, 40 пациента имели узловой и многоузловой зоб (25 пациентов - эутиреоидный зоб; 9 - токсический зоб; 9 - узловую форму ХАИТ); 25 пациентов страдали ДТЗ. Распределение пациентов по полу и возрасту представлены.

И в основной, и в контрольной группах преимущественно составили женщины (80,3 % и 80,9%, соответственно), находились в возрасте от 30 до 70 лет, что соответствует распределению заболевания среди населения и отражает важную социально-экономическую значимость проблемы. Возраст больных колебался от 18 до 65 лет. Из числа пролеченных пациентов мужчин было 27 (19,42%), женщин - 112(80,58%).

Сопутствующую патологию имели 82 пациентов (59 %). Наиболее часто встречались: артериальная гипертензия, ишемическая болезнь сердца, хронические заболевания органов брюшной полости (холецистит, язвенная болезнь желудка и 12 перстной кишки), сахарный диабет и другие. Некоторые из пациентов имели несколько сопутствующих заболеваний. Все заболевания во время оперативного лечения находились в стадии ремиссии. Распределение сопутствующей патологии у пациентов по группам представлено.

Сопутствующую сердечно-сосудистую патологию имели 35,7% пациентов основной и 35% пациентов контрольной групп, соответственно. Хронические заболевания органов брюшной полости имели по 23,8% пациентов основной и 25% пациентов контрольной групп, хронические заболевания органов малого таза - 16,7% пациенток основной группы и 17,5% пациенток контрольной группы. Значительно реже (до 13,4% пациентов) встречались болезни органов дыхания и сахарный диабет 9,7% в обеих группах.

Увеличение ЩЖ у оперированных больных в обеих группах соответствовало I-II степени по классификации ВОЗ и I-V степени по классификации О.В. Николаева (табл. 1.).

Таблица 1.

Степень увеличения щитовидной железы

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Нозологическая Форма	**Г руппы**	**Степень увеличения щитовидной железы**				**Число наблюдений**	
Узловой зоб		I-II	III	IV	V	Абс	%
	I	11(7,9%)	13(9,3%)	8 (5,7%)	2 (1,4%)	34	24,5
	II	10 (7,2%)	14 (10,7%)	8 (5,7%)	1 (0,7%)	30	21,6
Многоузловой зоб	I	3 (2,2%)	5 (3.6%)	1 (0,7%)	1 (0,7%)	10	7,2
	II	3(1,9%)	5(3.6%)	1 (0,7%)	1 (0,7%)	10	7,2
ДТЗ	I	9(6,5%)	13 (9,4%)	4(2,9%)	1 (0,7%)	27	19,4
	II	7(5%)	13(9,4%)	4(2,9%)	1 (0,7%)	25	18,0
Всего:		44(31,6%)	62(44,6%)	26(18,7%)	7(5%)	139	100

Основу обследования больных составил диагностический комплекс, включающий следующий алгоритм: анализ жалоб, физикальный осмотр, лабораторные и инструментальные методы исследования: УЗИ ЩЖ. В комплексное обследование пациентов входили также электрокардиография, рентгенография органов грудной клетки, при необходимости рентгенография пищевода с контрастированием, рутинные лабораторные исследования.

В послеоперационном периоде осуществлялся клинический осмотр пациентов. Контроль за состоянием ткани железы и зоны операции осуществлялся с помощью УЗИ.

Предварительные данные о форме, размерах, консистенции, подвижности, болезненности ЩЖ можно получить при осмотре и пальпации.

Осмотр позволяет установить наличие зоба, в ряде случаев предположить характер поражения (диффузный зоб или узловой) и его локализацию (в каком анатомическом отделе щитовидной железы располагается узел), подвижность при глотании. При зобе небольших размеров (I степени) уточнить данные клинического осмотра помогает УЗИ. Обязательно проводится пальпация регионарных лимфоузлов (все группы лимфоузлов шеи, под- и надключичные лимфоузлы). Аускультативно можно выявить шум над общей сонной артерией,

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что иногда говорит о ее компрессии зобом. При ДТЗ или ХАИТ (гипертрофической форме) аускультативно над всей тканью ЩЖ может выслушиваться сосудистый шум ("жужжащая железа"). При загрудинном зобе часто видно набухание вен шеи и передней поверхности грудной клетки. Кроме того, осмотр позволяет выявить симптомы, характерные для нарушения функции ЩЖ (глазные симптомы, дрожание рук, беспокойное поведение больного, отеки и др.).

С целью рационального использования различных методов диагностики заболеваний ЩЖ в основной группе проведена комплексная диагностика с использованием лабораторных и инструментальных методов. Критерии достоверности отдельно взятого диагностического метода получены при исследовании в общей сложности 71 больных основной группы с верифицированным на операциях диагнозом и представляют среднестатистическую величину и чем больше методов включается в диагностический комплекс, тем выше диагностическая достоверность комплекса.

Клиника ДТЗ в отличие от узлового зоба имеет ряд своих особенностей, и они главным образом связаны с числом имевших место рецидивов и осложнениями заболевания.

В комплексном предоперационном обследовании пациентов основной гуппы также наряду с инструментальными исследованиями, 52 (73,2%) больным выполнялись гормональные исследования (41 пациентов с узловым зобом, 6 с токсическим зобом, 5 больных ДТЗ), с помощью которых оценивалось функциональное состояние ЩЖ как эндокринного органа. Исследование включало определение концентраций ТТГ и биологически активных свободных фракций Т3, Т4 в сыворотке крови.

Исследование гормонов ЩЖ проводилось также, когда степень ее увеличения часто не соответствовал тяжести заболевания.

Результат и обсуждение

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Оперативные вмешательства на ЩЖ выполнялись в обеих группах традиционными хирургическами методами, но в основной группе пациентов с применением новых подходов к диагностике и тщательной предоперационной подготовкой (операции из минидоступа). Все операции проводились под эндотрахеальным наркозом (ЭТН), который обладает несомненными преимуществами перед другими методами обезболивания, отвечает всем требованиям современной анестезии, а мышечная релаксация облегчает операционный доступ и условия выполнения операции.

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Использовался стандартный доступ к ЩЖ. При запрокинутой назад, голове разрез кожи располагался на 1-2 см выше яремной вырезки строго симметрично, по ходу кожной складки. Воротниковый разрез по Николаеву длиной от 6 до 10 см в зависимости от объема ЩЖ.



Рис. 1. Доступ к щитовидной железе.

Рассекалась кожа, подкожная клетчатка с первой фасцией и платизмой. Далее выполнялось рассечение второй фасции до передних яремных вен, по

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показаниям лигирование яремных вен на зажимах капроном, электрокоагуляция мелких подкожных сосудов. Верхний лоскут отсепаровывался на 3-5 см. Рана изолировалась салфетками. Рассекалась третья и наружный листок четвертой фасций до уровня перстневидного хряща строго по средней линии. Внутренний листок четвертой фасции рассекался у края грудинощитовидной мышцы. Рана расширялась крючками Фарабефа. Пальцем дополнительно мобилизовывалась боковая доля ЩЖ с одновременной ревизией.

Операция из минидоступа по хирургической технике близка к традиционной. Основным отличием является длина и локализация кожного разреза. Меньший разрез значительно улучшает косметический эффект и снижает послеоперационный дискомфорт. Обычно, длина разреза менее 6,0 см считается миниинвазивной. Объем операции из минидоступа не отличается от традиционной тиреоидэктомии.

Мини доступ обычно выполняется с разрезом кожи не более 5,0 см, при этом он располагается несколько выше, чем при традиционной тиреоидэктомии на 1,5 - 2,0 см. Открытая диссекция тканей проводится вплоть до выделения верхнего полюса доли ЩЖ. Для подтягивания удаляемой части ЩЖ использовали нити-держалки с марлевым шариком. Выполнялось экстра- или субфасциальное выделение удаляемого участка, затем отсечение ткани на зажимах. Выделение железы начиналось с наиболее подвижного отдела доли. При больших зобах применялся «принцип раскачивания», при этом удаляемая часть ткани подтягивалась в рану. Далее ход операции определялся объемом оперативного вмешательства.





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Рис. 2. Доступ к щитовидной железе многоузлового зоба.

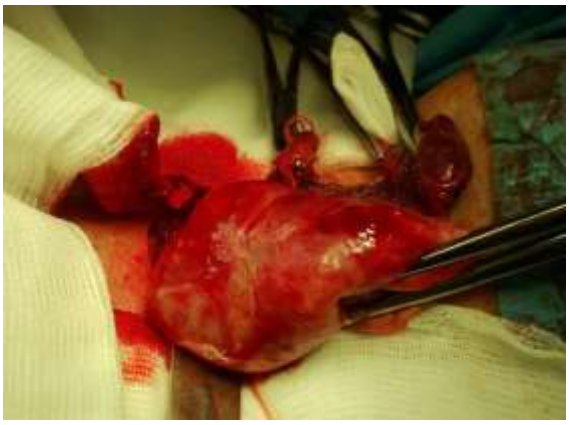


Рис. 3. Этап мобилизации



Рис. 4. Этапы операции гемиструмэктомии

Субтотальная резекция доли произведена 18 (25%) пациентам в первой группе и 17 (25%) во второй группе. Гемитиреоидэктомия была произведена в первой группе 8 (11,8%) и 6 (8,8%) пациентам во второй группе. Гемитиреоидэктомия с перешейком была произведена в первой группе 2 (2,8%) больным, 3 (4,4%) -во второй группе. Резекция перешейка произведена в обеих группах в равном количестве случаев - по 2 больному (в первой группе это составило 2,8%, во второй - 2,9%).

Таблица 2.

Характер выполненных операций в I и II группе больных

Название операции	I группа		II группа		Итого	
	Абс. число	%	Абс. число	%	Абс. Число	%
Субтотальная резекция доли	19	25,4	17	25	36	25,2
Резекция перешейка	2	2,8	2	2,9	4	2,8
Гемитиреоидэтомия	8	11,2	6	8,8	14	10,1
Гемитиреоидэктомия с резекцией доли	3	2,8	3	4,4	6	3,6
Субтотальная резекция щитовидной железы	10	14,1	28	41,2	38	27,3

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Тиреоидэктомия	30	42,3	11	16,2	41	29,5
Всего	71	100	68	100	139	100

Гемитиреоидэктомия с перешейком с субтотальной резекцией противоположной доли была произведена в первой группе 2 (2,8%) пациентам, во второй группе - 2 (2,9%). Субтотальная резекция ЩЖ произведена больным первой группы в 10 (14,1%) случаях и в 28 (41,2%) случаях - во второй группе. Тиреоидэктомия выполнена у 41 больных первой группы 30 (42,3%) и 11 (16,2%) - во второй группы. Наиболее распространенной операцией в первой группе была тиреоидэктомия 34 (42,3%) во второй - субтотальная резекция ЩЖ 28 (41,2%).

Оперативные вмешательства на одной доле выполнены в первой группе у 12 (16,9%) больных, во второй - у 20 (29,4%).

В I группе (имеются ввиду пациенты, оперированные из минидоступа) максимальное количество операций имели отличный косметический результат - 54 (76 %) пациентов, во II группе было 19 (28 %), во II группе в наибольшем количестве операций - у 68 пациента 34(50 %) отмечен хороший косметический результат. В I группе хороший косметический результат операции отметили 14 пациентов (19,7%), удовлетворительный - 3 пациента (4,3%). Во II группе отличный результат операции отмечен у 19 (28 %) пациентов, удовлетворительный - у 14 пациентов (20, %). Неудовлетворительный результат во II группе отмечен в 1 (1,5 %) случаях. В I группе неудовлетворительных результатов отмечено не было.

Таблица 3. Косметический результат операций на щитовидной железе из минидоступа в I и II группе больных

Оценка результата операции	I группа		II группа	
	Абс.	%	Абс.	%
Отличный результат	54	76	19	28
Хороший результат	14	19,7	34	50
Удовлетворительный результат	3	4,3	14	20,5
Неудовлетворительный	0	0	1	1,5
Всего	71	100	68	100

Основными оценочными критериями были наличие послеоперационных

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осложнений как непосредственно после операции, так и отдаленных, длительность пребывания в стационаре, удовлетворенность косметическим результатом оперативного вмешательства, наличие рецидива заболевания в течение года. Изучение осложнений в раннем послеоперационном периоде в контрольной группе (II) показали, что у 4 (5,9 %) пациентов выявлены признаки гипопаратиреоза, потребовавшей дополнительной медикаментозной терапии. У 5 (7,4 %) пациентов после операции отмечены воспалительные изменения со стороны послеоперационной раны, потребовавших назначения дополнительной противовоспалительной терапии и перевязок.

В послеоперационном периоде в контрольной группе односторонний парез ВГН с временным (преходящим) нарушением фонации отмечен в 1 случаи при тиреоидэктомии по поводу ДТЗ II ст. Это объясняется травматизацией ВГН при его выделении тупфером. При повторном осмотре через 6 месяцев нарушения фонации не наблюдалось ни у одного больного. Кровотечения, возникшие в первые часы после операции в контрольной группе и потребовавшие повторного оперативного вмешательства при оперативном вмешательстве отмечены у I (1,5%) пациента с ДТЗ. Признаки транзиторного гипопаратиреоза отмечены у 4 (5,9%) пациентов в контрольной группе и у 1 (1,4 %) больной основной группе.

Следовательно, наиболее чаше осложнения в ближайшей послеоперационном периоде в контрольной группе.

Таким образом, сравнительный анализ показывает преимущества при операциях из миидоступа, отражающиеся в экономии времени эксплуатации операционной и операционной бригады.

Средний стационарный койко-день после операции, выполненной традиционном способом, составил 6,4±2,1 дней, что свидетельствует о быстрой реабилитации пациентов, имеет большое экономическое значение.

ВЫВОДЫ

1. Методика определения ряда ультразвуковых признаков позволяло оптимизировать диагностику заболеваний щитовидной железы на ранней

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стадии, при этом ее чувствительность составляет 73%, специфичность - 94,2%, диагностическая точность - 89,8%. Компьютерная томография позволяет устанавливать точный диагноз уже на интраоперационном этапе.

2. Разработанный алгоритм хирургического лечения больных с заболеваниями ЩЖ позволяет сократить сроки госпитализации и способствует к улучшению результатов как в ближайшем, так и в отдаленном послеоперационном периоде.

3. Своевременная комплексная диагностика с гормональными исследованиями, с помощью которых оценивалось функциональное состояние ЩЖ, а также тщательная индивидуальная предоперационная подготовка и послеоперационное ведение позволили сократить ранние послеоперационные осложнения с 16,2% до 4,2%.

Список литературы

1. Колчина Е. О., Кокшарова Е. А. Структурные и функциональные послеоперационные осложнения после хирургического лечения диффузного токсического зоба: гипотиреоз, гипопаратиреоз и дисфония – обзор литературы и описание клинического случая // Парадигма. – 2025. – №11-1

2. Кухтенко Ю.В., Косивцов О.А., Михин И.В., Рясков Л.А. Результаты хирургического лечения пациентов с различными заболеваниями щитовидной железы // Вестник ВолгГМУ. – 2015. – №6. – С.67-71.

3. Шулутко А.М., Семиков В.И., Грязнов С.Е. и др. Риск гипокальциемии после операций на щитовидной железе // Хирургия. – 2015. – №11. – С.35-40. DOI: 10.17116/hirurgia20151135-40

4. Arauchi A., Matsuura K., Shimizu T. Functional thyroid follicular cells differentiation from human – induced pluripotent stem cells in suspension culture // Front Endocrinol. – 2017. – Vol. 8. – P.103.

5. Jin S., Sugitani I. Narrative review of management of thyroid surgery complications // Gland Surg. – 2021. – Vol. 10. – №3. – P.1135-1146. DOI: 10.21037/gs-20-859.

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PEDAGOGICAL CONDITIONS FOR DEVELOPING COHERENT SPEECH AND COMMUNICATION SKILLS IN OLDER PRESCHOOL CHILDREN

Shamuratova Khurliman Kutlymuratovna,

lecturer at the Department of Preschool Education of the NSPI named after Ajiniyaz

Abstract

The article scientifically substantiates a complex of pedagogical conditions that ensure the effective formation of coherent speech and communicative skills in older preschool children. The essence of coherent speech as an important indicator of a child's readiness for school education and their successful socialization is revealed.

Keywords

senior preschool age, coherent speech, communicative skills, pedagogical conditions, developing environment, dialogic interaction, monologue, socialization.

ПЕДАГОГИЧЕСКИЕ УСЛОВИЯ ФОРМИРОВАНИЯ СВЯЗНОЙ РЕЧИ И КОММУНИКАТИВНЫХ НАВЫКОВ У ДЕТЕЙ СТАРШЕГО ДОШКОЛЬНОГО ВОЗРАСТА

Шамуратова Хурлиман Кутлымуратовна,

преподаватель кафедры Дошкольного образования НГПИ имени Ажинияза

Аннотация. В статье научно обосновывается комплекс педагогических условий, обеспечивающих эффективное формирование связной речи и коммуникативных навыков у детей старшего дошкольного возраста. Раскрывается сущность связной речи как важного показателя готовности ребенка к школьному обучению и его успешной социализации.

Ключевые слова: старший дошкольный возраст, связная речь, коммуникативные навыки, педагогические условия, развивающая среда, диалогическое взаимодействие, монолог, социализация.

Введение

На старшем этапе дошкольного детства происходят качественные изменения в речевом и личностном развитии ребенка. В возрасте 5-7 лет речь

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из средства обслуживания сиюминутных бытовых потребностей превращается в полноценный инструмент мышления, планирования деятельности, самовыражения и установления социальных контактов. Сформированность связной речи - умения логично, последовательно и понятно для окружающих излагать свои мысли - выступает не только центральной задачей речевого развития, но и определяющим критерием психологической готовности к обучению в школе.

Вместе с тем в условиях современной социокультурной ситуации педагоги и детские психофизиологи констатируют нарастание негативных тенденций в речевой сфере дошкольников. Широкое распространение экранных устройств, ограничение практики коллективных подвижных и сюжетно-ролевых игр, а также недостаток содержательного семейного общения приводят к тому, что многие дети старшего дошкольного возраста испытывают серьезные затруднения при составлении описательных рассказов, пересказе художественных текстов и поддержании конструктивного диалога со сверстниками.

Возникает объективное противоречие между высокими требованиями стандарта дошкольного образования к уровню коммуникативно-речевого развития выпускников детского сада и недостаточной эффективностью традиционных, преимущественно обучающих, методов работы. Решение данной проблемы требует определения и научно-методического обоснования специальных педагогических условий, активизирующих внутренний потенциал ребенка.

Основная часть

Психолого-педагогическая характеристика связной речи и общения старших дошкольников. Связная речь представляет собой сложную форму речемыслительной деятельности, объединяющую в себе диалогическую и монологическую формы. В старшем дошкольном возрасте ребенок овладевает способностью строить высказывания разных типов: описание (характеристика

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предметов, явлений), повествование (передача временной последовательности событий) и элементы рассуждения (обоснование причинно-следственных связей).

Параллельно со связной речью формируются коммуникативные навыки - базовые умения, обеспечивающие полноценное взаимодействие личности с социумом. К ним относятся: умение слушать и слышать собеседника, не прерывая его высказывания; способность инициативно вступать в диалог, задавать вопросы и отвечать на них в соответствии с контекстом; навыки использования средств невербальной выразительности (мимика, жесты, интонация, темп речи); умение ориентироваться на партнера по общению, учитывать его эмоциональное состояние и находить мирные способы разрешения возникающих речевых конфликтов.

Формирование связной речи и коммуникативных навыков имеет взаимообусловленный характер: высокий уровень владения языковыми средствами расширяет возможности общения, а богатая практика взаимодействия создает естественную потребность в совершенствовании речевой культуры.

Комплекс педагогических условий формирования речевой и коммуникативной компетентности. Для достижения устойчивых положительных результатов в речевом развитии старших дошкольников необходимо создание целостной педагогической системы, включающей следующие взаимосвязанные условия.

Первое условие: Проектирование коммуникативно-стимулирующей предметно-развивающей среды. Предметно-пространственная среда дошкольной организации должна носить вариативный, трансформируемый и насыщенный характер. В группе необходимо выделение специальных зон речевой и коммуникативной активности: «уголков сказки», детских библиотек, мини-театров (пальчиковый, теневой, кукольный), а также зон для сюжетно-ролевых игр. Наличие открытых материалов для творческого конструирования

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и моделирования провоцирует детей на совместные обсуждения, планирование игровых замыслов и распределение ролей, что стимулирует непрерывный речевой обмен.

Второе условие: Внедрение интерактивных и игровых технологий в образовательный процесс. Игра остается ведущей формой деятельности, через которую происходит освоение социальных норм и речевых образцов. Высокую педагогическую ценность имеют:

-Сюжетно-ролевые игры с усложненными сценариями (например, «Редакция детской газеты», «Экскурсионное бюро», «Космическая станция»), где речевые роли требуют применения специализированной лексики, вежливых форм обращения и умения вести профессиональный диалог.

-Игровые ситуативные тренинги, направленные на отработку правил речевого этикета в нестандартных ситуациях (знакомство, просьба о помощи, выражение благодарности, аргументированный отказ).

-Мнемотехническое моделирование, облегчающее процесс овладения монологической речью. Использование графических схем и мнемотаблиц помогает детям удерживать структуру описания или повествования, сохраняя логику и связность текста.

Третье условие: Переход к субъект-субъектному стилю взаимодействия педагога с детьми. Педагог должен выступать не как источник готовых знаний и строгий контролер речевых ошибок, а как партнер по общению. Данное условие предполагает широкое использование проблемно-поисковых бесед, открытых вопросов («Как ты думаешь, почему...?», «Что бы произошло, если...?»), а также организацию дискуссий, в которых выслушивается и уважается мнение каждого ребенка. Такой подход снимает эмоциональную скованность, страх допустить ошибку и стимулирует детскую речевую инициативу.

Четвертое условие: Интеграция речевой деятельности с другими видами детского творчества. Связная речь наиболее успешно развивается в

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синтезе с изобразительным искусством, конструированием, музыкой и театрализацией. Составление словесных историй по собственным рисункам или поделкам, озвучивание персонажей в процессе драматизации сказок, словесное описание прослушанных музыкальных произведений делают речевую практику эмоционально привлекательной и глубоко проживаемой ребенком.

Взаимодействие с семьей в процессе речевого развития. Обязательным элементом эффективной педагогической системы является обеспечение преемственности между дошкольным учреждением и семьей. Педагогам важно вести просветительскую работу среди родителей, разъясняя опасность гиперопеки в речевой сфере (когда взрослые угадывают желания ребенка по жестам и не стимулируют словесные просьбы) и вред чрезмерной увлеченности гаджетами.

Организация семейных проектов, совместных вечеров сказок, рекомендация игр на развитие речи в домашних условиях («Слова-ассоциации», «Сочини концовку сказки», «Придумай историю по дороге в детский сад») позволяют закрепить полученные в детском саду коммуникативные навыки в естественной семейной обстановке.

Заключение

Формирование связной речи и коммуникативных навыков у детей старшего дошкольного возраста - это многоаспектный процесс, требующий систематической и научно обоснованной организации образовательной среды.

Проведенный анализ позволяет сделать вывод, что успешность данного процесса обеспечивается совокупностью ключевых педагогических условий: созданием коммуникативно-ориентированной предметной среды, широким применением игровых и мнемотехнических технологий, установлением партнерского стиля общения между воспитателем и воспитанниками, а также интеграцией речевой работы с различными видами детского творчества и семейным воспитанием. Реализация указанных условий способствует не только преодолению речевых трудностей и размыканию коммуникативных барьеров,

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но и обеспечивает целостное гармоничное развитие личности будущего первоклассника, готового к активному и доброжелательному взаимодействию с окружающим миром.

СПИСОК ИСПОЛЬЗОВАННОЙ ЛИТЕРАТУРЫ

1. Алексеева, М. М. Методика развития речи и обучения родному языку дошкольников / М. М. Алексеева, В. И. Яшина. - М.: Академия, 2020. - С 400.
2. Запорожец, А. В. Психология ребенка дошкольного возраста / А. В. Запорожец, Д. Б. Эльконин. - М.: Просвещение, 2019. - 352 с.
3. Ушакова, О. С. Теория и практика развития речи дошкольника / О. С. Ушакова. - М.: ТЦ Сфера, 2021. - 240 с.
4. G.X.Jumasheva, Sh.E. Oteniyazova, X.K.Shamuratova. Balalar tilin ósiriw/ Oqıw qollanba. Nókis, “Avangard baspa” 2025. B-212

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DEVELOPING LOGICAL THINKING IN PRIMARY SCHOOL STUDENTS VIA VISUAL MODELING TOOLS: AN ANALYSIS OF NATIONAL AND FOREIGN EXPERIENCES

TOSHTEMIROVA MAFTUNA KARIMOVNA

Teacher at the Department of Primary Education, Denau Institute of Entrepreneurship and Pedagogy

Email: maftunatoshtemirohamda161@gmail.com UDC: 373.3:502.4

TOSHTEMIROVA YULDUZ KARIM QIZI

Teacher, Department of Preschool Education Denau Institute of Entrepreneurship and Pedagogy

Email: toshtemirovayulduz48@gmail.com UDC: 373.3:502.4

Abstract

This article provides a theoretical and methodological framework for developing logical thinking skills in primary school students, along with a comparative analysis of advanced international and national experiences in this field. The study highlights the role of logical thinking in personal intellectual development, its pedagogical and psychological aspects, and the scientific foundations of forming logical operations in young learners. Specifically, it analyzes the effectiveness of competency-based approaches, problem-based learning, inquiry-based learning, STEAM technologies, and methods aimed at fostering critical and creative thinking utilized in the educational systems of developed countries such as Finland, Singapore, South Korea, and Japan. Furthermore, the paper outlines the essence of reforms in the Republic of Uzbekistan regarding the modernization of the education system, integration into international assessment programs, refinement of state educational standards, and the integration of logical thinking competencies into the primary education curriculum. As a result of the research, effective pedagogical mechanisms, innovative methods, and didactic conditions for enhancing logical thinking in primary school students based on the integration of foreign and national practices

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are identified, and practical recommendations for their implementation are proposed.

Keywords

primary education, logical thinking, intellectual development, competency-based approach, critical thinking, creative thinking, STEAM education, problem-based learning, innovative pedagogy, foreign experience, national experience..

In today’s context of globalization and information-driven transformations, one of the most vital tasks facing the educational system is developing students' competencies in independent thinking, critical analysis, problem-solving, and the effective application of knowledge and skills in real-life situations. Rapid advancements in science and technology, complex economic and social dynamics, and evolving labor market requirements demand not only sound knowledge but also higher-order intellectual competencies, such as logical thinking, creative problem-solving, and autonomous decision-making. Consequently, fostering cognitive activity and particularly developing logical thinking skills during the educational process stands out as a priority in pedagogical science.

Logical thinking is a fundamental component of human cognition, enabling individuals to comprehend cause-and-effect relationships, compare, analyze, synthesize, classify, and draw well-founded conclusions regarding various phenomena and processes. Psychological and pedagogical research consistently identifies advanced logical thinking as a primary indicator of an individual's intellectual potential, cognitive activity, and overall academic success. Early school age, in particular, represents a crucial period of rapid cognitive development during which thought operations are structured, laying the necessary intellectual foundation for subsequent educational stages. Therefore, effective pedagogical practices aimed at developing logical thinking at this primary stage directly influence students' future academic outcomes and personal development.

The importance of fostering logical thinking in primary education is widely acknowledged internationally. In advanced educational systems across the globe,

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cultivating logical and critical thinking is treated as a strategic priority. Countries such as Finland, Singapore, Japan, South Korea, and Canada actively incorporate problem-based learning, project-based activities, inquiry-based instruction, STEAM approaches, and competency-based models to encourage independent inquiry, logical analysis, and practical problem-solving. These approaches help learners cultivate higher-order thinking skills, leading to outstanding performance in international assessment programs.

These global trends are equally reflected in Uzbekistan's education system. In recent years, comprehensive reforms have been undertaken to modernize the national education framework in line with international standards, focusing on enhancing functional literacy and logical thinking competencies. In particular, regulatory frameworks, updated national curriculum standards, and instructional content aligned with international benchmark programs—such as PISA, TIMSS, and PIRLS—are specifically designed to strengthen students' analytical and logical thinking abilities.

However, an analysis of educational practice reveals that the implementation of methods and technologies designed to foster logical thinking in primary school students remains insufficient. There is a pressing need to systematically integrate advanced practices into everyday teaching routines. Conducting comparative studies between national and international experiences, evaluating their effectiveness through evidence-based research, and designing viable pedagogical mechanisms constitute highly relevant scientific challenges.

These circumstances underline the necessity of conducting an in-depth study of both international and national practices in developing logical thinking within primary education, identifying their distinctive features and pedagogical potential. Accordingly, the objective of this study is to perform a comparative analysis of advanced international and national experiences regarding logical thinking development in primary school students, determine their effective parameters, and formulate scientific and methodological recommendations for educational implementation.

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Developing logical thinking in primary education represents a key research domain spanning pedagogy, psychology, and didactics. A review of scientific literature indicates that the formation and evolution of logical thinking are intrinsically tied to human cognitive activity, intellectual progress, and overall instructional effectiveness. Consequently, this subject is extensively documented in both foreign and domestic scholarly literature.

The philosophical and psychological foundations of logical thinking date back to antiquity. Aristotle's formal laws of logic established the scientific basis of human thought, providing a theoretical foundation for subsequent investigations into cognitive processes. Later thinkers, including R. Descartes, J. Locke, and I. Kant, further enriched theoretical perspectives on human cognition, mental operations, and intellectual development. In their works, logical reasoning is defined as a primary vehicle for acquiring knowledge and discerning truth.

By the 20th century, research into child cognitive development entered a new phase. Swiss psychologist J. Piaget elaborated his theory of cognitive development, outlining the sequential stages of children's intellectual growth. According to Piaget, primary school-aged children operate within the concrete operational stage, during which mental operations such as comparison, grouping, classification, analysis, and generalization undergo active development. Piaget's insights serve as a key theoretical foundation for designing methodologies to foster logical thinking in primary education [6].

The socio-pedagogical dimensions of logical thinking were extensively examined by L.S. Vygotsky. Through his "Zone of Proximal Development" theory, Vygotsky demonstrated that a child's thinking develops through collaborative interaction with adults and peers. Thus, alongside nurturing independent thinking, providing pedagogical support and using collaborative learning strategies are essential components of the instructional process [7].

The didactic foundations for developing logical thinking are also broadly covered in the works of J. Bruner [6], J. Dewey [7], and B. Bloom [8]. J. Bruner

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proposed discovery learning, arguing that acquiring knowledge through independent exploration significantly enhances students' logical thinking skills. J. Dewey highlighted that instruction structured around problem situations fosters analytical and critical thinking skills [10]. Meanwhile, Bloom's Taxonomy positions higher-order cognitive activities—ranging from knowledge recall to analysis, evaluation, and creation—as critical metrics for cognitive development [9].

In recent international research, the development of logical thinking is closely tied to competency-based paradigms. Studies focusing on educational frameworks in Finland, Singapore, and Japan emphasize problem-based learning, project work, inquiry-based teaching, and STEAM approaches as highly effective tools for building analytical and logical competencies. These frameworks transform learners from passive receivers of information into active creators capable of applying knowledge in practical contexts.

Domestic scholars in Uzbekistan have likewise paid significant attention to cognitive and logical development in primary education. In particular, the pedagogical works of R.Kh. Jurayev, N.A. Muslimov, B.Kh. Khodjayev, U.N. Nishonaliyev, A. Avloniy, and other researchers highlight key aspects of developing independent thinking, implementing innovative educational technologies, and incorporating competency-based methodologies. These studies emphasize creating problem-solving scenarios, utilizing interactive teaching strategies, and establishing interdisciplinary links as crucial drivers for boosting cognitive activity and logical thinking.

Furthermore, research evaluating educational quality in Uzbekistan against international metrics underscores the urgency of addressing logical thinking development. International assessments such as PISA, TIMSS, and PIRLS focus directly on evaluating students' abilities to apply knowledge in real-world contexts, analyze data, draw conclusions, and solve problems—skills that form the core of logical thinking. Consequently, refining instructional content in accordance with

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international requirements and fostering logical thinking competencies among primary school students remain central priorities for the national education system.

The literature review reveals that although logical thinking development has been studied from various perspectives by both international and national scholars, there remains a distinct need for research focused on harmonizing advanced foreign practices with national pedagogical traditions within primary education, based on a modern competency-based approach. From this perspective, identifying effective pedagogical mechanisms for developing logical thinking in primary school students through comparative analysis represents an essential scientific task.

This study provides a theoretical and methodological analysis of international and national experiences regarding the development of logical thinking in primary education. The findings demonstrate that logical thinking serves as a vital determinant of students' intellectual growth, capacity for autonomous learning, problem-solving skills, and effective decision-making in real-life contexts. Therefore, systematically building logical thinking skills starting from the primary education level is a primary imperative of modern education.

The scientific literature and theoretical frameworks examined in this research confirm that the development of logical thinking is directly linked to students' age and individual characteristics, the learning environment, instructional methods, and pedagogical technologies. The theoretical principles advanced by scholars such as J. Piaget, L.S. Vygotsky, J. Bruner, and B. Bloom provide essential foundations for understanding how cognitive operations develop in primary school-aged children.

Analysis of international experience demonstrates the high efficacy of competency-based approaches, problem-based learning, inquiry-based instruction, project work, and STEAM technologies across developed educational systems like Finland, Singapore, Japan, and South Korea. These strategies foster independent reasoning, analytical abilities, and creative engagement among primary learners.

The evaluation of national experience indicates that significant reforms are currently underway in Uzbekistan to build logical thinking competencies. The

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implementation of the National Curriculum, competency-oriented instructional content, and alignment with international assessment frameworks offer extensive opportunities to cultivate students' analytical and logical capabilities. Nevertheless, maximizing these opportunities requires continuous refinement of pedagogical practice.

Based on the study results, it can be concluded that an effective model for fostering logical thinking in primary education should synthesize the best elements of international practices with national pedagogical traditions. In this regard, incorporating modern pedagogical technologies that cultivate independent thinking, analytical skill, reflective evaluation, and practical problem-solving is of paramount importance.

REFERENCES

1. Ministry of Preschool and School Education of the Republic of Uzbekistan. *National Curriculum for General Secondary Education*. Tashkent, 2022.
2. Avloniy A. *Turkic Gulistan or Morality* (*Turkiy guliston yoxud axloq*). Tashkent: O‘qituvchi, 1992. 160 p.
3. Khodjayev B.Kh. *Theory and Practice of General Pedagogy*. Tashkent: Sano-standart, 2017. 416 p.
4. Hasanboyev J., To‘raqulov Kh., Haydarov M., et al. *Pedagogy*. Tashkent: Fan va texnologiya, 2011. 512 p.
5. Tolipov O‘., Usmonboyeva M. *Applied Foundations of Pedagogical Technologies*. Tashkent: Fan, 2006. 260 p.
6. Piaget J. *The Psychology of Intelligence*. London: Routledge, 2001. 182 p.
7. Vygotsky L.S. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press, 1978. 159 p.
8. Bruner J.S. *The Process of Education*. Cambridge, MA: Harvard University Press, 1960. 97 p.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 09.10.2026
PUBLISHED: 10.10.2026

9. Bloom B.S. (Ed.). *Taxonomy of Educational Objectives: Handbook I. Cognitive Domain*. New York: Longmans, Green and Co., 1956. 207 p.

10. Dewey J. *Democracy and Education*. New York: Macmillan, 1916. 434 p.

11. Anderson L.W., Krathwohl D.R. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman, 2001. 352 p.

12. OECD. *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. Paris: OECD Publishing, 2023.

13. Mullis I.V.S., Martin M.O. *PIRLS 2021 International Results in Reading*. Amsterdam: IEA, 2023.

14. Mullis I.V.S., Martin M.O. *TIMSS 2023 International Results in Mathematics and Science*. Boston College, 2024.

https://creativecommons.org/licenses/by/4.0/

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MODERN APPROACHES TO THE APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PUBLIC ADMINISTRATION

Maratova Shaxsanem Marat qizi

University of World Economy and Diplomacy

Abstract

This article examines modern approaches to the application of artificial intelligence technologies in public administration, focusing on their potential to automate public services and improve administrative efficiency. Based on scientific studies by international researchers, the advantages and challenges of implementing artificial intelligence in the public sector are analyzed. The article also explores the legal framework for the development of digital public administration in Uzbekistan and provides recommendations for the effective application of artificial intelligence technologies.

Keywords

artificial intelligence, public administration, digital transformation, e-government, public services, automation, machine learning, intelligent systems.

DAVLAT BOSHQARUVI TIZIMIDA SUN’IY INTELLEKT TEXNOLOGIYALARINI QO‘LLASHNING ZAMONAVIY YONDASHUVLARI

Maratova Shaxsanem Marat qizi

Jahon iqtisodiyoti va diplomatiya universiteti

Email: shaxsanemmaratova03@gmail.com

Annotatsiya. Maqolada davlat boshqaruvi tizimida sun’iy intellekt texnologiya-larini qo‘llashning zamonaviy yondashuvlari, davlat xizmatlarini avtomatlashtirish va boshqaruv samaradorligini oshirishdagi imkoniyatlari tadqiq etiladi. Xorijiy olimlarning ilmiy ishlari asosida sun’iy intellektni davlat sektoriga joriy etishning afzalliklari va muammolari tahlil qilinadi. Shuningdek, O‘zbekistonda raqamli davlat boshqaruvini rivojlantirishning huquqiy asoslari

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o‘rganilib, sun’iy intellekt texnologiyalarini samarali qo‘llash bo‘yicha tavsiyalar ishlab chiqiladi.

Kalit so‘zlar: sun’iy intellekt, davlat boshqaruvi, raqamli transformatsiya, elekt-ron hukumat, davlat xizmatlari, avtomatlashtirish, mashinali o‘qitish, intellektual tizimlar.

Kirish

Zamonaviy axborot-kommunikatsiya texnologiyalarining rivojlanishi davlat boshqaruvi tizimida yangi imkoniyatlarni yuzaga keltirmoqda. Xususan, sun’iy intellekt texnologiyalari davlat xizmatlari sifatini oshirish, ma’muriy jarayonlarni avtomatlashtirish va boshqaruv qarorlarini qo‘llab-quvvatlashning istiqbolli vositalaridan biri hisoblanadi.

An’anaviy davlat boshqaruvida hujjatlarni qayta ishlash, fuqarolar murojaatlarini ko‘rib chiqish va ma’lumotlarni tahlil qilish katta vaqt hamda inson resurslarini talab etadi. Sun’iy intellekt texnologiyalaridan foydalanish ushbu jarayonlarni optimallashtirish, takrorlanuvchi vazifalarni kamaytirish va ma’lumot-larga asoslangan boshqaruv mexanizmlarini rivojlantirish imkonini beradi.

O‘zbekistonda «Raqamli O‘zbekiston - 2030» strategiyasi va «Sun’iy intel-lekt texnologiyalarini 2030-yilga qadar rivojlantirish strategiyasi» davlat boshqaruvida innovatsion texnologiyalarni joriy etishning muhim huquqiy asoslarini belgilaydi [10, 11].

Jahon tajribasi shuni ko‘rsatadiki, sun’iy intellekt texnologiyalarining davlat boshqaruvi tizimiga integratsiyalashuvi nafaqat ma’muriy jarayonlarning samaradorligini oshirish, balki davlat organlari faoliyatining ochiqligi va shaffofligini ta’minlashda ham muhim ahamiyat kasb etmoqda. Xususan, mashinali o‘qitish, katta ma’lumotlar tahlili va tabiiy tilni qayta ishlash texnologiyalari yordamida davlat xizmatlarini shaxsiylashtirish, fuqarolar ehtiyojlarini aniqlash hamda boshqaruv jarayonlarida yuzaga kelishi mumkin bo‘lgan muammolarni oldindan baholash imkoniyatlari kengaymoqda. Bu esa davlat boshqaruvida an’anaviy yondashuvlardan ma’lumotlarga asoslangan

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intellektual boshqaruv tizimlariga bosqichma-bosqich o‘tish zaruratini yuzaga keltirmoqda.

Shu bilan birga, davlat boshqaruvida sun’iy intellekt texnologiyalarini joriy etish ma’lumotlar xavfsizligi, algoritmik shaffoflik, huquqiy javobgarlik va malakali mutaxassislar tayyorlash bilan bog‘liq masalalarni ham dolzarb-lashtirmoqda. Ayniqsa, davlat organlarida mavjud axborot tizimlarini o‘zaro integratsiya qilish, ma’lumotlar sifatini ta’minlash va sun’iy intellekt yordamida shakllantirilgan tavsiyalar ustidan inson nazoratini saqlash muhim hisoblanadi. Mazkur omillarni kompleks o‘rganish davlat boshqaruvida sun’iy intellekt texnologiyalaridan samarali va mas’uliyatli foydalanishning ilmiy-uslubiy asoslarini takomillashtirishga xizmat qiladi.

Tadqiqotning maqsadi davlat boshqaruvida sun’iy intellekt texnologiyalarini qo‘llashning zamonaviy yondashuvlarini tahlil qilish va O‘zbekiston sharoitida ular-dan samarali foydalanish yo‘nalishlarini aniqlashdan iborat.

Davlat boshqaruvida sun’iy intellekt texnologiyalaridan foydalanish masa-lalari xorijiy olimlarning ilmiy tadqiqotlarida keng yoritilgan. A. Zuiderwijk, Y.-C. Chen va F. Salem (2021) sun’iy intellektning davlat boshqaruvidagi imkoniyatlari va xavflarini o‘rganib, uning samaradorligi texnologik infratuzilma, tashkiliy tayyorgarlik va huquqiy tartibga solishga bog‘liqligini ta’kidlagan [1].

T. Q. Sun va R. Medaglia (2019) davlat sektorida sun’iy intellektni joriy etishdagi tashkiliy va texnologik muammolarni tahlil qilgan [2]. B. W. Wirtz, J. C. Weyerer va B. J. Sturm (2020) esa algoritmik shaffoflik, ma’lumotlar maxfiy-ligi va sun’iy intellekt tizimlari ustidan nazorat masalalariga alohida e’tibor qaratgan [3].

A. Androutsopoulou va hammualliflari (2019) sun’iy intellektga asoslan-gan chatbotlar davlat organlari va fuqarolar o‘rtasidagi kommunikatsiyani takomillashtirish imkoniyatlarini o‘rgangan [4]. N. Aoki (2020) bunday tizim-larga fuqaro-larning ishonchi masalasini tadqiq etgan [5]. O. S. Al-Mushayt (2019) esa

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elektron hukumat xizmatlarini sun’iy intellekt yordamida avtomatlashtirish yondashuvini taklif qilgan [6].

Mazkur tadqiqotda tizimli va qiyosiy tahlil, ilmiy umumlashtirish hamda konseptual yondashuv usullaridan foydalanildi. Xorijiy ilmiy manbalar va O‘zbekis-tonning normativ-huquqiy hujjatlari o‘rganilib, sun’iy intellektni davlat bosqaruviga joriy etishning asosiy yo‘nalishlari umumlashtirildi.

Tadqiqot natijalari va muhokama

Davlat boshqaruvida sun’iy intellekt texnologiyalarini qo‘llashning asosiy yo‘na-lishlaridan biri davlat xizmatlarini avtomatlashtirish hisoblanadi. Tabiiy tilni qayta ishlash texnologiyalari yordamida fuqarolar murojaatlarini tasniflash, tegishli davlat organlariga yo‘naltirish va elektron xizmatlar haqida avtomatik ma’lumot berish mumkin. Bunday tizimlar fuqarolarning davlat xizmatlaridan foydalanishini soddalashtirishga xizmat qiladi.

Ikkinchi muhim yo‘nalish katta hajmdagi ma’lumotlarni tahlil qilish va boshqaruv qarorlarini qo‘llab-quvvatlashdir. Mashinali o‘qitish algoritmlari iqtiso-diy, ijtimoiy va demografik ma’lumotlarni tahlil qilish, mavjud tendensiyalarni aniqlash hamda istiqboldagi ehtiyojlarni prognozlash imkonini beradi. Masalan, hududiy boshqaruv organlari aholi soni va infratuzilma holati haqidagi ma’lumotlar asosida yangi ta’lim yoki sog‘liqni saqlash muassasalariga bo‘lgan ehtiyojni baho-lashi mumkin.

Uchinchi yo‘nalish elektron hujjat aylanishini takomillashtirish bilan bog‘liq. Sun’iy intellekt yordamida hujjatlarni avtomatik guruhlash, matn mazmunini umumlashtirish va zarur ma’lumotlarni qidirish davlat xizmatchilarining ish yuk-lamasini kamaytirishi mumkin.

OECD tomonidan 2025-yilda e’lon qilingan tadqiqotda sun’iy intellektning davlat boshqaruvi funksiyalarida qo‘llanilishi, jumladan, ma’muriy jarayonlarni avtomatlashtirish va davlat xizmatlarini takomillashtirish imkoniyatlari tahlil qilin-gan [7]. BMTning elektron hukumat bo‘yicha hisobotida esa raqamli infratuzilma

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va inson kapitali davlat xizmatlarini rivojlantirishning muhim omillari sifatida ko‘rsatilgan [8].

O‘zbekiston Respublikasida sun’iy intellekt texnologiyalarini rivojlantirish davlat siyosatining ustuvor yo‘nalishlaridan biridir. Prezidentning 2024-yil 14-oktabrdagi PQ-358-son qarori bilan tasdiqlangan strategiyada sun’iy intellekt texnologiyalarini rivojlantirish, ularni turli sohalarga joriy etish va tegishli infratuzilmani shakllantirish vazifalari belgilangan [11].

Shu bilan birga, sun’iy intellektni davlat boshqaruviga joriy etishda ma’lumot-lar sifati, axborot xavfsizligi, algoritmik shaffoflik va malakali mutaxassislar tayyorlash muhim ahamiyatga ega. UNESCO tavsiyalarida ham sun’iy intellektdan foydalanishda inson huquqlari, adolatlilik va javobgarlik tamoyillariga rioya etish zarurligi ta’kidlangan [9].

O‘tkazilgan nazariy tahlil asosida davlat boshqaruviga sun’iy intellektni joriy etishning bosqichma-bosqich yondashuvi taklif etiladi. Ushbu yondashuv davlat organlarining raqamli tayyorgarligini baholash, ma’lumotlarni integratsiya qilish, intellektual tizimlarni ishlab chiqish, sinovdan o‘tkazish va amaliy faoliyatga joriy etishni nazarda tutadi.

O‘zbekiston sharoitida davlat xizmatlari uchun o‘zbek va qoraqalpoq tillarini qo‘llab-quvvatlovchi intellektual yordamchilarni rivojlantirish ham istiqbolli yo‘nalish hisoblanadi. Bunday tizimlar fuqarolarning davlat xizmatlaridan o‘z ona tilida foydalanish imkoniyatlarini kengaytirishi mumkin.

Xulosa

Davlat boshqaruvi tizimida sun’iy intellekt texnologiyalaridan foydalanish davlat xizmatlari sifatini oshirish, ma’muriy jarayonlarni avtomatlashtirish va boshqaruv qaror-larini takomillashtirish uchun yangi imkoniyatlar yaratadi.

Tadqiqot natijalari sun’iy intellektni samarali joriy etish texnologik infratuzilma bilan bir qatorda ma’lumotlar sifati, huquqiy tartibga solish, algoritmik shaffoflik va davlat xizmatchilarining raqamli kompetensiyalariga ham bog‘liq ekanligini ko‘rsatadi.

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O‘zbekistonda qabul qilingan raqamli rivojlanish strategiyalari davlat boshqaruvida sun’iy intellekt texnologiyalarini rivojlantirish uchun muhim asos yaratmoqda. Kelgusida intellektual davlat xizmatlarini kengaytirish, elektron hujjat aylanishini av-tomatlashtirish va milliy tillarga moslashtirilgan sun’iy intellekt tizimlarini yaratish ustuvor vazifalardan biri bo‘lishi mumkin.

Shuningdek, davlat boshqaruvi tizimida sun’iy intellekt texnologiyalarini bosqichma-bosqich joriy etish, davlat organlari o‘rtasida ma’lumotlar almashinuvini takomillashtirish va yagona raqamli infratuzilmani rivojlantirish muhim ahamiyatga ega. Bunda sun’iy intellekt tizimlarining ishonchliligi, axborot xavfsizligi va fuqarolarning shaxsiy ma’lumotlarini himoya qilish talablariga alohida e’tibor qaratish zarur.

Umuman olganda, sun’iy intellekt texnologiyalarini davlat boshqaruviga ilmiy asoslangan va tizimli yondashuv asosida integratsiya qilish boshqaruv samaradorligini oshirish, davlat organlari faoliyatining ochiqligi va shaffofligini ta’minlash hamda fuqarolarga yo‘naltirilgan zamonaviy davlat xizmatlarini shakllantirishga xizmat qiladi. Shu bois ushbu yo‘nalishda ilmiy tadqiqotlarni kengaytirish, innovatsion yechimlarni amaliyotga tatbiq etish va ularning samaradorligini muntazam baholab borish dolzarb vazifalardan biri hisoblanadi.

Foydalanilgan adabiyotlar

1. Zuiderwijk, A., Chen, Y.-C., & Salem, F. (2021). Implications of the use of artificial intelligence in public governance: A systematic literature review and a research agenda. Government Information Quarterly, 38(3), 101577.

2. Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. Government Information Quarterly, 36(2), 368–383.

3. Wirtz, B. W., Weyerer, J. C., & Sturm, B. J. (2020). The Dark Sides of Artificial Intelligence: An Integrated AI Governance Framework for Public Administration. International Journal of Public Administration, 43(9), 818–829.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 09.10.2026
PUBLISHED: 10.10.2026

4. Androutsopoulou, A., Karacapilidis, N., Loukis, E., & Charalabidis, Y. (2019). Transforming the communication between citizens and government through AI-guided chatbots. Government Information Quarterly, 36(2), 358–367.

5. Aoki, N. (2020). An experimental study of public trust in AI chatbots in the public sector. Government Information Quarterly, 37(4), 101490.

6. Al-Mushayt, O. S. (2019). Automating E-Government Services With Artificial Intelligence. IEEE Access, 7, 146821–146829.

7. OECD. (2025). Governing with Artificial Intelligence: The State of Play and Way Forward in Core Government Functions. OECD Publishing.

8. United Nations. (2024). UN E-Government Survey 2024. https://desapublications.un.org/publications/un-e-government-survey-2024.

9. UNESCO. (2021). Recommendation on the Ethics of Artificial Intelligence. https://www.unesco.org/en/legal-affairs/recommendation-ethics-artificial-intelligence.

10. O‘zbekiston Respublikasi Prezidentining 2020-yil 5-oktabrdagi PF-6079-son Farmoni. «Raqamli O‘zbekiston-2030» strategiyasi. https://lex.uz/uz/acts/-5030957.

11. O‘zbekiston Respublikasi Prezidentining 2024-yil 14-oktabrdagi PQ-358-son qarori. «Sun’iy intellekt texnologiyalarini 2030-yilga qadar rivojlantirish strategiyasini tasdiqlash to‘g‘risida». https://lex.uz/ru/acts/-7158604.

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STYLISTIC ANALYSIS OF SYMBOLISM IN KHALED HOSSEINI'S "THE KITE RUNNER"

Zayniyeva Gulchaman Ilhomjon qizi

Teacher, National university of Uzbekistan named after Mirzo Ulugbek

Department of foreign language and literature

gulchamanzayniyeva@gmail.com +99897 002 53 71

Abstract

Khaled Hosseini's debut novel, The Kite Runner (2003), stands as a seminal text in postcolonial Afghan-American literature. While much of the existing scholarship focuses on its thematic exploration of guilt, redemption, and political turmoil, this paper provides a rigorous stylistic analysis of the symbolic elements embedded in the narrative structure and linguistic framework. By applying principles of literary stylistics and cognitive poetics, this study examines how Hosseini utilizes key recurring symbols — most notably the kite, the cleft lip, scars, and dreams — to construct emotional depth, encode psychological states, and reflect historical transformations. The findings reveal that Hosseini's symbolic architecture operates on dual levels: micro-stylistic (foregrounding, figurative language, sensory imagery) and macro-stylistic (narrative parallelism and thematic motifs), bridging individual human experience with broader socio-political realities.

Keywords

Stylistics, Symbolism, Khaled Hosseini, The Kite Runner, Foregrounding, Cognitive Poetics, Afghan Literature.

Introduction

Literary stylistics serves as a bridge between linguistics and literary criticism, analyzing how language choices create aesthetic effects, convey implicit meanings, and shape thematic architecture. Khaled Hosseini's The Kite Runner offers a rich domain for stylistic inquiry due to its evocative imagery, narrative symmetry, and deeply layered symbolic network.

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Symbolism in literature is rarely a passive figurative device; rather, it operates as a dynamic stylistic mechanism that foregrounds narrative tension and psychological progression. While socio-historical readings of Hosseini's work often highlight the backdrop of Afghanistan's political decline—from the monarchy to Soviet invasion and Taliban rule—a stylistic approach unpacks how linguistic and narrative choices imbue physical objects, bodily marks, and abstract visions with symbolic resonance. This study aims to analyze the principal symbols in The Kite Runner through a stylistic lens, demonstrating how language constructs meaning across psychological and socio-political dimensions.

Theoretical Framework and Methodology

This research adopts a stylistic framework grounded in the concepts of foregrounding (Mukarovsky, Short) and cognitive stylistic mapping (Stockwell):

Foregrounding (Deviation and Parallelism): Examines how specific linguistic features stand out against the background of ordinary language to draw reader attention to symbolic importance.

Cognitive Poetics: Analyzes how readers construct mental models (schemas) of physical objects—such as kites or scars—and map emotional or abstract meanings onto them.

The methodology involves qualitative textual analysis, selecting textual evidence where key symbols appear, analyzing their lexical, semantic, and structural foregrounding, and tracing their transformation across the narrative arc of the protagonist, Amir.

Stylistic Analysis of Primary Symbols

The Kite: Freedom, Betrayal, and Redemption

The kite serves as the central macro-symbol of the novel, evolving stylistically from a representation of childhood joy and socio-cultural connection to a poignant emblem of betrayal and ultimate redemption.

Lexical and sensory foregrounding: Hosseini employs dense sensory imagery when describing kite fighting. Words associated with tension, sharpness, and color—

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glass-coated string, paper birds, soaring, slicing, crimson—create a dynamic visual and tactile experience. The physical act of "cutting" another kite foreshadows the psychological severance between Amir and Hassan.

Structural parallelism: The narrative begins and ends with kite flying. In Chapter 1, the sight of winter kites in San Francisco triggers Amir's memory ("uncoiling like a paper snake"), setting the reflective tone. The climax in Chapter 7 (the kite tournament) is immediately juxtaposed with Hassan's assault in the alley. The structural loop closes in Chapter 25, where Amir flies a kite with Sohrab, shifting his role from perpetrator to protector. The repetition of the iconic phrase— "For you, a thousand times over" —acts as a stylistic refrain, signifying the thematic transition from guilt to redemption.

The Cleft Lip and Scars: Embodied Guilt and Atonement

Physical marks on the body function as persistent visual symbols in Hosseini's stylistic repertoire.

Symbolic Mirroring: Hassan is born with a congenital cleft lip, a physical mark of his lower socioeconomic status (Hazara) and vulnerability. Baba pays for surgery to fix Hassan's lip, a gesture that amplifies Amir's jealousy.

Somatic Stylistics: During Amir's violent confrontation with Assef in Kabul, Amir suffers a split upper lip caused by brass knuckles. Stylistically, Hosseini utilizes exact anatomical descriptions to highlight this connection. The scar Amir acquires mirrors Hassan's original cleft lip, symbolizing the physical internalization of his long-suppressed guilt. The scar ceases to be merely an injury; through linguistic convergence, it becomes a permanent badge of atonement.

The Pomegranate Tree: Decay of Innocence

The pomegranate tree at Cemetery Hill acts as a spatial symbol that tracks the trajectory of Amir and Hassan's relationship.

Semantic Contrast and Imagery: Early in the novel, the tree is depicted using vibrant imagery: flourishing green leaves, lush shade, and sweet fruit, symbolizing childhood innocence and fraternal bond.

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Metaphorical Decay: Following the betrayal, Amir confronts Hassan at the tree, throwing pomegranates at him in an attempt to provoke a reaction. The red juice staining their clothes mimics blood, foreshadowing violence and emotional rupture. Years later, when Amir returns to Kabul, the tree is described as "leafless, gnarled, and fruitless." The stylistic shift from vivid vitality to muted, lifeless adjectives underscores the devastation of war and the loss of innocence.

Synthesis and Socio-Political Dimensions

Hosseini's use of symbolism transcends individual psychological arcs, mirroring the micro-macro relationship between the personal lives of his characters and the history of Afghanistan.

Symbol	Micro-Level (Psychological / Individual)	Macro-Level (Socio-Political / Afghan Context)
The Kite	Amir's quest for Baba's love; guilt; redemption.	Traditional Afghan culture, freedom prior to political oppression, hope for rebirth.
The Cleft Lip / Scar	Personal guilt, identity alignment, physical sacrifice.	Division between ethnic groups (Pashtuns and Hazaras), shared suffering, structural trauma.
Pomegranate Tree	Fractured friendship between Amir and Hassan.	The decline and destruction of peaceful, pre-war Afghanistan under conflict.

Conclusion

Through a stylistic analysis of Khaled Hosseini's The Kite Runner, this study demonstrates how linguistic choices—such as sensory foregrounding, thematic refrains, structural parallelism, and spatial imagery—transform physical objects and bodily conditions into complex symbols. The kite, the scar, and the pomegranate tree

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do not merely decorate the narrative prose; they actively drive the cognitive processing of the novel's core themes: betrayal, trauma, and moral recovery. By anchoring abstract emotional states to concrete, recurring linguistic symbols, Hosseini achieves a stylistic resonance that unifies the personal journey of his protagonist with the collective destiny of a nation.

References

Hosseini, K. (2003). The Kite Runner. New York: Riverhead Books.

Mukarovsky, J. (1964). Standard Language and Poetic Language. A Prague School Reader on Esthetics, Literary Structure, and Style.

Short, M. (1996). Exploring the Language of Poems, Plays and Prose. London: Longman.

Stockwell, P. (2002). Cognitive Poetics: An Introduction. Routledge.

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IMPROVING THE METHODOLOGY FOR DEVELOPING STUDENTS' METACOGNITIVE COMPETENCIES THROUGH THE TEACHING OF PEDAGOGICAL DISCIPLINES IN HIGHER EDUCATION

Melliyeva Dilfuza O'ralovna

Lecturer, Department of Primary Education Methodology, Faculty of Pedagogy,

Denov Institute of Entrepreneurship and Pedagogy

Email: d.meliyeva@dtpi.uz ORCID ID: 0009-0005-7397-5233

Abstract

This article examines the methodological foundations for developing metacognitive competencies in future primary school teachers through an integrated system of pedagogical learning tasks. Particular attention is paid to the cognitive, regulatory, and reflective criteria for assessing metacognitive competence. The study substantiates the use of metacognitive awareness questionnaires, pedagogical case studies, the think-aloud method, reflective journals, and assessment rubrics to monitor students' learning processes. A didactic technological map is proposed to integrate primary education subjects and organize metacognitive tasks across successive stages of learning, including diagnosis, planning, modeling, self-monitoring, correction, and reflection. The proposed approach aims to enhance students' reflective and analytical thinking, independent learning, strategic decision-making, and ability to transfer acquired knowledge into authentic pedagogical practice. The findings provide a methodological basis for designing an integrated model for developing metacognitive competencies in future primary school teachers and improving their professional preparation.

Keywords

Metacognitive competence, future primary school teachers, higher education, pedagogical disciplines, metacognitive learning tasks, cognitive processes, self-regulated learning, reflective thinking, didactic integration, pedagogical strategies,

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self-monitoring, reflective assessment, professional competence, primary education methodology.

СОВЕРШЕНСТВОВАНИЕ МЕТОДИКИ РАЗВИТИЯ МЕТАКОГНИТИВНЫХ КОМПЕТЕНЦИЙ СТУДЕНТОВ ПОСРЕДСТВОМ ПРЕПОДАВАНИЯ ПЕДАГОГИЧЕСКИХ ДИСЦИПЛИН В ВЫСШЕМ ОБРАЗОВАНИИ

Ключевые слова: метакогнитивная компетентность, будущие учителя начальных классов, высшее образование, педагогические дисциплины, метакогнитивные учебные задания, когнитивные процессы, саморегулируемое обучение, рефлексивное мышление, дидактическая интеграция, педагогические стратегии, самоконтроль, рефлексивное оценивание,

Аннотация: В статье рассматриваются методологические основы развития метакогнитивных компетенций будущих учителей начальных классов посредством интегрированной системы педагогических учебных заданий. Особое внимание уделяется когнитивным, регулятивным и рефлексивным критериям оценки метакогнитивной компетентности. Обосновывается применение опросников для оценки метакогнитивной осведомлённости, анализа педагогических кейсов, метода мышления вслух, рефлексивных дневников и оценочных рубрик для мониторинга учебной деятельности студентов. Предлагается дидактическая технологическая карта, направленная на интеграцию учебных предметов начального образования и последовательную организацию метакогнитивных заданий на различных этапах обучения, включая диагностику, планирование, моделирование, самоконтроль, коррекцию и рефлексию. Предлагаемый подход направлен на развитие рефлексивного и аналитического мышления студентов, навыков самостоятельного обучения, стратегического принятия решений и способности переносить приобретённые знания в реальные условия педагогической практики. Результаты исследования

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профессиональная компетентность, методика начального образования.

создают методологическую основу для разработки целостной модели развития метакогнитивных компетенций будущих учителей начальных классов и совершенствования их профессиональной подготовки.

OLIY TA’LIMDA PEDAGOGIK FANLARNI O‘QITISH ORQALI TALABALARNING METAKOGNITIV KOMPETENSIYALARINI RIVOJLANTIRISH METODIKASINI TAKOMILLASHTIRISH

Kalit so‘zlar: metakognitiv kompetentlik, bo‘lajak boshlang‘ich sinf o‘qituvchilari, oliy ta’lim, pedagogik fanlar, metakognitiv o‘quv topshiriqlari, kognitiv jarayonlar, o‘zini o‘zi boshqarib o‘qish, refleksiv tafakkur, didaktik integratsiya, pedagogik strategiyalar, o‘z-o‘zini nazorat qilish, refleksiv baholash, kasbiy kompetentlik, boshlang‘ich ta’lim metodikasi.

Annotatsiya: Mazkur maqolada integratsiyalashgan pedagogik o‘quv topshiriqlari tizimi orqali bo‘lajak boshlang‘ich sinf o‘qituvchilarining metakognitiv kompetensiyalarini rivojlantirishning metodologik asoslari yoritilgan. Metakognitiv kompetentlikni baholashning kognitiv, regulyativ va refleksiv mezonlariga alohida e’tibor qaratilgan. Talabalarning o‘quv faoliyatini monitoring qilishda metakognitiv xabardorlikni aniqlash so‘rovnomalari, pedagogik keyslar tahlili, ovoz chiqarib fikrlash metodi, refleksiv kundaliklar va baholash mezonlari asosidagi rubrikalardan foydalanishning ahamiyati asoslab berilgan. Shuningdek, boshlang‘ich ta’lim fanlarini integratsiyalash hamda ta’limning izchil bosqichlarida metakognitiv topshiriqlarni tashkil etishga yo‘naltirilgan didaktik texnologik xarita taklif etilgan. Mazkur xarita diagnostika, rejalashtirish, modellashtirish, o‘z-o‘zini monitoring qilish, korreksiya va refleksiya bosqichlarini qamrab oladi. Taklif etilayotgan yondashuv talabalarning refleksiv va tahliliy tafakkurini, mustaqil ta’lim olish ko‘nikmalarini, strategik qarorlar qabul qilish qobiliyatini hamda egallangan bilimlarni real pedagogik amaliyotga tatbiq etish salohiyatini rivojlantirishga xizmat qiladi. Tadqiqot natijalari bo‘lajak boshlang‘ich sinf o‘qituvchilarining metakognitiv kompetensiyalarini rivojlantirishning yaxlit modelini ishlab chiqish

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va ularning kasbiy tayyorgarligini takomillashtirish uchun metodologik asos bo‘lib xizmat qiladi.

The process of assessing the metacognitive competence of future primary school teachers is based on the integration of cognitive, regulatory, and reflective criteria. In this process, the cognitive criterion determines the extent to which students understand their own cognitive processes and possess pedagogical strategies, while the regulatory criterion measures their ability to independently plan and monitor learning activities and flexibly adapt didactic methods [5, pp. 199–218]. The reflective criterion, in turn, determines students’ capacity to analyze their personal mistakes and achievements and transfer the experience gained directly into school practice.

To assess these indicators, metacognitive awareness questionnaires, pedagogical case study analysis, the think-aloud method, and reflective journals are used in an integrated manner. The assessment process is organized through diagnostic, formative, and summative approaches. The diagnostic stage identifies students’ initial learning difficulties; the formative stage relies on assessment rubrics, self-assessment, and peer assessment during lessons; and the summative stage includes the evaluation of final portfolios and the defense of pedagogical projects. This approach promotes the development of future teachers’ reflective and analytical thinking and enables their systematic preparation for conscious professional practice.

Figure 2.2.2-c. Designing a System of Metacognitive Learning Tasks Based on the Integration of Subjects in Primary Education

To demonstrate the practical application of the metacognitive learning task system substantiated above in the context of practical classes, a specialized didactic technological map was developed based on the content of the main modules of the Pedagogy of Primary Education course. This structured educational matrix reflects the continuous sequence of metacognitive strategies, pedagogical tasks, and self-monitoring mechanisms adapted to develop students’ reflective and analytical thinking at each stage of a lesson (Table 2.2.1).

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Table 2.2.1

Didactic Technological Map for Designing a System of Metacognitive Learning Tasks Based on the Integration of Primary Education Subjects

No.	Lesson stages and duration	Content of integrated subjects	Types and objectives of metacognitive learning tasks	Cognitive and metacognitive activity methods	Expected outcomes and assessment methods
1	Organizational and motivational stage (5–7 minutes)	Mother Tongue and Reading Literacy + Natural Sciences: concepts representing ecological and natural phenomena in a text	Perceptual-diagnostic tasks: questions and discussions aimed at identifying students' individual cognitive abilities and existing knowledge of the topic	"Know – Want to Know – Learned" (KWL) strategy, brainstorming, diagnosis of cognitive barriers	Prior knowledge is activated, and learning objectives are identified
2	Planning and modeling stage (10–12 minutes)	Mathematics + Mother Tongue: semantic analysis of word problems and mathematical modeling	Strategic tasks (Level 1): developing a plan for solving an integrated problem, selecting and comparing algorithms	Think-aloud method, intellectual mapping, algorithmic analysis	A rational problem-solving strategy is selected, and the steps are planned
3	Activity-based	Mathematics + Natural Sciences	Strategic-corrective tasks (Level 2):	Modeling, comparative	Interdisciplinary

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	integration stage (15–18 minutes)	+ Technology: quantitative analysis of natural laws and the development of practical visual models	cognitive conflict-based cases, error identification, and strategy correction	analysis, pair work, problem-based inquiry methods	connections are applied in practice, and self-correction is implemented
4	Reflective assessment and transfer stage (8–10 minutes)	Primary Education Methodology: applying acquired knowledge to lesson plans	Integrative-transformative tasks (Level 3): transferring knowledge to new pedagogical situations and analyzing personal experience	Reflective journals, analysis using assessment rubrics, transfer exercises	Individual thinking strategies are objectively assessed, and methodological models are developed

The didactic technological map and the multilevel content-and-activity-based framework analyzed above constitute an important practical stage in differentiating the cognitive processes of future primary school teachers, identifying their individual cognitive trajectories, and adapting instruction to their metacognitive needs. By improving students' ability to systematize pedagogical information, construct concept maps, and work with key cognitive cues and assessment rubrics, their reflective and analytical thinking, design skills, and professional-methodological competencies are continuously developed. In this process, every prospective specialist, regardless of their learning pace, thinking style, or intellectual potential, gains a solid practical foundation that enables them to consciously plan their independent learning strategies, monitor their progress, identify emerging didactic difficulties in a timely manner, and correct them constructively. The system of learning tasks developed within the framework of this research is intended to transform future teachers from

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passive recipients of knowledge acquired through reproductive learning into active managers of their own learning and cognitive activities, that is, into metacognitive agents. The systematic relationships established among the main components of the Pedagogy of Primary Education course foster a holistic approach to educational content. This, in turn, helps prevent excessive cognitive load during lessons, facilitates multidimensional comprehension of learning materials, and contributes to overcoming barriers to pedagogical thinking.

The gradual design of metacognitive tasks based on the modules of the Pedagogy of Primary Education course serves as an initial foundation for developing holistic pedagogical thinking in students. The mechanisms for modeling learning materials at perceptual-diagnostic, strategic-corrective, and integrative-transformative levels not only provide future teachers with thorough theoretical and academic preparation but also develop their ability to anticipate and analyze non-standard pedagogical situations that may arise in real school practice and to make optimal methodological decisions. This didactic preparation establishes the necessary pedagogical conditions for future teachers to independently design lesson plans, create active learning environments that take into account the developmental characteristics of primary school pupils, and adapt flexibly to the requirements of contemporary national curricula. These content-and-activity-based frameworks, which have been successfully developed and tested, provide a direct foundation for the next logical stage of the research: developing a comprehensive methodological model for fostering metacognitive competencies in future primary school teachers and substantiating the mechanisms for its practical implementation.

REFERENCES

1. Ministry of Preschool and School Education of the Republic of Uzbekistan. *National Curriculum for General Secondary Education*. Tashkent, 2022.

2. Avloniy A. *Turkic Gulistan or Morality* (*Turkiy guliston yoxud axloq*). Tashkent: O‘qituvchi, 1992. 160 p.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 09.10.2026
PUBLISHED: 10.10.2026

3. Khodjayev B.Kh. *Theory and Practice of General Pedagogy*. Tashkent: Sano-standart, 2017. 416 p.

4. Hasanboyev J., To‘raqulov Kh., Haydarov M., et al. *Pedagogy*. Tashkent: Fan va texnologiya, 2011. 512 p.

5. Tolipov O‘., Usmonboyeva M. *Applied Foundations of Pedagogical Technologies*. Tashkent: Fan, 2006. 260 p.

6. Piaget J. *The Psychology of Intelligence*. London: Routledge, 2001. 182 p.

7. Vygotsky L.S. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press, 1978. 159 p.

8. Bruner J.S. *The Process of Education*. Cambridge, MA: Harvard University Press, 1960. 97 p.

9. Bloom B.S. (Ed.). *Taxonomy of Educational Objectives: Handbook I. Cognitive Domain*. New York: Longmans, Green and Co., 1956. 207 p.

10. Dewey J. *Democracy and Education*. New York: Macmillan, 1916. 434 p.

11. Anderson L.W., Krathwohl D.R. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives*. New York: Longman, 2001. 352 p.

12. OECD. *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. Paris: OECD Publishing, 2023.

13. Mullis I.V.S., Martin M.O. *PIRLS 2021 International Results in Reading*. Amsterdam: IEA, 2023.

14. Mullis I.V.S., Martin M.O. *TIMSS 2023 International Results in Mathematics and Science*. Boston College, 2024.

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LINGUISTIC AND SOCIOLINGUISTIC FEATURES OF ENGLISH LOANWORDS IN THE UZBEK LANGUAGE

Xolmatova Dilshodaxon Abdullayevna

Deputy Mayor of Fergana City, Head of the Family and Women's Affairs Department.

ORCID: 0009-0007-5239-3220 Email: xolmatovad74@gmail.com

Abstract

This article analyzes the linguistic and sociolinguistic features of lexical units borrowed from English into modern Uzbek. As a result of globalization and the development of digital technologies, education, business, mass media, and social networks, the number of English-origin words in the Uzbek vocabulary and the scope of their use are expanding. The study examines the semantic, phonetic, graphic, morphological, and functional characteristics of these borrowings, as well as the processes through which they adapt to the Uzbek language. It highlights the role of sociolinguistic factors such as age, professional activity, communicative environment, level of education, and the use of the internet and social networks in the use of English loanwords. The analysis demonstrates that English borrowings have become one of the active sources enriching the modern Uzbek lexicon; however, their use is directly influenced by literary language norms, the availability of Uzbek equivalents, and the communicative context.

Keywords

Uzbek language, English language, loanwords, English borrowings, neologism, lexicon, sociolinguistics, globalization, language contact, language change

O‘ZBEK TILIDA INGLIZCHA O‘ZLASHMALARNING LINGVISTIK VA SOTSIOLINGVISTIK XUSUSIYATLARI

Xolmatova Dilshodaxon Abdullayevna

Farg‘ona shahar hokimi o‘rinbosari, Oila va xotin-qizlar bo‘limi boshlig‘i.

ORCID: 0009-0007-5239-3220 Email: xolmatovad74@gmail.com

Anotatsiya. *Mazkur maqolada zamonaviy o‘zbek tilida ingliz tilidan o‘zlashayotgan leksik birliklarning lingvistik va sotsiolingvistik xususiyatlari tahlil*

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qilinadi. Globallashuv, raqamli texnologiyalar, ta'lim, biznes, ommaviy axborot vositalari va ijtimoiy tarmoqlarning rivojlanishi natijasida o'zbek tilining lug'at tarkibida inglizcha kelib chiqishga ega bo'lgan birliklar soni va qo'llanish doirasi kengayib bormoqda. Tadqiqotda o'zlashmalarning semantik, fonetik, grafik, morfologik va funksional xususiyatlari, shuningdek, ularning o'zbek tiliga moslashuv jarayonlari yoritiladi. Inglizcha o'zlashmalarning qo'llanishida yosh, kasbiy faoliyat, kommunikativ muhit, ta'lim darajasi, internet va ijtimoiy tarmoqlardan foydalanish kabi sotsiolingvistik omillarning roli ko'rsatib beriladi. Tahlil natijasida inglizcha o'zlashmalar zamonaviy o'zbek tilining lug'aviy tarkibini boyituvchi faol manbalardan biriga aylanayotgani, biroq ularning qo'llanishi adabiy til me'yorlari, o'zbekcha muqobillarning mavjudligi va kommunikativ vaziyat bilan bevosita bog'liq ekanligi asoslanadi.

Kalit so'zlar: *bo'zbek tili, ingliz tili, o'zlashma so'zlar, inglizcha o'zlashmalar, neologizm, leksika, sotsiolingvistika, globallashuv, til kontakti, til o'zgarishi.*

Kirish

Til jamiyat bilan uzviy aloqada rivojlanadigan murakkab ijtimoiy hodisa bo'lib, uning lug'at tarkibi jamiyatdagi iqtisodiy, siyosiy, ilmiy, texnologik va madaniy o'zgarishlarni bevosita aks ettiradi. Ayniqsa, globallashuv va raqamli kommunikatsiya sharoitida turli tillar o'rtasidagi aloqalarning kuchayishi natijasida bir tildan ikkinchi tilga leksik birliklarning o'tishi tabiiy jarayonga aylanmoqda.

Bugungi kunda o'zbek tilining lug'aviy tarkibida ingliz tilidan o'zlashgan yoki ingliz tili vositasida ommalashgan ko'plab birliklarni uchratish mumkin. Bunday birliklar, ayniqsa, axborot texnologiyalari, iqtisodiyot, biznes, ta'lim, sport, moda, ommaviy madaniyat va internet kommunikatsiyasi sohalarida faol qo'llanmoqda.

Masalan, ***internet, blog, blogger, marketing, menejer, biznes, startap, onlayn, oflayn, brend, trend, kontent, platforma, servis, smartfon, chat, podkast, striming*** kabi birliklar turli kommunikativ vaziyatlarda keng qo'llanmoqda.

O'zlashma birliklarning tilga kirib kelishi faqat lug'at tarkibining miqdoriy kengayishi bilan chegaralanmaydi. Ular o'zbek tilining fonetik, grafik, morfologik va

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semantik tizimiga moslashadi. Ayrim birliklar o‘zbek tilida mustaqil leksema sifatida shakllansa, boshqalari o‘zbekcha affikslarni qabul qilib, yangi so‘z shakllarini hosil qiladi.

Masalan, ingliz tilidan o‘zlashgan ***blog, biznes, marketing, startap*** kabi birliklarning o‘zbekcha nutqda turli grammatik shakllarda qo‘llanishi ularning til tizimiga moslashayotganini ko‘rsatadi.

Shu jihatdan inglizcha o‘zlashmalarni faqat leksikologik nuqtayi nazardan emas, balki sotsiolingvistik jihatdan ham o‘rganish muhimdir.

Til kontaktlari va o‘zlashma birliklar masalasi umumiy tilshunoslikda uzoq tarixga ega. Tilshunoslikda o‘zlashmalar til tizimlari o‘rtasidagi aloqaning tabiiy natijasi sifatida qaraladi. O‘zbek tilining lug‘aviy tarkibi ham tarixiy jihatdan turli tillar bilan aloqalar natijasida shakllangan. Arab, fors-tojik, rus va boshqa tillardan kirib kelgan birliklar o‘zbek tilining lug‘at tarkibidan mustahkam o‘rin olgan.

Bugungi davrda esa ingliz tili yangi o‘zlashmalarning faol manbalaridan biriga aylanmoqda. Bunga, avvalo, ingliz tilining xalqaro ilmiy, texnologik, iqtisodiy va kommunikativ maydondagi mavqeyi sabab bo‘lmoqda.

O‘zbekistonda ingliz tilining ta’lim, xalqaro hamkorlik, axborot texnologiyalari va professional kommunikatsiyadagi qo‘llanish doirasining kengayishi ham inglizcha birliklarning o‘zbek tilidagi faollashuviga ta’sir ko‘rsatmoqda.

OAK materiallarida ham zamonaviy o‘zbek tilidagi o‘zlashmalar, ularning imlosi va lug‘at tarkibidagi o‘rni bilan bog‘liq masalalar tadqiqot predmeti sifatida ko‘rinadi. Jumladan, inglizcha yoki ingliz tili orqali boshqa tillardan o‘zlashayotgan birliklarning o‘zbek tili imlosiga moslashuvi va ularni lug‘atlarda berish mezonlari bo‘yicha tadqiqotlar mavjud.

O‘zlashma birliklarning tarqalishi jamiyatdagi ijtimoiy guruhlar va kommunikativ muhitga qarab farqlanadi.

Ayniqsa, yoshlar nutqida inglizcha birliklarning faol qo‘llanishi kuzatiladi. Buning asosiy sabablaridan biri internet va ijtimoiy tarmoqlarning yoshlar kommunikatsiyasidagi o‘rnining kuchayishidir.

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Masalan, quyidagi birliklar yoshlar va raqamli kommunikatsiya muhitida faol uchrashi mumkin:***like, post, story, follow, repost, comment, online, offline, chat, trend, content.***

Ularning ayrimlari o‘zbekcha muqobillarga ega bo‘lsa-da, inglizcha shakl kommunikativ jihatdan ixcham yoki zamonaviyroq deb qabul qilinishi mumkin.

Shu sababli o‘zlashmalarning qo‘llanishi faqat “muqobil mavjud yoki mavjud emas” tamoyili bilan izohlanmaydi. Unda kommunikativ qulaylik, guruhga mansublik, kasbiy identifikatsiya va zamonaviylik kabi omillar ham ishtirok etadi.

Bugungi kunda ijtimoiy tarmoqlar yangi so‘z va iboralarning tez tarqalish mexanizmlaridan biridir. An’anaviy kommunikatsiyada yangi birlikning keng ommaga kirib borishi nisbatan uzoq vaqt talab qilishi mumkin. Raqamli kommunikatsiyada esa yangi birliklar qisqa muddatda katta auditoriyaga tarqalishi mumkin.

Bu jarayon o‘zbek tilining lug‘at tarkibida dinamik o‘zgarishlarni yuzaga keltirmoqda. Masalan, ***post, like, repost, story, follower, blogger, trend, kontent*** kabi birliklarning keng qo‘llanishi raqamli kommunikatsiyaning leksik tizimga ta’sirini ko‘rsatadi. Shu bilan birga, ushbu birliklarning ayrimlari vaqtinchalik moda xarakteriga ega bo‘lishi, ayrimlari esa uzoq muddat davomida faol qo‘llanib, til tizimida mustahkamlanishi mumkin.

Xulosa

Zamonaviy o‘zbek tilida inglizcha o‘zlashmalarning ko‘payishi globallashuv, raqamli texnologiyalar, xalqaro ta’lim, biznes va ommaviy kommunikatsiya bilan bevosita bog‘liq. Inglizcha o‘zlashmalar o‘zbek tiliga kirib kelish jarayonida fonetik, grafik, morfologik va semantik jihatdan moslashadi. Ularning ayrimlari o‘zbek tilining faol lug‘aviy qatlamiga kirib, o‘zbekcha grammatik qo‘shimchalarni qabul qilmoqda.

O‘zlashmalarning tarqalishida ijtimoiy omillar ham muhim ahamiyatga ega. Xususan, yosh, kasbiy faoliyat, ta’lim, internetdan foydalanish darajasi va kommunikativ muhit inglizcha birliklarning qo‘llanish chastotasiga ta’sir ko‘rsatadi.

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Tadqiqot shuni ko‘rsatadiki, inglizcha o‘zlashmalarni faqat “chet tilidan kirgan so‘zlar” sifatida emas, balki o‘zbek tilining zamonaviy rivojlanish jarayonlarini aks ettiruvchi lingvistik va sotsiolingvistik hodisa sifatida o‘rganish zarur.

Kelgusidagi tadqiqotlarda o‘zbek tilidagi inglizcha o‘zlashmalarning chastotaviy ko‘rsatkichlarini korpus materiallari asosida aniqlash, ularning yosh guruhlari va kasbiy qatlamlar bo‘yicha qo‘llanishini statistik jihatdan tahlil qilish hamda o‘zlashmalarning o‘zbek tilida mustahkamlanish mezonlarini ishlab chiqish maqsadga muvofiqdir.

References

1. McCloskey M., Rapp B. Developmental dysgraphia: An overview and framework for research // Cognitive Neuropsychology. 2017. Vol. 34(3–4). P. 65–82. DOI: 10.1080/02643294.2017.1369016.

2. Niolaki G. Z., Negoita A., Vousden J. I., Terzopoulos A. R., Taylor L., Masterson J. What spelling errors can tell us about the development of processes involved in children’s spelling // Frontiers in Psychology. 2023. Vol. 14. Article 1178427. DOI: 10.3389/fpsyg.2023.1178427.

3. Hepner C., McCloskey M., Rapp B. Do reading and spelling share orthographic representations? Evidence from developmental dysgraphia // Cognitive Neuropsychology. 2017. Vol. 34(3–4). P. 119–143. DOI: 10.1080/02643294.2017.1375904.

4. Niolaki G. Z., Masterson J. Transfer effects in spelling from transparent Greek to opaque English in seven-to-ten-year-old children // Bilingualism: Language and Cognition. 2012. Vol. 15(4). P. 757–770. DOI: 10.1017/S1366728911000721.

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THE PEDAGOGICAL MODEL FOR DEVELOPING NATIONAL VALUES IN STUDENTS THROUGH LEGAL EDUCATION AND MECHANISMS FOR ITS PRACTICAL IMPLEMENTATION

Tursunboyeva Xushnozbegim Dilmurod qizi

Law and Character Education Teacher at General Secondary School No. 10

xushnozbegim200220@gmail.com

Abstract

This article provides a theoretical examination of the pedagogical model for developing national values in students through legal education and the mechanisms for implementing it in educational practice. The aim of the study is to substantiate a pedagogical model designed to develop such qualities as respect for human dignity, justice, responsibility, compliance with the law, and awareness of civic duty by integrating legal knowledge with national values. In this context, national values are considered not as concepts that replace legal norms, but as an educational resource that helps students understand their social and moral significance.

The study employs theoretical analysis of relevant scientific and pedagogical literature, comparison, generalization, and pedagogical modeling. The proposed model encompasses target, content-related, organizational-methodological, and assessment components. Its content is based on the interrelationship between rights and responsibilities, respect for individual rights, family and community responsibility, solidarity, and respect for cultural heritage. To implement the model in practice, the article proposes the use of problem-based legal scenarios, discussions, role-playing activities, project-based learning, and cooperation among families, schools, and mahallas.

The effectiveness of the model is assessed according to students' knowledge of legal concepts, their ability to interpret value-related situations with sound reasoning, explain the consequences of their decisions, and demonstrate responsibility in collaborative activities. The article also discusses the use of observation, scenario-based tasks, and student reflection as assessment methods. As the article is theoretical

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and methodological in nature, it emphasizes the need for future experimental research to verify the practical effectiveness of the proposed model.

Keywords

Legal education, national values, pedagogical model, legal culture, civic responsibility, value-oriented education, pedagogical mechanisms, family–school–mahalla cooperation

HUQUQIY TA’LIM JARAYONIDA O‘QUVCHILARDA MILLIY QADRIYATLARNI SHAKLLANTIRISHNING PEDAGOGIK MODELI VA UNI AMALIYOTGA TATBIQ ETISH MEXANIZMLARI

Tursunboyeva Xushnozbegim Dilmurod qizi

10 - umumiy o’rta ta’lim maktabi huquq va tarbiya o’qituvchisi

xushnozbegim200220@gmail.com

Annotatsiya

Maqolada huquqiy ta’lim jarayonida o‘quvchilarda milliy qadriyatlarni shakllantirishning pedagogik modeli va uni ta’lim amaliyotiga tatbiq etish mexanizmlari nazariy jihatdan yoritiladi. Tadqiqotning maqsadi huquqiy bilimlarni milliy qadriyatlar bilan uyg‘unlashtirish orqali o‘quvchilarda inson qadriga hurmat, adolat, mas’uliyat, qonunlarga rioya qilish va fuqarolik burchini anglash kabi sifatlarni rivojlantirishga yo‘naltirilgan pedagogik modelni asoslashdan iborat. Bunda milliy qadriyatlar huquqiy me’yorlarni almashtiruvchi tushuncha sifatida emas, balki ularning ijtimoiy va axloqiy mazmunini anglashga yordam beruvchi tarbiyaviy manba sifatida ko‘rib chiqiladi.

Tadqiqotda mavzuga oid ilmiy-pedagogik adabiyotlarni nazariy tahlil qilish, qiyoslash, umumlashtirish va pedagogik modellashtirish usullaridan foydalanish nazarda tutiladi. Taklif etilayotgan model maqsadli, mazmuniy, tashkiliy-metodik va baholash komponentlarini qamrab oladi. Modelning mazmuniy asosini huquq va majburiyatlarning o‘zaro bog‘liqligi, shaxs huquqlariga hurmat, oilaviy va jamoaviy mas’uliyat, hamjihatlik hamda madaniy merosga ehtirom tashkil etadi. Uni amaliyotga tatbiq etish uchun muammoli huquqiy vaziyatlarni tahlil qilish, munozara,

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rolli mashg‘ulotlar, loyiha faoliyati va oila–maktab–mahalla hamkorligidan foydalanish taklif etiladi.

Model samaradorligini baholashda o‘quvchilarning huquqiy tushunchalarni bilishi, qadriyatlar bilan bog‘liq vaziyatlarni asosli talqin qilishi, qarorlarining oqibatlarini tushuntirishi va hamkorlikdagi faoliyatda mas’uliyat ko‘rsatishi mezon sifatida belgilanadi. Baholashni kuzatuv, vaziyatli topshiriqlar va o‘quvchi refleksiyasi orqali tashkil etish imkoniyatlari yoritiladi. Maqola nazariy-metodik xarakterga ega bo‘lib, taklif etilgan modelning amaliy samaradorligini tasdiqlash uchun keyinchalik tajriba-sinov tadqiqotini o‘tkazish zarurligi ta’kidlanadi.

Kalit so‘zlar: huquqiy ta’lim, milliy qadriyatlar, pedagogik model, huquqiy madaniyat, fuqarolik mas’uliyati, qadriyatga yo‘naltirilgan ta’lim, pedagogik mexanizmlar, oila–maktab–mahalla hamkorligi.

Kirish

Huquqiy ta’lim o‘quvchilarning qonunlar, huquqlar va majburiyatlar haqidagi bilimlarini shakllantirish bilan birga, ularni kundalik hayotda asosli qaror qabul qilishga tayyorlashni ham nazarda tutadi. O‘quvchi huquqiy me’yorning mazmunini bilishi, uning muayyan vaziyatda qanday qo‘llanishini tushunishi va o‘z xatti-harakatining boshqalarga ta’sirini baholay olishi zarur. Shu jihatdan huquqiy ta’limni milliy qadriyatlar bilan uyg‘unlashtirish inson qadriga hurmat, adolat, halollik, mas’uliyat va hamjihatlik tushunchalarining amaliy mazmunini ochishga xizmat qilishi mumkin.

Milliy qadriyatlar xalqning tarixiy tajribasi, madaniy merosi va ijtimoiy munosabatlarida shakllangan axloqiy mezonlarni qamrab oladi. Oilaga ehtirom, kattalarni hurmat qilish, o‘zaro yordam, mahalla hayotida ishtirok etish va jamoa oldidagi mas’uliyat shular jumlasidandir. Huquqiy ta’limda ushbu qadriyatlarni yoritish ularning shaxs huquqlari, tenglik va erkin tanlov bilan munosabatini tushuntirishni talab etadi. Bunda an’ana yoki jamoaning fikri shaxs huquqlarini cheklash uchun asos sifatida talqin qilinmasligi lozim. Pedagogik yondashuv

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o‘quvchiga milliy qadriyatlarga hurmat bilan munosabatda bo‘lish hamda turli vaziyatlarni huquqiy mezonlar asosida baholash imkonini berishi kerak.

Mavzuning pedagogik muammosi huquqiy bilim, qadriyatga munosabat va amaliy xulq-atvor o‘rtasidagi bog‘liqlikni ta’minlashdan iborat. Masalan, o‘quvchi adolat yoki mas’uliyat tushunchasiga ta’rif bera olishi uning nizoli vaziyatda adolatli qaror chiqarishini avtomatik ravishda anglatmaydi. Shu sababli ta’lim mazmunida tushunchalarni o‘zlashtirish bilan bir qatorda, vaziyatni tahlil qilish, manfaatlar va huquqlarni farqlash, muqobil yechimlarni taqqoslash hamda qarorni dalillar bilan asoslashga yo‘naltirilgan topshiriqlar bo‘lishi zarur. Milliy qadriyatlarning tarbiyaviy imkoniyati ham aynan shunday faoliyat orqali ochilishi mumkin.

Mazkur masalani o‘rganishda qadriyatlarni shakllantirish va ularni baholash chegaralarini aniqlashtirish muhimdir. O‘quvchining qadriyatlarni o‘zlashtirganlik darajasini faqat u bildirgan fikrlar yoki o‘qituvchi kutgan javoblar orqali baholash yetarli emas. O‘quvchi muammoli vaziyatni qanday tushuntirishi, boshqa shaxsning huquqlarini hisobga olishi, o‘z qarorini asoslay olishi va hamkorlikdagi vazifalarni qanday bajarishi ham e’tiborga olinishi kerak. Baholash shaxsiy e’tiqodni nazorat qilishga emas, huquqiy mulohaza yuritish va mas’uliyatli ishtirok etish ko‘nikmalarini aniqlashga yo‘naltiriladi.

Huquqiy ta’lim orqali milliy qadriyatlarni shakllantirish uchun dars, sinfdan tashqari faoliyat va maktabdagi kundalik munosabatlar o‘rtasida izchillik zarur. Darsda hurmat va adolat haqida tushuncha berilib, maktab muhitida o‘quvchining fikri tinglanmasa yoki unga nisbatan bir xil mezonlar qo‘llanmasa, ta’limning tarbiyaviy ta’siri cheklanishi mumkin. Shuning uchun pedagogik model o‘quv materiallari va metodlar bilan birga, o‘qituvchi–o‘quvchi muloqoti, sinf qoidalarini muhokama qilish, hamkorlikdagi faoliyat hamda oila va mahalla bilan aloqalarni ham qamrab olishi lozim.

Tadqiqotning maqsadi huquqiy ta’lim jarayonida o‘quvchilarda milliy qadriyatlarni shakllantirishga yo‘naltirilgan pedagogik modelni nazariy asoslash va uni amaliyotga tatbiq etish mexanizmlarini belgilashdan iborat. Ushbu maqsadga

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erishish uchun huquqiy ta’lim va milliy qadriyatlarning mazmuniy aloqalarini aniqlash, model komponentlarini ishlab chiqish, o‘quv faoliyatini tashkil etish usullarini tavsiflash hamda baholash mezonlarini belgilash vazifalari qo‘yiladi.

Maqolaning asosiy tadqiqot savoli quyidagicha ifodalanadi: huquqiy bilimlarni milliy qadriyatlar bilan uyg‘unlashtirish o‘quvchilarning huquqiy mulohaza yuritishi va mas’uliyatli xulq-atvorini rivojlantirishga xizmat qilishi uchun qanday pedagogik shart-sharoitlar yaratilishi kerak? Taklif etilayotgan yondashuvda maqsad, mazmun, o‘quv faoliyati va baholashning o‘zaro muvofiqligi modelning asosiy tamoyili sifatida olinadi. Tadqiqot nazariy-metodik xarakterga ega bo‘lib, modelning samaradorligi haqidagi xulosalar keyingi tajriba-sinov ishlari orqali tekshirilishi lozim.

Materiallar va metodlar

Mazkur maqola huquqiy ta’lim jarayonida o‘quvchilarda milliy qadriyatlarni shakllantirishga yo‘naltirilgan pedagogik modelni ishlab chiqishga qaratilgan nazariy-metodik tadqiqot sifatida tashkil etiladi. Tadqiqot doirasida yangi empirik ma’lumotlar, o‘quvchilar o‘rtasida o‘tkazilgan so‘rovnoma natijalari yoki tajriba-sinov ko‘rsatkichlari taqdim etilmaydi. Metodologik yondashuv huquqiy bilim, qadriyatlarni anglash va mas’uliyatli faoliyat o‘rtasidagi bog‘liqlikni tushuntirish hamda ushbu bog‘liqlikni ta’lim jarayonida ta’minlash mexanizmlarini modellashtirishga asoslanadi.

Tadqiqotning obyekti umumiy o‘rta ta’lim muassasalaridagi huquqiy ta’lim va unga bog‘liq tarbiyaviy faoliyatdir. Tadqiqot predmeti huquqiy mazmunni milliy qadriyatlar bilan uyg‘unlashtirishning pedagogik shartlari, o‘quv faoliyatini tashkil etish usullari va natijalarni baholash mezonlaridan iborat. O‘quvchilarning yosh xususiyatlari, huquqiy tushunchalarni anglash darajasi hamda kundalik ijtimoiy tajribasi modelni amaliyotga moslashtirishda hisobga olinadigan omillar sifatida belgilanadi.

Tadqiqot materiallarini tanlash mezonlari. Modelning nazariy asosini shakllantirish uchun huquqiy ta’lim, fuqarolik tarbiyasi, qadriyatga yo‘naltirilgan

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pedagogika va faol o‘qitish usullariga oid ilmiy adabiyotlar, shuningdek, ta’lim mazmunini belgilovchi hujjatlar tahlil materiali sifatida olinishi ko‘zda tutiladi. Manbalarni tanlashda mavzuga bevosita aloqadorlik, muallif va nashr haqidagi ma’lumotlarning tekshirilishi, tushunchalarning aniq ta’riflanishi hamda pedagogik xulosalarning dalillar bilan asoslanganligi mezonlariga tayaniladi. Normativ hujjatlar ta’limning huquqiy chegaralarini aniqlash uchun, ilmiy adabiyotlar esa model komponentlari va metodik yechimlarni asoslash uchun qo‘llanadi. Ushbu yondashuv tizimli adabiyotlar sharhi sifatida taqdim etilmaydi.

Nazariy tahlil va tushunchalarni aniqlashtirish. Nazariy tahlil usuli orqali “huquqiy bilim”, “huquqiy madaniyat”, “milliy qadriyat”, “fuqarolik mas’uliyati” va “pedagogik model” tushunchalarining tadqiqotdagi mazmuni belgilanadi. Huquqiy bilim o‘quvchining huquq va majburiyatlar haqidagi tushunchalarini; qadriyatlarni anglash esa ularning mazmunini izohlash va muayyan vaziyat bilan bog‘lash qobiliyatini ifodalaydi. Mas’uliyatli faoliyat qarorning oqibatlarini hisobga olish, boshqalarning huquqlariga hurmat ko‘rsatish va o‘z zimmasidagi vazifani bajarish orqali tavsiflanadi. Ushbu jihatlar o‘zaro bog‘liq bo‘lsa-da, baholashda alohida ko‘rib chiqiladi.

Qiyosiy tahlil. Qiyoslash usuli huquqiy me’yorlar va milliy qadriyatlarning mazmuniy aloqalarini aniqlash uchun qo‘llanadi. Masalan, o‘zaro yordam qadriyati hamkorlik va ijtimoiy mas’uliyat bilan, inson qadriga hurmat esa shaxs huquqlarini tan olish bilan bog‘lab ko‘rib chiqiladi. Shu bilan birga, axloqiy tavsiya va huquqiy majburiyat o‘rtasidagi farq saqlanadi. Urf-odat, oilaviy qarash yoki jamoa fikrini huquqiy me’yor bilan tenglashtirmaslik modelning metodologik sharti hisoblanadi. Muammoli vaziyatlarda yechim shaxs huquqlari, tenglik va qonuniylik mezonlari asosida baholanadi.

Pedagogik modellashtirish. Modellashtirish usuli maqsadli, mazmuniy, tashkiliy-metodik va baholash komponentlarini yagona tuzilishga birlashtirish uchun qo‘llanadi. Maqsadli komponent o‘quvchilarda rivojlantirilishi ko‘zda tutilgan bilim va ko‘nikmalarni belgilaydi. Mazmuniy komponent huquqiy tushunchalar, milliy

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qadriyatlar va ular bilan bog‘liq hayotiy vaziyatlarni qamrab oladi. Tashkiliy-metodik komponent vaziyatli topshiriqlar, munozaralar, rolli mashg‘ulotlar, loyihalar va hamkorlik shakllarini belgilaydi. Baholash komponenti esa topshiriqlar natijasini kuzatish, tahlil qilish va keyingi o‘quv faoliyatini moslashtirishga xizmat qiladi.

Model komponenti	Mazmuni	Amaliy vazifasi
Maqsadli	Rivojlantirilishi ko‘zda tutilgan bilim va ko‘nikmalar	O‘quv natijalarini belgilash
Mazmuniy	Huquqiy tushunchalar, milliy qadriyatlar va hayotiy vaziyatlar	Ta’lim mazmunini tanlash
Tashkiliy-metodik	Vaziyatli topshiriqlar, munozaralar, rolli mashg‘ulotlar, loyihalar va hamkorlik	O‘quv faoliyatini tashkil etish
Baholash	Topshiriq natijalarini kuzatish va tahlil qilish	Keyingi o‘quv faoliyatini moslashtirish

Modelni ishlab chiqish ketma-ketligi muammoni aniqlash, kutiladigan o‘quv natijalarini belgilash, mazmunni tanlash, faoliyat usullarini ishlab chiqish va baholash mezonlarini shakllantirishdan iborat. Har bir topshiriq muayyan o‘quv natijasi bilan bog‘lanishi lozim. Masalan, boshqa shaxsning huquqini hisobga olish ko‘nikmasi faqat tushunchani yoddan aytish orqali emas, manfaatlar to‘qnashgan vaziyatni tahlil qilish va yechimni asoslash orqali baholanadi.

Baholash mezonlarini belgilash. Taklif etilayotgan modelda natijalarni baholash uchun quyidagi mezonlar ajratiladi:

Baholash yo‘nalishi	Kuzatiladigan ko‘rsatkich	Baholash vositasi

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Baholash yo‘nalishi	Kuzatiladigan ko‘rsatkich	Baholash vositasi
Huquqiy bilim	Huquq va majburiyatlarni tushuntirish, axloqiy talabni huquqiy me’yordan farqlash	Qisqa yozma topshiriq, tushunchalarni izohlash
Qadriyatlarni anglash	Qadriyat mazmunini hayotiy vaziyat bilan bog‘lash, uning qo‘llanish chegaralarini tushuntirish	Vaziyatli topshiriq, asoslangan yozma javob
Huquqiy mulohaza	Tomonlarning huquqlarini aniqlash, muqobil yechimlarni taqqoslash va qarorni asoslash	Muammoli vaziyat tahlili, munozara
Mas’uliyatli ishtirok	Kelishilgan vazifani bajarish, boshqalarning fikrini tinglash va hamkorlik qoidalariga rioya qilish	Tuzilgan mezonlar asosidagi pedagogik kuzatuv
Refleksiya	O‘z qarorining sababi va oqibatini tushuntirish, uni qayta ko‘rib chiqish imkoniyatini anglash	Refleksiv yozuv, o‘zini baholash varaqasi

Jadvaldagi ko‘rsatkichlar taklif etilayotgan baholash mezonlari bo‘lib, ularning ishonchliligi va qo‘llash qulayligi amaliy sinov orqali tekshirilishi kerak. Bir martalik javob yoki alohida xatti-harakat o‘quvchining barqaror qadriyatga munosabati haqida yakuniy xulosa chiqarish uchun yetarli deb olinmaydi. Baholash turli topshiriqlar va kuzatuvlarda namoyon bo‘lgan natijalarni birgalikda ko‘rib chiqishga asoslanadi.

Amaliy tatbiq va etik tamoyillar. Modelni keyinchalik sinovdan o‘tkazishda topshiriqlarning yoshga mosligi, ishtirokchilarning shaxsiy ma’lumotlarini himoya qilish va barcha o‘quvchilar uchun teng ishtirok imkoniyatini ta’minlash talab etiladi. Oilaviy an’analar yoki shaxsiy qarashlar baholash obyekti sifatida olinmaydi. Oila va

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mahalla bilan hamkorlik o‘quv maqsadiga mos faoliyat orqali tashkil etilib, o‘quvchining shaxsiy hayotiga oid ma’lumotlarni oshkor qilishga olib kelmasligi lozim.

Tadqiqotning metodologik cheklovi shundaki, nazariy jihatdan izchil tuzilgan model uning amaliy samaradorligini o‘z-o‘zidan tasdiqlamaydi. O‘quvchilarning tayyorgarligi, o‘qituvchining metodik mahorati va maktab muhiti natijalarga ta’sir qilishi mumkin. Shu sababli modelning ta’lim natijalariga ta’sirini aniqlash keyingi empirik tadqiqotning vazifasi sifatida belgilanadi.

Muhokama

Taklif etilgan pedagogik model huquqiy ta’limda milliy qadriyatlarni alohida tarbiyaviy mavzu sifatida bayon qilish bilan cheklanmay, ularni huquqiy vaziyatlarni tushunish va qarorlarni asoslash jarayoniga kiritishni nazarda tutadi. Modelning nazariy ahamiyati huquqiy bilim, qadriyatlarni anglash, amaliy ishtirok va refleksiya o‘rtasidagi bog‘liqlikni belgilashda namoyon bo‘ladi. Biroq mazkur bog‘liqlikning modelda ifodalanishi uning amaliyotda avtomatik ravishda yuzaga kelishini anglatmaydi. Natija topshiriqlar mazmuni, o‘qituvchining muloqot usuli, baholashning izchilligi va maktab muhitiga bog‘liq bo‘lishi mumkin.

Huquqiy me’yor va milliy qadriyatlar munosabati

Modelni qo‘llashdagi asosiy masalalardan biri huquqiy talab bilan axloqiy tavsiyani farqlashdir. Milliy qadriyatlar o‘quvchiga muayyan xatti-harakatning ijtimoiy mazmunini tushuntirishga yordam beradi. Huquqiy me’yor esa shaxsning huquqlari, majburiyatlari va qonuniy cheklovlarini belgilaydi. Ushbu ikki tushunchani tenglashtirish o‘quvchida urf-odat yoki jamoa kutgan xatti-harakat doimo huquqiy majburiyat hisoblanadi, degan noto‘g‘ri tasavvur paydo qilishi mumkin.

Shu sababli mashg‘ulotlarda bir vaziyatni huquqiy va axloqiy mezonlar asosida alohida tahlil qilish maqsadga muvofiq. Masalan, yordamga muhtoj kishiga ko‘maklashishning axloqiy ahamiyati muhokama qilinishi mumkin, biroq yordamning shakli, xavfsizligi va ixtiyoriyligi ham hisobga olinadi. O‘quvchi

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qadriyatning mazmunini tushunishi bilan birga, undan foydalanish boshqa shaxsning huquqini cheklashga olib kelmasligini ham anglab yetishi kerak.

Milliy qadriyatlarni ta’lim mazmuniga kiritishda ularning turli oilalar va ijtimoiy muhitlarda turlicha namoyon bo‘lishi e’tiborga olinadi. Muayyan oilaviy odatni barcha o‘quvchilar uchun yagona me’yor sifatida belgilash pedagogik jihatdan asosli emas. Model umumiy muhokama uchun inson qadriga hurmat, adolat, halollik, mas’uliyat va hamjihatlik kabi tushunchalarni tanlashni, ularning amaliy ifodasini esa turli misollar orqali ochishni taklif etadi.

Bilimdan amaliy qarorga o‘tish muammosi

Huquqiy tushunchani bilish bilan uni vaziyatda qo‘llash o‘rtasida farq mavjud. O‘quvchi “tenglik” yoki “mas’uliyat” tushunchasini to‘g‘ri izohlashi, ammo manfaatlar to‘qnashgan vaziyatda qarorini asoslashda qiynalishi mumkin. Modeldagi vaziyatli topshiriqlar shu farqni hisobga olgan holda tuziladi. Ular o‘quvchidan muammoni aniqlash, tomonlarning huquqlarini ko‘rsatish, yechimlarni taqqoslash va tanlov oqibatini tushuntirishni talab qiladi.

Bunday topshiriqlarning qiymati muhokamada bir nechta nuqtayi nazarni ko‘rib chiqish imkoniyatiga bog‘liq. Agar vaziyat faqat o‘qituvchi kutgan javobni topishga yo‘naltirilsa, o‘quvchining mustaqil mulohazasi yetarli darajada namoyon bo‘lmasligi mumkin. Shu bilan birga, turli fikrlarni muhokama qilish har qanday yechimni maqbul deb qabul qilishni anglatmaydi. Taklif etilgan qaror shaxs huquqlari, qonuniylik, xavfsizlik va dalillarning asoslanganligi mezonlari bo‘yicha tahlil qilinishi lozim.

Modelning ehtimoliy afzalligi o‘quvchiga dastlabki qarorini qayta ko‘rib chiqish imkoniyatini berishidir. Fikr-mulohazadan keyin javobni takomillashtirish xatoni faqat bahoni pasaytiruvchi holat sifatida emas, o‘rganish uchun material sifatida ko‘rib chiqishga yordam berishi mumkin. Biroq ushbu imkoniyatning natijasi empirik tekshiruvsiz tasdiqlangan deb hisoblanmaydi.

O‘qituvchi faoliyati va maktab muhitining ahamiyati

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Modelni amalga oshirish o‘qituvchidan huquqiy mazmunni tushuntirish bilan birga, munozarani boshqarish va mezonga asoslangan fikr-mulohaza berishni talab etadi. O‘qituvchi o‘quvchining fikrini aniqlashtiruvchi savollar orqali rivojlantirishi, dalilsiz xulosalarni ko‘rsatishi va muhokamada chetda qolgan nuqtayi nazarlarni ochishi kerak. Shaxsiy qarashlarni baholash bilan topshiriqdagi huquqiy mulohazani baholash o‘rtasidagi chegarani saqlash ham muhimdir.

Maktabdagi kundalik munosabatlar model mazmuniga muvofiq bo‘lishi zarur. Darsda adolatli munosabat targ‘ib etilib, baholash mezonlari o‘quvchilarga tushuntirilmasa, ta’lim mazmuni bilan amaliy tajriba o‘rtasida ziddiyat yuzaga keladi. Shuningdek, o‘quvchining fikr bildirish imkoniyati, sinf qoidalarining tushunarliligi va nizolarni hal qilish tartibi huquqiy ta’limning amaliy muhitini tashkil etadi. Demak, modelni faqat alohida mashg‘ulotlar to‘plami sifatida qo‘llash uning imkoniyatlarini cheklashi mumkin.

Hamkorlikning imkoniyatlari va chegaralari

Oila–maktab–mahalla hamkorligi o‘quvchilarning huquqiy tushunchalarni turli hayotiy vaziyatlar bilan bog‘lashiga sharoit yaratishi mumkin. Biroq hamkorlikdagi tadbirning o‘tkazilishi o‘z-o‘zidan ta’lim natijasini tasdiqlamaydi. Tadbir oldidan o‘quv maqsadi belgilanishi, ishtirok davomida o‘quvchi bajaradigan vazifa aniqlanishi va yakunda faoliyat tahlil qilinishi kerak.

Hamkorlikni tashkil etishda oilalarning vaqt, moddiy sharoit va ishtirok imkoniyatidagi farqlar hisobga olinadi. Ota-onasi tadbirga kelmagan yoki mahalla loyihasida qatnasha olmagan o‘quvchining natijasini past baholash modelning teng ishtirok tamoyiliga zid bo‘ladi. Shu sababli maktab doirasida bajariladigan muqobil topshiriqlar ham nazarda tutilishi lozim. Hamkorlik o‘quvchining shaxsiy hayoti yoki oilaviy qarashlarini tekshirish vositasiga aylanmasligi kerak.

Baholash natijalarini talqin qilish

Modelda bilim, mulohaza, hamkorlikdagi ishtirok va refleksiya alohida ko‘rsatkichlar orqali baholanadi. Bunday ajratish o‘quvchining qaysi jihatda yordamga ehtiyoji borligini aniqlashga xizmat qiladi. Masalan, huquqiy

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tushunchalarni yaxshi bilgan o‘quvchi boshqa tomonning manfaatlarini hisobga olishda qiynalishi mumkin. Aksincha, hamkorlikda faol qatnashgan o‘quvchi o‘z qarorini huquqiy tushunchalar bilan asoslash uchun qo‘shimcha yordamga muhtoj bo‘lishi mumkin.

Baholashning muhim cheklovi o‘quvchining ijtimoiy jihatdan ma’qullanadigan javobni berishga intilishi bilan bog‘liq. “Men doimo adolatli bo‘laman” kabi bayonot amaliy xulq-atvorning yetarli dalili emas. Shu bois yozma javob, vaziyat tahlili va kuzatuv natijalarini birgalikda ko‘rib chiqish taklif etiladi. Shunga qaramay, ushbu vositalar o‘quvchining ichki e’tiqodi yoki barcha vaziyatlardagi xulq-atvori haqida to‘liq xulosa chiqarish imkonini bermaydi.

Tadqiqot cheklovlari va keyingi tekshiruv yo‘nalishlari

Mazkur ishda modelning qo‘llanishi natijasida o‘quvchilarda qanday o‘zgarish yuz bergani aniqlanmagan. Shu sababli huquqiy madaniyat yoki milliy qadriyatlarga munosabat yaxshilangani haqida xulosa chiqarish uchun asos mavjud emas. Taqdim etilgan natija modelning tarkibi, tatbiq bosqichlari va baholash mezonlarining nazariy ishlab chiqilganligidan iborat.

Keyingi tadqiqotda avvalo topshiriqlarning yoshga mosligi, tushunarliligi va baholash mezonlarining qo‘llash qulayligini kichik sinov orqali tekshirish maqsadga muvofiq. So‘ng boshlang‘ich va yakuniy natijalarni taqqoslash, imkon bo‘lsa, taqqoslash guruhidan foydalanish orqali modelning ta’siri o‘rganilishi mumkin. Baholovchilar bir xil javobga qanchalik o‘xshash baho berishi, mashg‘ulotlar belgilangan tartibda amalga oshirilgani va natijalar vaqt o‘tishi bilan saqlanishi ham tekshirilishi lozim. Ushbu tekshiruvlar modelning qaysi sharoitlarda foydali bo‘lishi va qaysi jihatlari takomillashtirilishi kerakligini aniqlashga xizmat qiladi.

Xulosa

Huquqiy ta’lim jarayonida o‘quvchilarda milliy qadriyatlarni shakllantirish huquqiy bilimlarni hayotiy vaziyatlar, axloqiy mulohaza va mas’uliyatli faoliyat bilan bog‘lashni talab etadi. Mazkur maqolada ushbu vazifani amalga oshirish uchun maqsadli, mazmuniy, tashkiliy-metodik va baholash komponentlaridan iborat

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pedagogik model taklif etildi. Modelning asosiy xususiyati o‘quv maqsadi, topshiriq mazmuni, faoliyat usuli va baholash mezonlari o‘rtasidagi muvofiqlikni ta’minlashdan iborat.

Milliy qadriyatlarni huquqiy ta’limga integratsiya qilishda huquqiy me’yor va axloqiy tavsiya o‘rtasidagi farq saqlanishi zarur. Inson qadriga hurmat, adolat, halollik, hamjihatlik va mas’uliyat kabi qadriyatlar huquqiy tushunchalarning ijtimoiy mazmunini ochishga xizmat qilishi mumkin. Biroq urf-odat yoki jamoa fikri shaxs huquqlarini cheklash uchun asos sifatida talqin qilinmasligi lozim. Shu sababli modelda vaziyat va qarorlarni baholashning asosiy mezonlari sifatida shaxs huquqlariga hurmat, tenglik, qonuniylik va xavfsizlik belgilanadi.

Modelni amaliyotga tatbiq etish boshlang‘ich tushunchalarni aniqlash, o‘quv maqsadi va muhokama qoidalarini belgilash, mazmunni o‘rganish, bilimlarni amaliy vaziyatlarda qo‘llash hamda baholash va qayta aloqa bosqichlarini qamrab oladi. Vaziyatli topshiriqlar, munozaralar, rolli mashg‘ulotlar va kichik loyihalar o‘quvchining huquqiy tushunchalarni qo‘llashi, turli tomonlarning manfaatlarini hisobga olishi va o‘z qarorini asoslashiga imkon beradigan metodik vositalar sifatida taklif etiladi. Ularning tanlanishi o‘quvchilarning yoshi, tayyorgarligi va mashg‘ulotning aniq maqsadiga mos bo‘lishi kerak.

Baholashda o‘quvchining shaxsiy e’tiqodiga umumiy baho berishdan ko‘ra, uning topshiriqdagi kuzatiladigan faoliyatini tahlil qilish muhimdir. Huquq va majburiyatlarni farqlash, vaziyatdagi muammoni aniqlash, yechimni dalillar bilan asoslash, hamkorlikdagi vazifani bajarish va o‘z qarorini qayta ko‘rib chiqish modelning baholash yo‘nalishlarini tashkil etadi. Bir martalik javob o‘quvchida qadriyatlar barqaror shakllanganini tasdiqlamaydi. Shu bois turli topshiriqlar, pedagogik kuzatuv va refleksiv yozuvlardan olingan ma’lumotlarni birgalikda ko‘rib chiqish zarur.

Modelni qo‘llash uchun o‘qituvchining metodik tayyorgarligi va maktabdagi munosabatlarning ta’lim mazmuniga muvofiqligi alohida ahamiyatga ega. O‘quvchilarning fikri tinglanishi, baholash mezonlari tushuntirilishi va nizolar izchil

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tartibda hal qilinishi huquqiy ta’limning amaliy asosini tashkil etadi. Oila–maktab–mahalla hamkorligi esa aniq o‘quv maqsadiga yo‘naltirilgan, yoshga mos va xavfsiz faoliyat orqali tashkil etilishi lozim. Oilalarning ishtirok imkoniyatidagi farqlar o‘quvchilarni baholashga ta’sir qilmasligi kerak.

Tadqiqotning natijasi pedagogik model va uni tatbiq etish mexanizmlarining nazariy ishlab chiqilganligi bilan chegaralanadi. Model o‘quvchilarning huquqiy mulohazasi yoki mas’uliyatli xulq-atvorini yaxshilashi empirik jihatdan tasdiqlanmagan. Keyingi bosqichda topshiriqlar va baholash mezonlarini dastlabki sinovdan o‘tkazish, boshlang‘ich hamda yakuniy natijalarni taqqoslash va modelning turli ta’lim sharoitlarida qo‘llanishini tekshirish zarur. Ana shu tekshiruvlar uning amaliy imkoniyatlarini baholash va takomillashtirish yo‘nalishlarini belgilashga asos bo‘ladi.

Foydalanilgan adabiyotlar

1. O‘zbekiston Respublikasining “Ta’lim to‘g‘risida”gi Qonuni. 2020-yil 23-sentabr, O‘RQ-637-son. Lex.uz. lex.uz

2. O‘zbekiston Respublikasi Prezidentining “Jamiyatda huquqiy ong va huquqiy madaniyatni yuksaltirish tizimini tubdan takomillashtirish to‘g‘risida”gi Farmoni. 2019-yil 9-yanvar, PF-5618-son. Lex.uz. lex.uz

3. O‘zbekiston Respublikasi Vazirlar Mahkamasining “Uzluksiz ma’naviy tarbiya konsepsiyasini tasdiqlash va uni amalga oshirish chora-tadbirlari to‘g‘risida”gi qarori. 2019-yil 31-dekabr, 1059-son. Lex.uz. lex.uz

4. Avloniy, A. *Turkiy guliston yoxud axloq*. Elektron matn. Asar matni. TURKIY GULISTON YOXUD AXLOQ

5. UNESCO. *Global Citizenship Education: Topics and Learning Objectives*. Paris: UNESCO, 2015. Nashr matni. unesco.org

6. UNESCO. *Global Citizenship Education: Preparing Learners for the Challenges of the Twenty-First Century*. Paris: UNESCO, 2014. Nashr haqida. unesco.org

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 09.10.2026
PUBLISHED: 10.10.2026

7. Council of Europe. *Reference Framework of Competences for Democratic Culture. Volume 1: Context, Concepts and Model*. Strasbourg: Council of Europe Publishing, 2018. Nashr matni. rm.coe.int

8. Council of Europe. *Reference Framework of Competences for Democratic Culture. Volume 2: Descriptors*. Strasbourg: Council of Europe Publishing, 2018. Nashrlar sahifasi. durham-repository.worktribe.com

9. Council of Europe. *Reference Framework of Competences for Democratic Culture. Volume 3: Guidance for Implementation*. Strasbourg: Council of Europe Publishing, 2018. Nashrlar sahifasi. durham-repository.worktribe.com

10. Council of Europe. *The Reference Framework of Competences for Democratic Culture in Brief*. Strasbourg: Council of Europe, 2021. Nashr sahifasi. edoc.coe.int

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THE NATURE OF REASON IN THE MATURIDI SCHOOL OF KALAM

Nazarov Ozod Urolovich

Chief Imam-Khatib of Pastdargom District, Samarkand Region; Master's Student at Oriental University

Abstract

This article examines the nature of reason in the Maturidi school of Islamic theology, focusing on its role in human cognition and its status in understanding religious truths. Drawing primarily on the works of Abu Mansur al-Maturidi, it explores reason as a human faculty of knowledge, its relationship with sensory perception and revelation, and its capacity to establish the created nature of the universe and the existence of God. Particular attention is paid to the autonomy and limits of reason, human responsibility, and the rational foundations of faith.

Keywords

Maturidism, kalam, reason, nazar, istidlal, knowledge, perception, sensory cognition, revelation, fitra.

MOTURIDIY KALOM MAKTABIDA AQLNING MOHIYATI

Nazarov Ozod Urolovich

Samarqand viloyat Pastdarg'om tuman bosh imom xatibi, Oriental universiteti magistri

ozodnazar_2026@proton.me

Annotatsiya. Mazkur maqolada Moturidiy kalom maktabida aqlning mohiyati, bilish jarayonidagi o'rni va diniy haqiqatlarni anglashdagi maqomi tahlil qilinadi. Abu Mansur Moturidiy qarashlari asosida aqlning insonni bilishga yetaklovchi qobiliyat sifatidagi mazmuni, uning hissiy idrok va naql bilan munosabati, olamning yaratilganligini anglash hamda ilohiy mavjudlikni isbotlashdagi imkoniyatlari yoritiladi. Shuningdek, Moturidiy ta'limotida aqlning mustaqilligi va chegaralari, inson mas'uliyati hamda e'tiqodiy bilishning oqilona asoslari xususida fikr yuritiladi. Maqolada arab tilidagi kalomiy istilohlar va birlamchi manbalarga tayaniladi.

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Kalit so‘zlar: Moturidiy, kalom, aql, nazar, istidlol, ilm, idrok, hissiy bilish, naql, fitrat, taklif, ilohiyot, bilish nazariyasi.

Аннотация. В статье анализируется сущность разума в матуридитской школе калама, его роль в процессе познания и статус в осмыслении религиозных истин. На основе взглядов Абу Мансура ал-Матуриди рассматриваются разум как способность человека к познанию, его взаимосвязь с чувственным восприятием и откровением, а также его возможности в доказательстве сотворённости мира и существования Бога. Особое внимание уделяется самостоятельности и границам разума, человеческой ответственности и рациональным основаниям веры.

Ключевые слова: Матуриди, калам, разум, назар, истидляль, знание, восприятие, чувственное познание, откровение, фитра.

Kirish

Islom tafakkuri tarixida aql va vahiy munosabati eng muhim nazariy masalalardan biri sifatida namoyon bo‘ladi. Ushbu masala nafaqat diniy e‘tiqodning asoslarini tushuntirish, balki insonning borliqni anglash imkoniyatlari, bilimning manbalari, haqiqatni aniqlash mezonlari va axloqiy mas‘uliyatini belgilashda ham muhim ahamiyat kasb etgan. Islom ilohiyotida aqlning maqomi turli maktablarda turlicha talqin qilingan bo‘lsa-da, Moturidiy kalom maktabida uning bilish jarayonidagi faol va zarur o‘rni alohida ta‘kidlanadi.

Moturidiylik ta‘limotining asoschisi Abu Mansur Muhammad ibn Muhammad al-Moturidiy (taxminan 870–944) Samarqandda shakllangan ilmiy-ma‘rifiy muhitda faoliyat olib borib, ahli sunna kalomining muhim nazariy yo‘nalishlaridan biriga asos soldi. Uning qarashlarida aql diniy haqiqatlarga zid qo‘yilmaydi; aksincha, insonning borliqni kuzatishi, mavjud narsalar haqida fikr yuritishi va dalillar orqali xulosa chiqarishi e‘tiqodiy bilishning zarur sharti sifatida namoyon bo‘ladi.

Moturidiy kalomida aql masalasini faqat «insonning fikrlash qobiliyati» tarzida tor ma‘noda tushunish to‘g‘ri emas. Bu tushuncha, bir tomondan, insonning idrok etish, farqlash, tahlil qilish va xulosa chiqarish imkoniyatlarini qamrab olsa, ikkinchi

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tomondan, uning haqiqatni izlashdagi mas‘uliyati bilan ham bog‘liq. Shu sababli aql masalasi Moturidiy ta‘limotida epistemologik, ontologik va axloqiy jihatlarni o‘zida birlashtiradi .

Mazkur maqolaning maqsadi Moturidiy kalom maktabida aqlning mohiyatini birlamchi manbalar asosida ochib berish, uning bilish manbalari bilan munosabatini tahlil qilish hamda aqlning e‘tiqodiy va axloqiy vazifalarini ilmiy jihatdan yoritishdan iborat.

Mavzuning o‘rganilganlik darajasi va metodologik asoslari

Moturidiy ta‘limotini o‘rganishda, avvalo, Abu Mansur Moturidiyning «كتاب التوحيد» (*Kitob at-tavḥid*) asari muhim birlamchi manba hisoblanadi. Unda bilishning imkoniyati, olamning yaratilganligi, ilohiy mavjudlik, inson idroki va turli e‘tiqodiy qarashlarni dalillar asosida tahlil qilish masalalari keng yoritilgan . Muallifning «تأويلات أهل السنة» (*Ta‘vilot ahl us-sunna*) asari esa Qur‘on oyatlari tafsirida aqliy mushohada va naqliy dalillar o‘rtasidagi munosabatni kuzatish imkonini beradi.

Moturidiy maktabining keyingi rivojida Abu Mu‘in Maymun an-Nasafiyning « تبصرة الأدلة في أصول الدين» (*Tabsirat ul-adilla fi uṣul ad-din*) asari alohida o‘rin tutadi. Mazkur asarda Moturidiy kalomining asosiy tamoyillari tizimli ravishda bayon etilib, bilim, nazar, dalil, ilohiy sifatlar va inson irodasi kabi masalalar batafsil muhokama qilingan. Shu jihatdan Nasafiy asari Moturidiy qarashlarini keyingi kalomiy an‘ana doirasida tushunishda muhim manba vazifasini bajaradi .

Zamonaviy tadqiqotlarda Moturidiy ta‘limotining epistemologik va metafizik jihatlari ham keng o‘rganilgan. Ulrich Rudolphning *Al-Maturidi and the Development of Sunni Theology in Samarqand* asari Moturidiy qarashlarining tarixiy va nazariy shakllanishini yoritadi . Ramon Harvey *Transcendent God, Rational World: A Maturidi Theology* tadqiqotida Moturidiy ilohiyotining borliq, sababiyat, bilim va aql bilan bog‘liq jihatlarini tahlil qiladi . Peter Dorrollning Moturidiy metafizikasi va epistemologiyasiga bag‘ishlangan maqolasi esa ushbu maktabni faqat tarixiy aqidaviy yo‘nalish sifatida emas, balki o‘ziga xos falsafiy-nazariy tizim sifatida o‘rganish zarurligini ko‘rsatadi .

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Tadqiqotda tarixiy-qiyosiy, matniy-tahliliy, mantiqiy va tizimli yondashuvlardan foydalaniladi. Asosiy e‘tibor Moturidiyning arab tilidagi asarlariga qaratilib, keyingi moturidiy olimlarning qarashlari yordamchi manba sifatida jalb qilinadi. Ayni paytda Moturidiy matnlarida uchraydigan tushunchalarni zamonaviy falsafiy terminlar bilan aynan tenglashtirishdan saqlaniladi: masalan, «العقل» (*al-ʿaql*) tushunchasi bugungi falsafadagi «ong» yoki «ratsionallik» tushunchalarining har biri bilan to‘la mos kelmaydi.

Tadqiqotning asosiy ilmiy g‘oyasi

Moturidiy ta‘limotida aql vahiyga muqobil yoki undan mustaqil mutlaq haqiqat manbai sifatida emas, balki insonni dalil orqali haqiqatni anglashga olib boradigan muhim bilish vositasi sifatida talqin etiladi. Bu yondashuvda aqlning qadri uning shunchaki fikrlash qobiliyatida emas, balki mavjudotlar ustida tafakkur yuritish, dalil va da‘voni farqlash, xulosani asoslash hamda insonning e‘tiqodiy mas‘uliyatini anglash imkoniyatida namoyon bo‘ladi .

Shu nuqtai nazardan, Moturidiy kalomida aqlni bilish vositasi sifatida, borliqni anglashga xizmat qiluvchi nazariy qobiliyat sifatida va insonning mas‘uliyatini asoslovchi mezon sifatida o‘rganish maqsadga muvofiq.

Asosiy qism

Aql tushunchasining kalom ilmidagi mazmuni

Arab tilidagi «العقل» (*al-ʿaql*) istilohi lug‘aviy jihatdan bog‘lash, tutib turish, tiyish kabi ma‘nolar bilan aloqador. Kalomiy va falsafiy adabiyotlarda esa u insonning idrok etish, tafakkur qilish, narsalar o‘rtasidagi munosabatlarni anglash va xulosa chiqarish qobiliyatini ifodalash uchun ishlatiladi. Biroq kalom tarixida aqlning mohiyati haqida yagona va barcha maktablar tomonidan birdek qabul qilingan ta‘rif mavjud bo‘lmagan. Ayrim mualliflar uni bilimlarni hosil qilishga imkon beradigan qobiliyat, boshqalari esa zarur bilimlarni anglash yoki nazariy xulosalarga erishish vositasi sifatida izohlaganlar.

Moturidiy qarashlarini tahlil qilishda aqlni alohida, jismoniy yoki mustaqil mavjud substansiya sifatida tasavvur etishdan ko‘ra, insonning bilish faoliyati bilan bog‘liq

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qobiliyat sifatida tushunish to‘g‘riroqdir. Chunki «Kitob ut-tavḥid»da asosiy e‘tibor aqlning anatomik yoki metafizik tuzilishini aniqlashga emas, balki uning bilim hosil qilishdagi vazifasiga qaratiladi. Moturidiy uchun muhim savol insonning aqli qayerda joylashgani emas, balki u qanday qilib haqiqatni anglay olishi, qanday dalillarga tayanishi va xato xulosalardan qay yo‘sinda saqlanishidir .

Shu sababli Moturidiy epistemologiyasida aqlni «النظر» (*an-naẓar* – nazariy mushohada, fikriy tekshiruv) va «الاستدلال» (*al-istidlal* – dalil asosida xulosa chiqarish) tushunchalaridan ajratib bo‘lmaydi. Aql insonning bilish qobiliyatini bildirsa, nazar shu qobiliyatning maqsadli faoliyatini, istidlol esa dalillar asosida natijaga kelish jarayonini anglatadi. Demak, aql, nazar va istidlol bir-biriga yaqin, ammo aynan bir xil bo‘lmagan tushunchalardir .

Moturidiy ta‘limotida inson haqiqatni shunchaki eshitish yoki ko‘rish bilangina emas, balki kuzatgan va eshitgan ma‘lumotlarini tahlil qilish orqali anglaydi. Masalan, olamdagi o‘zgarishlar, mavjudotlarning muayyan xususiyatlarga ega bo‘lishi, ularning bir holatdan ikkinchi holatga o‘tishi aqliy mushohada uchun asos bo‘la oladi. Bunday mushohada insonni olamning mohiyati va uning mavjudlik sababi haqida savol qo‘yishga undaydi.

Bilim manbalari va aqlning ular orasidagi o‘rni

Moturidiy kalomida bilim masalasi aqlning mohiyatini ochib beruvchi asosiy nazariy yo‘nalishlardan biridir. «Kitob ut-tavḥid»ning dastlabki qismlarida bilimning imkoniyati, haqiqatning mavjudligi va bilimga olib boradigan vositalar muhokama qilinadi. Moturidiy bilishni nisbiy yoki mutlaqo imkonsiz hodisa sifatida ko‘ruvchi qarashlarga qarshi chiqib, inson uchun haqiqatni anglash imkoniyati mavjudligini asoslashga intiladi .Moturidiy epistemologiyasida odatda uch asosiy bilish yo‘li ajratiladi:

«الحواس» (*al-ḥavas*) – tashqi sezgi a‘zolari orqali bilish;

«الأخبار» (*al-axbar*) – xabar va ma‘lumotlar orqali bilish;

«النظر» (*an-naẓar*) – aqliy mushohada va fikriy dalillash orqali bilish.

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Bu tasnif Moturidiyning «Kitob ut-tavḥid» asaridagi bevosita bayoniga asoslanadi. Muallif quyidagicha yozadi:

«ثم السبيل التي يوصل بها إلى العلم بحقائق الأشياء العيان والأخبار والنظر».

Mazmuni: «Narsalarning haqiqatini bilishga olib boradigan yo‘llar – bevosita idrok, xabarlar va nazardir».

Ushbu iqtibosdan ko‘rinadiki, Moturidiy bilishning uch yo‘lini bir-biridan uzilgan yoki o‘zaro raqobat qiluvchi manbalar sifatida emas, balki insonni haqiqatni anglashga olib boradigan vositalar sifatida ko‘radi. Sezgilar bevosita tajribaga oid ma‘lumotlarni yetkazadi, xabar insonning shaxsiy tajribasidan tashqaridagi voqelik haqida bilim beradi, nazar esa ma‘lumotlar o‘rtasidagi munosabatlarni aniqlab, asosli xulosa chiqarishga xizmat qiladi.

Masalan, inson olovning issiqligini sezgi orqali idrok etadi. Biroq olovning xususiyatlari, uning boshqa hodisalar bilan munosabati yoki olamdagi o‘zgarishlarning umumiy qonuniyatlari haqida xulosa chiqarish oddiy sezgi bilan cheklanmaydi. Bu jarayonda aqliy tahlil zarur bo‘ladi. Xuddi shuningdek, uzoq o‘tmishda sodir bo‘lgan hodisalar yoki inson bevosita kuzata olmaydigan voqealar haqida bilim xabar orqali hosil qilinadi. Ammo xabarning ishonchliligi va mazmunini baholashda ham aql muhim vazifa bajaradi .

Shunday qilib, Moturidiy qarashlarida aql sezgi va xabarni inkor qilmaydi, balki ularni anglash, tekshirish va o‘zaro bog‘lash imkonini beradi. Bu jihat Moturidiy epistemologiyasining muhim xususiyatidir: bilim birgina manbaga bog‘lab qo‘yilmaydi, balki turli bilish vositalarining o‘zaro aloqasi asosida tushuntiriladi .

Aql va hissiy idrok munosabati

Moturidiy ta‘limotida hissiy idrok inson bilish faoliyatining zarur boshlang‘ich bosqichlaridan biri hisoblanadi. Inson tashqi olam bilan dastlab ko‘rish, eshitish, hid bilish, ta‘m bilish va teginish orqali munosabatga kirishadi. Biroq hissiy ma‘lumotlar o‘z-o‘zidan to‘liq va mukammal bilimni yuzaga keltirmaydi. Chunki sezgilar muayyan sharoitlarda xato qilishi, narsaning faqat tashqi ko‘rinishini aks ettirishi yoki voqelikning barcha jihatlarini qamrab olmasligi mumkin .

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Masalan, uzoqdan qaralganda katta ko‘ringan narsa yaqinlashganda kichik bo‘lib chiqishi mumkin. Suvga solingan to‘g‘ri tayoqning siniq ko‘rinishi ham hissiy idrokning sharoitga bog‘liqligini ko‘rsatadi. Bunday holatlarda aql sezgi bergan ma‘lumotni qayta ko‘rib chiqadi va ko‘rinish bilan voqelik o‘rtasidagi farqni aniqlashga yordam beradi.

Bundan aql sezgidan ustun turadi, degan mutlaq xulosa kelib chiqmaydi. Chunki aqliy xulosa ham ma‘lumotga muhtoj. Sezgi yetkazgan ma‘lumot bo‘lmasa, inson ko‘plab tashqi hodisalar haqida dastlabki tasavvurga ega bo‘la olmaydi. Demak, Moturidiy yondashuvini sezgi va aqlning qarama-qarshiligi sifatida emas, balki ularning vazifaviy uyg‘unligi sifatida talqin qilish lozim.

Bu masalada «الإدراك» (*al-idrok* – idrok etish) va «العلم» (*al-ʿilm* – bilim) tushunchalarini ham farqlash zarur. Idrok bilish jarayonining muayyan bosqichini ifodalashi mumkin, ilm esa narsaning yoki hodisaning ma‘lum jihati haqida hosil bo‘lgan bilimni anglatadi. Aql idrok qilingan ma‘lumotlarni tahlil qilib, ularning sababiy va mantiqiy aloqalarini aniqlashga xizmat qiladi.

Aql va xabar: naqlning anglanishidagi ratsional asos

Moturidiy kalomida xabar, xususan, ishonchli xabar diniy va dunyoviy bilimning muhim vositasi hisoblanadi. Inson o‘z tajribasi bilan qamrab ololmaydigan juda ko‘p ma‘lumotlarni boshqalardan oladi. Tarixiy voqealar, geografik ma‘lumotlar, avvalgi avlodlar tajribasi va diniy xabarlar shular jumlasidandir .

Biroq har qanday xabarni bir xil darajada ishonchli deb qabul qilish mumkin emas. Xabarning ishonchliligi, uni yetkazgan shaxs yoki manbaning holati, mazmunning boshqa ma‘lumotlarga muvofiqligi kabi masalalar tekshirishni talab qiladi. Bu yerda aql xabarni inkor etuvchi vosita emas, balki uning mazmunini anglash va ishonchliligini baholashga xizmat qiluvchi mezondir.

Moturidiy yondashuvida vahiy bilan aql o‘rtasidagi munosabatni ham shu nuqtayi nazardan tushunish lozim. Vahiy inson uchun aqlning o‘zi mustaqil ravishda to‘liq anglay olmaydigan ayrim masalalarni bayon qiladi. Aql esa vahiy xabarining

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mazmunini tushunish, dalillarini anglash va unga nisbatan yuzaga kelishi mumkin bo‘lgan shubhalarni muhokama qilish imkonini beradi.

Bu munosabatni «العقل والنقل» (*al-ʿaql va-n-naql* – aql va naql) iborasi bilan ifodalash mumkin. Biroq ushbu ikki tushunchani doimiy ziddiyatda turuvchi kuchlar sifatida tasvirlash Moturidiy qarashlarini soddalashtirib yuboradi. Moturidiyning «Kitob ut-tavḥid» asarida dinni bilishda eshitish va aqlning o‘zaro aloqasi alohida bob sarlavhasida ham ifodalangan: «السمع والعقل هما أصل ما يعرف به الدين» – «Dinni anglashning asoslari eshitish va aqldir» . Aqliy dalillash va naqliy asoslar shu tariqa bir-birini to‘ldiradigan, ammo vazifalari jihatidan farqlanadigan bilish yo‘llari sifatida namoyon bo‘ladi.

Aqlning bilish jarayonidagi faolligi: nazar va istidlol

Moturidiy kalomining o‘ziga xos jihatlaridan biri shundaki, unda insonning haqiqatni bilishi tayyor ma‘lumotlarni qabul qilish bilangina cheklanmaydi. Bilish faoliyati fikriy izlanish, kuzatish, taqqoslash va dalillashni ham o‘z ichiga oladi. Shu bois Moturidiy «taqlid» bilan «dalilga asoslangan e‘tiqod» o‘rtasida muhim farq qo‘yadi.

«Kitob ut-tavḥid»ning dastlabki boblaridan biri «إبطال التقليد ووجوب معرفة الدين بالدليل» – «Taqlidni rad etish va dinni dalil orqali bilishning zarurligi» deb nomlangan. Bob sarlavhasining o‘ziyoq muallifning metodologik pozitsiyasini ko‘rsatadi: e‘tiqod faqat boshqalardan eshitilgan fikrni takrorlashga emas, balki uning asoslarini anglashga tayanishi lozim. Bu yerda taqlidni rad etish avvalgi avlodlarning ilmiy merosini inkor etish yoki har bir inson barcha masalalarni mustaqil ravishda qaytadan kashf qilishi kerakligini anglatmaydi. Gap, avvalo, e‘tiqodning dalilsiz, anglanmagan va tekshirilmagan qarashga aylanib qolishining oldini olish haqida bormoqda.

Moturidiy nazar tushunchasini bilishning zarur yo‘li sifatida izohlar ekan, uni oddiy qarash yoki fikrning beixtiyor paydo bo‘lishi bilan tenglashtirmaydi. Nazar – muayyan masalani anglash maqsadida dalillarni ko‘rib chiqish, ularning o‘zaro munosabatini aniqlash va natijaga kelish jarayonidir. Shuning uchun u «النظر والتأمل» (*an-naẓar wa-t-taʿammul* – fikriy mushohada va chuqur mulohaza) shaklida ham ifodalanishi mumkin.

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Moturidiyning «Kitob ut-tavḥid» asarida quyidagi fikr keltiriladi:

«على أنّ مفزع الكلّ – عند النوائب واعتراض الشّبه – إلى النظر في ذلك والتأمّل، فدلّ أنه يدل على الحقائق ويوصل به إليها».

Mazmuni: «Qiyinchiliklar yuzaga kelganda va shubhalar paydo bo‘lganda, barcha kishilarning murojaat qiladigan yo‘li shu masala ustida fikr yuritish va mulohaza qilishdir. Bu esa nazarning haqiqatlarga dalolat qilishini va ularga yetkazishini ko‘rsatadi».

Ushbu iqtibosda nazar insonning tabiiy bilish ehtiyoji bilan bog‘liq holda namoyon bo‘ladi. Inson shubha yoki muammo bilan yuzlashganda, masalaning mohiyatini aniqlash uchun fikriy tahlilga murojaat qiladi. Demak, nazar faqat munozara yoki diniy bahslar uchun zarur bo‘lgan maxsus usul emas, balki insonning kundalik hayotida ham ishlaydigan umumiy bilish faoliyatidir.

Moturidiy nazar orqali axloqiy hodisalarni ham anglash mumkinligini ta‘kidlaydi. U insonning tabiiy mayllari bilan aql orqali anglaydigan baholari o‘rtasida farq bo‘lishini ko‘rsatadi. Manbada quyidagi jumla uchraydi:

«وما يحسّنه العقل غير الذي ترغب فيه الطبيعة، وما يقبّحه غير الذي ينفر عنه الطّبع».

Mazmuni: «Aql yaxshi deb topadigan narsa tabiat moyil bo‘ladigan narsadan farq qilishi, aql yomon deb biladigan narsa esa tabiiy ravishda nafrat uyg‘otadigan narsaga har doim ham mos kelmasligi mumkin» .

Bu fikr aqlning faqat nazariy bilim hosil qilish bilan cheklanmasligini ko‘rsatadi. U insonning istaklari, manfaatlari va tabiiy moyilliklarini baholashda ham muhim o‘rin tutadi. Inson biror narsani xohlashi uning foydali yoki yaxshi ekanini anglatmaydi. Xuddi shuningdek, biror ishning tabiiy jihatdan yoqimsiz bo‘lishi uning axloqiy jihatdan yomonligini o‘z-o‘zidan isbotlamaydi. Bunday vaziyatlarda aql hodisaning oqibatlari va mohiyatini tahlil qilishi kerak.

Shu tariqa Moturidiy qarashlarida aqlning faolligi ikki yo‘nalishda namoyon bo‘ladi: birinchisi – nazariy haqiqatlarni dalillar asosida anglash; ikkinchisi – inson faoliyati va axloqiy xatti-harakatlarini baholash. Bu ikki yo‘nalish o‘zaro bog‘liq, chunki haqiqatni anglash insonning amaliy qarorlariga ham ta‘sir ko‘rsatadi .

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Aql va olamning yaratilganligini anglash

Moturidiy kalomida aqlning muhim vazifalaridan biri borliqning mohiyati va mavjudlik sabablarini anglashdir. Olamning yaratilganligi haqidagi dalillar uning ontologik qarashlari bilan birga epistemologik uslubini ham namoyon etadi.

Moturidiy mavjud olamni o‘zgarmas va azaliy borliq sifatida emas, balki turli holatlarga ega, o‘zgarish va hodisalarga duchor bo‘ladigan mavjudlik sifatida tahlil qiladi. Bu yerda «الأعيان والأعراض» (*al-aʿyan va-l-aʿraz* – narsalar va arazlar) tushunchalari muhim o‘rin tutadi. Arazlar – narsalarda yuzaga keladigan, ularning o‘zida mustaqil holda mavjud bo‘lmaydigan holat va xususiyatlardir. Harakat, sukunat, rang va boshqa o‘zgaruvchan belgilar ushbu doirada muhokama qilinadi .

Moturidiy «Kitob ut-tavḥid»da olamning yaratilganligini asoslashda uning arazlardan xoli bo‘lmasligiga e‘tibor qaratadi. Bunda aqlning vazifasi sezgi orqali kuzatilgan o‘zgarishlarni tahlil qilish va ularning ontologik oqibatlarini aniqlashdan iborat. Muallif bilish yo‘llarini bayon qilganidan keyin olamdagi narsalarning hodisligini isbotlashga o‘tadi. Bu ketma-ketlik uning epistemologik qarashlari bilan ontologik dalillash usuli o‘rtasidagi bog‘liqlikni ko‘rsatadi.

Olamdagi narsalar o‘zgaradi, muayyan holatga ega bo‘ladi va boshqa holatga o‘tadi. O‘zgaruvchan xususiyatlar ularning mutlaq mustaqil va o‘z-o‘zidan mavjud bo‘lishi haqidagi tasavvurni shubha ostiga qo‘yadi. Shu asosda Moturidiy borliqning yaratilganligi va uni vujudga keltiruvchi Yaratuvchining mavjudligi haqida xulosa chiqaradi.

Bu dalillash usulining markazida «الاستدلال بالحدوث على المحدث» – «hodislik orqali hodis qiluvchining mavjudligini asoslash» tamoyili turadi. Bunda aql bevosita ko‘rinadigan o‘zgarishlardan ko‘rinmaydigan sababga qarab fikr yuritadi. Demak, aqlning vazifasi faqat hissiy olamni qayd etish emas, balki uning ortidagi mavjudlik asosini anglashga intilishdir.

Shuni ta‘kidlash lozimki, Moturidiy dalilini zamonaviy tabiiy fanlardagi evolyutsiya, kosmologik kengayish yoki fizik jarayonlar nazariyalari bilan aynan tenglashtirish to‘g‘ri bo‘lmaydi. Uning muhokamasi o‘rta asr kalomining ontologik kategoriyalari

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doirasida shakllangan. Biroq undagi umumiy metod – kuzatiladigan hodisalardan ularning mavjudlik asosiga qarab fikr yuritish – falsafiy va ilohiy tafakkur tarixida muhim ahamiyatga ega.

Aqlning imkoniyatlari va chegaralari

Moturidiy kalomida aqlga katta maqom berilishi uning barcha masalalarni mustaqil hal qila oladigan mutlaq vosita sifatida talqin etilganini anglatmaydi. Aqlning imkoniyatlari bor, ayni paytda uning chegaralari ham mavjud. Mazkur farqni anglash Moturidiy ta‘limotining o‘ziga xos xususiyatlarini to‘g‘ri talqin qilish uchun zarur.

Aql zarur va mumkin bo‘lgan narsalarni farqlash, qarama-qarshi fikrlarni tahlil qilish, dalillarning kuchini baholash va ayrim axloqiy qadriyatlarni anglash imkoniyatiga ega. Masalan, bir narsaning ayni bir jihatdan bir vaqtning o‘zida ham mavjud, ham mavjud emas bo‘lishi mumkin emasligi kabi mantiqiy zaruriyatlar aqliy idrok doirasiga kiradi.

Biroq inson aqli g‘ayb olamiga oid barcha tafsilotlarni mustaqil ravishda bilish imkoniga ega emas. Oxirat hayotining ayrim tafsilotlari, ibodatlarning aniq shakllari, ilohiy buyruq va qaytariqlarning muayyan mazmuni kabi masalalarda vahiy xabari zarur bo‘ladi. Bu holat aqlning zaifligini emas, balki bilish predmetlari va vositalarining turlicha ekanini ko‘rsatadi.

Moturidiy «Kitob ut-tavḥid»da aql bilan xabar o‘rtasidagi vazifaviy farqni quyidagicha ifodalaydi:

«الأمر والنهي، والوعد والوعيد، فيما ليس بمحسوس دليله، لا وجه لإدراكه إلا بالخبر».

Mazmuni: «Dalili hissiy yo‘l bilan idrok etilmaydigan buyruq va qaytariqlar, va‘da va tahdidlar kabi masalalarni xabar vositasidangina bilish mumkin» .

Bu iqtibos Moturidiy epistemologiyasidagi muhim chegarani belgilaydi: aql ayrim haqiqatlarni mustaqil anglay oladi, biroq hissiy va aqliy dalil bilan to‘liq aniqlab bo‘lmaydigan masalalarda xabar – vahiy va payg‘ambarlik xabari – zarur manbaga aylanadi.

Shu jihatdan Moturidiy yondashuvida aql va vahiy o‘rtasida raqobat emas, bilish vazifalarining taqsimlanishi mavjud. Aql vahiy zarurligini anglashga, payg‘ambarlik

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da‘vosini dalillar asosida tekshirishga va vahiy mazmunini tushunishga xizmat qiladi. Vahiy esa aql mustaqil ravishda aniqlay olmaydigan yoki batafsil bilolmaydigan masalalarda insonni xabardor qiladi.

Aql, fitrat va insonning e‘tiqodga oid mas‘uliyati

Moturidiy ta‘limotida aqlning maqomi insonning mas‘uliyati bilan chambarchas bog‘liq. Inson boshqa mavjudotlardan farqli ravishda fikr yuritish, tanlash va o‘z xatti-harakatlarini baholash imkoniyatiga ega. Shu sababli u e‘tiqodiy va axloqiy masalalarda mas‘ul subyekt sifatida qaraladi .

Bu o‘rinda «الفطرة» (*fiṭrat* – insonning tabiiy yaratilish xususiyati) tushunchasi ham muhim. Fitrat insonda haqiqatni qabul qilishga moyillik va borliq haqida savol qo‘yish imkoniyati mavjudligini anglatadi. Biroq fitratni aql bilan aynan bir tushuncha deb bo‘lmaydi. Aql fikrlash va dalillash qobiliyatini ifodalasa, fitrat inson tabiatiga xos dastlabki moyillik va tayyorgarlikni bildiradi.

Moturidiy fikricha, inson atrofidagi olamni kuzatish, undagi tartib va o‘zgarishlarni anglash orqali Yaratuvchi haqida xulosa chiqarishi mumkin. Shu sababli e‘tiqod faqat tashqi majburlash yoki ijtimoiy taqlid natijasi bo‘lib qolmasligi kerak. Inson o‘z imkoniyatlari doirasida haqiqatni izlashga, dalillarni anglashga va e‘tiqodini asoslashga intilishi lozim .

Bu yerda «التكليف» (*taklif* – diniy-axloqiy mas‘uliyat yuklanishi) tushunchasi aql bilan bevosita bog‘lanadi. Aql insonning buyruq va qaytariqlar mazmunini tushunish, o‘z harakatlarining oqibatlarini baholash va tanlov qilish imkoniyatini ta‘minlaydi. Aqlsiz yoki idrok qilish imkoniyati cheklangan shaxs bilan to‘laqonli idrok sohibi bo‘lgan insonning mas‘uliyati bir xil bo‘lmasligi ham shu tamoyil bilan izohlanadi .

Biroq Moturidiy ta‘limotida inson mas‘uliyatini faqat aql bilan cheklash mumkin emas. Mas‘uliyat masalasi ilohiy buyruq, insonning imkoniyati, ixtiyori va amal qilish sharoitlari bilan birgalikda ko‘rib chiqiladi. Shuning uchun aqlni taklifning yagona sharti sifatida emas, balki insonning mas‘uliyatli subyekt bo‘lishini ta‘minlovchi asosiy qobiliyatlardan biri sifatida talqin qilish maqsadga muvofiq.

Moturidiy maktabida aqlan va axloqan bilish

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Moturidiy ta‘limotida aqlning axloqiy bilishdagi o‘rni alohida e‘tiborga loyiq. Inson yaxshilik va yomonlik, foyda va zarar, adolat va zulm kabi tushunchalar haqida fikr yuritish imkoniyatiga ega. Bu imkoniyat axloqiy qarorlarning shunchaki tashqi ta‘sir yoki tabiiy mayllar asosida emas, balki anglangan mezonlar asosida qabul qilinishiga yordam beradi.

Bu masalada «الحسن والقبح» (yaxshilik va yomonlik, ma‘qullik va noma‘qullik) tushunchalari muhim nazariy ahamiyatga ega. Kalom maktablari ushbu masalani turlicha izohlaganlar. Moturidiy yondashuvida inson aqli ayrim xatti-harakatlarning yaxshi yoki yomonligini, ularning foydali yoki zararli jihatlarini anglash imkoniyatiga ega. Biroq muayyan amalning shariat nuqtayi nazaridan majburiyligi, savob yoki jazoga sabab bo‘lishi kabi masalalar vahiy va ilohiy xitob bilan ham bog‘liqdir .

Demak, axloqiy qadriyatni anglash bilan uning diniy-huquqiy maqomini belgilashni farqlash zarur. Aql ayrim axloqiy haqiqatlarni anglaydi, vahiy esa ularni diniy mas‘uliyat, buyruq va qaytariqlar tizimida aniqlashtiradi. Bunday yondashuv Moturidiy ta‘limotida aqlning faol o‘rnini ko‘rsatish bilan birga, diniy me‘yorlarning o‘ziga xos manbaga ega ekanini ham e‘tirof etadi.

Aqlning axloqiy vazifasi insonning tabiiy istaklarini nazorat qilishda ham ko‘rinadi. Moturidiy ta‘kidlaganidek, insonning tabiiy moyilligi bilan aql orqali anglangan yaxshilik har doim ham mos kelavermaydi. Bu fikr « وما يحسّنه العقل غير الذي ترغب فيه الطبيعة...» jumlasida yaqqol ifodalangan . Shuning uchun axloqiy yetuklik nafaqat nimani xohlashni, balki nima to‘g‘ri ekanini anglashni ham talab qiladi. Bu jihatdan aql insonni tabiiy mayllarning oddiy ijrochisi bo‘lib qolishdan saqlaydi.

Moturidiy qarashlarining ilmi kalomdagi boshqa yondashuvlardan farqli jihatlari

Aqlning mohiyati masalasi Moturidiy maktabiga xos bo‘lsa-da, bu muammo islom kalomining boshqa yo‘nalishlarida ham muhokama qilingan. Xususan, mu‘taziliy, ash‘ariy va moturidiy mutakallimlar aqlning e‘tiqodiy bilishdagi o‘rni, axloqiy

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hukmlarni anglash imkoniyati va vahiy bilan munosabati yuzasidan turli qarashlarni ilgari surganlar .

Mu‘taziliylar aqlning axloqiy bilish imkoniyatlariga kengroq o‘rin ajratganlar. Ularning yondashuvida yaxshilik va yomonlikning ayrim jihatlari inson aqli orqali anglanishi, ilohiy adolatning oqilona asoslanishi muhim o‘rin tutadi. Moturidiylikda ham aqlning bunday imkoniyatlari tan olinadi, biroq masalalar ahli sunna aqidasi va vahiy bilan bog‘liq umumiy metodologiya doirasida talqin qilinadi .

Ash‘ariy kalomida ham aql nazariy dalillashning muhim vositasi hisoblanadi. Shu bois Moturidiy va Ash‘ariy maktablarini «aql tarafdorlari» va «naql tarafdorlari» tarzida keskin qarama-qarshi qo‘yish ilmiy jihatdan to‘g‘ri emas. Ular o‘rtasidagi farqlar ko‘proq aqlning ayrim masalalardagi imkoniyatlari, axloqiy hukmlarning asoslanishi va inson mas‘uliyatining talqinida namoyon bo‘ladi .

Moturidiy maktabining o‘ziga xos jihati shundaki, u inson aqlining mustaqil bilish imkoniyatlarini e‘tirof etish bilan birga, vahiy xabarining zarurligini ham izchil asoslaydi. Shu tariqa aql va naql bir-birini inkor qiluvchi emas, balki vazifalari farqlanadigan bilish vositalari sifatida namoyon bo‘ladi .

Ushbu farqlarni o‘rganishda Abu Mu‘in an-Nasafiyning «Tabsirat al-adilla» asari muhim ahamiyatga ega. Nasafiy Moturidiy maktabining nazariy qarashlarini tizimlashtirib, bilim, nazar, dalillash va inson mas‘uliyati masalalarini batafsil yoritadi. Mazkur asar Moturidiy qarashlarining keyingi davrda qanday rivojlantirilganini aniqlash imkonini beradi .

Moturidiy ta‘limotida aqlning ilmiy-metodologik ahamiyati

Moturidiy kalomida aqlning mohiyatini tahlil qilish uning faqat diniy e‘tiqod doirasidagi vazifalarini aniqlash bilan cheklanmaydi. Ushbu ta‘limotda bilimning manbalari, haqiqatni tekshirish mezonlari, dalilning ishonchliligi va insonning fikriy mas‘uliyati kabi umumiy ilmiy-metodologik masalalar ham muhim o‘rin egallaydi.

Birinchidan, Moturidiy aqliy bilishni taqlidiy qabul qilishdan farqlaydi. Bu yondashuv e‘tiqodning ongli va dalillangan bo‘lishini talab qiladi. Natijada bilim egasining o‘z fikri uchun mas‘uliyati kuchayadi .

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Ikkinchidan, u sezgi, xabar va nazarni bilishning o‘zaro bog‘liq yo‘llari sifatida ko‘radi. Bunday yondashuv bilishni bir tomonlama tushuntirishdan saqlaydi. Inson tajribasi, ijtimoiy xotira va nazariy tafakkur birgalikda bilim hosil qilishda qatnashadi .

Uchinchidan, Moturidiy aqlning imkoniyatlarini e‘tirof etish bilan birga, uning chegaralarini ham belgilaydi. Bu esa bilish jarayonida metodologik aniqlikni ta‘minlaydi: qaysi masalani aql orqali, qaysi masalani ishonchli xabar orqali bilish mumkinligi farqlanadi .

To‘rtinchidan, aqlning axloqiy vazifasi insonning bilim va amaliy faoliyati o‘rtasidagi aloqani ko‘rsatadi. Inson haqiqatni anglash bilan birga, o‘z xatti-harakatlarini ham baholash imkoniyatiga ega bo‘ladi .

Zamonaviy tadqiqotlarda ham Moturidiy kalomining aynan shu jihatlari alohida o‘rganilmoqda. Ramon Harvey Moturidiy tafakkurini an‘anaviy kalom doirasida qolgan holda zamonaviy falsafiy ilohiyot bilan muloqot qila oladigan tizim sifatida tahlil qiladi. Uning tadqiqotida «an‘ana va aql», «oqilona borliq» va «tabiiy ilohiyot» masalalari alohida boblarda ko‘rib chiqilgan .

Ulrich Rudolph esa Moturidiy ta‘limotining shakllanishini Samarqanddagi hanafiy ilmiy muhit va o‘sha davr kalomiy munozaralari bilan bog‘liq holda o‘rganadi. Bu yondashuv Moturidiy qarashlarini tarixiy sharoitdan uzib qo‘ymasdan, ularning ilmiy-nazariy asoslarini aniqlashga yordam beradi .

Xulosa

Moturidiy kalom maktabida aql insonning haqiqatni anglash, mavjudotlar ustida tafakkur yuritish, dalillarni tahlil qilish va asosli xulosalar chiqarish imkoniyatini ta‘minlovchi muhim bilish qobiliyati sifatida namoyon bo‘ladi. Abu Mansur Moturidiy qarashlarida aqlning mohiyati uning mavhum ta‘rifidan ko‘ra, bilish jarayonidagi vazifalari orqali ochib beriladi.

Tadqiqot natijalariga ko‘ra, quyidagi xulosalarga kelish mumkin:

1. Moturidiy ta‘limotida aql insonning bilish faoliyatidagi asosiy qobiliyatlardan biri bo‘lib, u nazar va istidlol jarayonlari orqali namoyon bo‘ladi. Aqlning vazifasi

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mavjud ma‘lumotlarni shunchaki qabul qilish emas, balki ularni tahlil qilish va haqiqatni aniqlashdan iborat.

2. Moturidiy epistemologiyasida hissiy idrok, ishonchli xabar va aqliy mushohada bilimning o‘zaro bog‘liq manbalari hisoblanadi. Bu yondashuv bilimni faqat sezgiga yoki faqat nazariy tafakkurga bog‘lab qo‘ymaydi.

3. Aqlning muhim vazifalaridan biri olamdagi o‘zgarishlar va hodisalar ustida fikr yuritish orqali borliqning yaratilganligini hamda Yaratuvchining mavjudligini anglashdan iborat. Bunda «النظر» va «الاستدلال» tushunchalari Moturidiy dalillash metodining asosiy unsurlari sifatida namoyon bo‘ladi.

4. Moturidiy aqlni e‘tiqodiy masalalarda faol bilish vositasi deb biladi va dalilga asoslanmagan taqlidiy e‘tiqodni tanqid qiladi. Biroq bu holat inson aqli barcha diniy masalalarni mustaqil hal qila oladi, degan ma‘noni anglatmaydi.

5. Aqlning imkoniyatlari bilan uning chegaralarini farqlash Moturidiy ta‘limotining muhim xususiyatidir. Inson aqli ayrim haqiqatlarni mustaqil anglay olsa-da, g‘ayb olamining tafsilotlari, ibodatlarning aniq shakllari va ilohiy buyruqlarning muayyan mazmuni haqida vahiy xabariga ehtiyoj sezadi.

6. Moturidiy qarashlarida aqlning axloqiy ahamiyati ham alohida o‘rin tutadi. U insonning tabiiy moyilliklari bilan ongli axloqiy baholari o‘rtasidagi farqni anglashga yordam beradi. Shu tariqa aql insonning diniy va axloqiy mas‘uliyatini asoslovchi muhim omilga aylanadi.

7. Moturidiy kalomining ilmiy-metodologik ahamiyati aql, sezgi va xabarni yagona bilish tizimida o‘zaro bog‘lay olganida namoyon bo‘ladi. Bu yondashuvni zamonaviy epistemologiya nuqtayi nazaridan o‘rganish islom tafakkurida bilim manbalari va insonning bilish imkoniyatlari haqidagi qarashlarni chuqurroq anglashga xizmat qiladi.

Umuman olganda, Moturidiy kalom maktabida aql nafaqat e‘tiqodni himoya qilish vositasi, balki insonning borliqni anglash, haqiqatni izlash va o‘z faoliyatiga mas‘uliyat bilan yondashishini ta‘minlaydigan muhim ma‘naviy-intellektual qobiliyat sifatida talqin qilinadi. Uning ta‘limotida aql va vahiy munosabatining uyg‘unligi

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islomiy tafakkurning ratsional imkoniyatlarini namoyon etuvchi muhim nazariy asoslardan biridir.

I. Birlamchi arabcha manbalar

1. الماتريدي، أبو منصور محمد بن محمد. كتاب التوحيد. تحقيق وتعليق: بكر طوبال أوغلي، محمد آروتشي. – أنقرة: وقف ديانة تركيا، مركز البحوث الإسلامية، 2003. – 718 ص.

2. الماتريدي، أبو منصور محمد بن محمد. تأويلات أهل السنة. تحقيق: مجدي باسلوم. – بيروت: دار الكتب العلمية، 2005. – 10 أجزاء.

3. النسفي، أبو المعين ميمون بن محمد. تبصرة الأدلة في أصول الدين. تحقيق وتعليق: حسين آتاي. – أنقرة: رئاسة الشؤون الدينية للجمهورية التركية، 1993.

تبصرة الأدلة في أصول الدين

4. النسفي، أبو المعين ميمون بن محمد. تبصرة الأدلة في أصول الدين على طريقة الإمام أبي منصور الماتريدي. تحقيق: كلود سلامة. – دمشق: المعهد العلمي الفرنسي للدراسات العربية، 1990–1993. – جزآن.

5. البزدوي، أبو اليسر محمد بن محمد. أصول الدين. تحقيق: هانس بيتر لينه. – القاهرة: عيسى البابي الحلبي، 1963.

6. التفتازاني، سعد الدين مسعود بن عمر. شرح العقائد النسفية. – بيروت: دار إحياء التراث العربي، 2014.

7. الأشعري، أبو الحسن علي بن إسماعيل. مقالات الإسلاميين واختلاف المصلين. تحقيق: محمد محيي الدين عبد الحميد. – القاهرة: مكتبة النهضة المصرية، 1950.

8. الغزالي، أبو حامد محمد بن محمد. الاقتصاد في الاعتقاد. تحقيق: إنصاف رمضان. – دمشق: دار قتيبة، 2003.

9. الغزالي، أبو حامد محمد بن محمد. تهافت الفلاسفة. تحقيق: سليمان دنيا. – القاهرة: دار المعارف، 1966.

10. البغدادي، عبد القاهر بن طاهر. أصول الدين. – إسطنبول: مطبعة الدولة، 1928.

II. Zamonaviy arab tilidagi tadqiqotlar

11. أبو زهرة، محمد. تاريخ المذاهب الإسلامية في السياسة والعقائد وتاريخ المذاهب الفقهية. – القاهرة: دار الفكر العربي.

12. صبحي، أحمد محمود. في علم الكلام: دراسة فلسفية لآراء الفرق الإسلامية في أصول الدين. – الإسكندرية: دار النهضة العربية، 1969.

13. الشافعي، حسن محمود. المدخل إلى دراسة علم الكلام. – القاهرة: مكتبة وهبة.

14. النشار، علي سامي. نشأة الفكر الفلسفي في الإسلام. – القاهرة: دار المعارف.

15. بدوي، عبد الرحمن. مذاهب الإسلاميين. – بيروت: دار العلم للملايين.

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III. Xorijiy ilmiy tadqiqotlar

16. Rudolph, U. Al-Māturīdī and the Development of Sunnī Theology in Samarqand. Translated by Rodrigo Adem. – Leiden; Boston: Brill, 2015. – 362 p.

17. Harvey, R. Transcendent God, Rational World: A Māturīdī Theology. – Edinburgh: Edinburgh University Press, 2021. – 296 p.

18. Dorroll, P. The Universe in Flux: Reconsidering Abū Manṣūr Al-Māturīdī‘s Metaphysics and Epistemology // Journal of Islamic Studies. – 2016. – Vol. 27. – No. 2. – P. 119–135.

19. Nasr, S. H., Leaman, O. (eds.). History of Islamic Philosophy. – London; New York: Routledge, 1996.

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THE USE OF DIDACTIC AND EDUCATIONAL GAMES AS A MEANS OF DEVELOPING BASIC MATHEMATICAL CONCEPTS IN PRESCHOOLERS

Turebekova Gulzhakhan Adilbekovna

acting associate professor at the Department of Preschool Education of the NSPI named after Ajiniyaz

Abstract

The article examines the theoretical and practical aspects of using didactic and developmental games in fostering elementary mathematical concepts in preschool children. It analyzes the psychological and pedagogical significance of play as the leading form of preschool development. The effectiveness of integrating mathematical games into the educational process of a preschool educational organization is substantiated.

Keywords

preschool education, elementary mathematical concepts, didactic games, developmental games, play activity, mathematical development, logical thinking, preschoolers.

ИСПОЛЬЗОВАНИЕ ДИДАКТИЧЕСКИХ И РАЗВИВАЮЩИХ ИГР КАК СРЕДСТВО ФОРМИРОВАНИЯ ЭЛЕМЕНТАРНЫХ МАТЕМАТИЧЕСКИХ ПОНЯТИЙ У ДОШКОЛЬНИКОВ

Туребекова Гулжахан Адилбековна,

и.о. доцента кафедры дошкольного образования НГПИ имени Ажинияза

Аннотация. В статье рассматриваются теоретические и практические аспекты использования дидактических и развивающих игр в процессе формирования элементарных математических понятий у детей дошкольного возраста. Анализируется психологическое и педагогическое значение игровой деятельности как ведущей формы развития дошкольников. Обоснована эффективность интеграции математических игр в образовательный процесс дошкольной образовательной организации.

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Ключевые слова: дошкольное образование, элементарные математические понятия, дидактические игры, развивающие игры, игровая деятельность, математическое развитие, логическое мышление, дошкольники.

Введение. В современной системе дошкольного образования особый акцент делается на гармоничное умственное развитие ребенка, где формирование элементарных математических понятий занимает одно из ключевых мест. Математические представления являются не только основой для последующего успешного обучения в школе, но и формируют у ребенка базисные структуры логического мышления, аналитические способности, пространственное воображение и сообразительность.

Основная сложность математического развития дошкольников заключается в абстрактном характере математических категорий (число, форма, пространственно-временные отношения). В силу возрастных психологических особенностей у детей дошкольного возраста преобладает наглядно-действенное и наглядно-образное мышление. Ввиду этого традиционные репродуктивные методы обучения оказываются малоэффективными и могут вызывать у детей снижение познавательного интереса.

Ведущим видом деятельности в дошкольном возрасте, согласно фундаментальным исследованиям Л. С. Выготского, А. Н. Леонтьева и Д. Б. Эльконина, выступает игра. В связи с этим использование дидактических и развивающих игр становится наиболее естественным, эффективным и психофизиологически обоснованным средством освоения математических понятий.

Основная часть

Психолого-педагогическое значение дидактических и развивающих игр. Дидактическая игра представляет собой многоплановое педагогическое явление: с одной стороны, это игровой метод обучения дошкольников, с другой - самостоятельная игровая деятельность, а также средство всестороннего воспитания личности.

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В структуре дидактической игры выделяются следующие обязательные компоненты:

- Дидактическая (обучающая) задача - то, чему педагог хочет научить детей в процессе игры;
- Игровая задача - цель, которую ставят перед собой дети (например, «помочь сказочному герою», «собрать пазл», «выиграть соревнование»);
- Игровые действия - способы проявления активности детей в игровых целях;
- Правила - регуляторы поведения и выполнения игровых действий;
- Результат - подведение итогов (достижение игровой цели и усвоение дидактического материала).

Развивающие игры отличаются от традиционных дидактических тем, что они создают условия для постоянного усложнения задач («зоны ближайшего развития»). Они стимулируют не просто повторение изученного, но и поиск самостоятельных решений, развитие вариативного и абстрактного мышления.

Классификация математических игр по направлениям развития. Для системного формирования математических представлений дидактические и развивающие игры целесообразно разделить на пять основных блоков:

1. **Игры на количество и счёт:**

Цель: формирование понятия о числе, составе числа, навыков прямого и обратного счёта, сравнения множеств.

Примеры: «Считай не ошибись», «Составь число», «Сосчитай предметы», «Математическое лото».

Механика: ребенок учится соотносить количество предметов с цифрой, сравнивать группы элементов («больше», «меньше», «равно»).

2. **Игры на освоение величины и формы:**

Цель: знакомство с геометрическими фигурами и объёмными телами, развитие навыков измерения и сравнения предметов по длине, ширине, высоте и объёму.

Примеры: «Чудесный мешочек», «Найди предмет такой же формы», «Построй лесенку», «Геометрическая мозаика».

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Механика: моделирование предметов из геометрических фигур, группировка по признакам формы и размера.

3. Игры на пространственную ориентацию:

Цель: освоение пространственных категорий (вправо, влево, вверх, вниз, впереди, сзади, внутри, снаружи).

Примеры: «Куда пойдёшь - что найдёшь?», «Найди клад по карте-схеме», «Математический диктант на сетке».

Механика: ориентирование в пространстве помещения, на листе бумаги и на плоскости стола.

4. Игры на временные представления:

Цель: усвоение последовательности частей суток, дней недели, времен года, понятий «вчера», «сегодня», «завтра».

Примеры: «Живая неделя», «Времена года», «Когда это бывает?», «Вчера, сегодня, завтра».

Механика: работа с наглядными моделями (часы-календарь, карточки-цепочки).

5. Игры на развитие логического мышления:

Цель: формирование умений анализировать, синтезировать, сравнивать, классифицировать и обобщать.

Примеры: Блоки Дьенеша, Палочки Кюизенера, «Танграм», «Найди лишнее», «Логические цепочки».

Механика: решение задач на группировку по двум и более признакам одновременно (цвет, форма, размер).

Методические условия эффективного применения игр. Для того чтобы игровая деятельность приносила максимальный обучающий и развивающий эффект, педагогу необходимо соблюдать ряд методических условий:

- Системность и постепенность: переходы от простых наглядных игр к более сложным логическим задачам должны соответствовать возрастным и индивидуальным возможностям детей.

- Интеграция в различные формы работы: математические игры должны

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применяться не только на специально организованных занятиях, но и в свободное время, во время прогулок, а также в индивидуальной работе.

- Создание развивающей предметно-пространственной среды: доступность математических игр, игровых наборов и конструкторов в математическом уголке группы.

- Сочетание наглядности и практического действия: использование осязаемых материалов (счётные палочки, природный материал, геометрические блоки), с которыми ребенок может производить манипуляции.

Заключение. Использование дидактических и развивающих игр в дошкольном образовании является высокоэффективным средством формирования элементарных математических понятий. Благодаря включению математического содержания в игровую форму абстрактные категории становятся понятными, наглядными и доступными для восприятия ребенком.

Игровая форма обучения позволяет не только передавать знания и формировать вычислительные и измерительные навыки, но и развивает познавательную активность, внимание, память, пространственное воображение и логическое мышление дошкольников. Систематическое применение дидактических и развивающих игр в образовательном процессе ДОО обеспечивает успешную психологическую и интеллектуальную готовность детей к обучению в школе.

Список литературы

1. Выготский, Л. С. // Психология развития. СПб.: Питер, 2001. - С. 56-79.
2. Ерофеева, Т. И. Дошкольники изучают математику: Методическое пособие для воспитателей. М.: Просвещение, 2006. - 128 с.
3. Михайлова, З. А. Игровые задачи для дошкольников: Книга для воспитателя детского сада. СПб.: Детство-Пресс, 2010. - 144 с.
4. Носова, Е. А., Непомнящая, R. Л. Логика и математика для дошкольников: Методическое пособие. СПб.: Акцидент, 2002. - 96 с.
5. Смоленцева, А. А. Сюжетно-дидактические игры с математическим содержанием. М.: Просвещение, 1993. - 95 с.

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Psychological Foundations of Developing Management Functions in Young People in Higher Education

Akhmedova Mukhlisa

Lecturer, Department of Pedagogy, Navoi State University

Email: axmedovamuxlisa183@gmail.com

Abstract

This article examines the psychological foundations of developing management functions in higher education students. It distinguishes management functions, understood as goal setting, planning, organizing, coordination, and monitoring, from the cognitive executive functions that support purposeful behaviour. A conceptual analysis of selected research on executive functions, self-regulated learning, motivation, leadership development, and feedback informs an instructional framework. The analysis identifies four interconnected domains: cognitive regulation, motivational engagement, interpersonal coordination, and reflective monitoring. A four-stage framework comprising diagnostic assessment, targeted preparation, practical management, and reflective evaluation is proposed. Observable behavioural indicators are specified for each management function. The framework connects individual self-management with participation in shared tasks and supports assessment through plans, work records, observation, and reflection. This theoretical article reports no original participant data. Its contribution is a structured proposal for teaching and assessing management functions; its effectiveness and measurement properties require empirical investigation in higher education.

Keywords

management functions; higher education; university students; executive functions; self-regulated learning; motivation; teamwork; reflection.

Introduction

Higher education requires students to manage tasks that extend beyond acquiring subject knowledge. Independent assignments, collaborative projects, presentations, and teaching practice involve setting priorities, allocating time,

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coordinating contributions, and evaluating outcomes. A student may understand a topic yet struggle to translate that understanding into an achievable plan. Similarly, a group may possess adequate subject knowledge while failing to clarify responsibilities or respond to delays. These difficulties make the development of management functions relevant to academic work and professional preparation.

In this article, management functions refer to goal setting, planning, organizing, coordination, and monitoring. These functions describe what a person does when directing individual or collective activity. Executive functions describe cognitive processes supporting goal-directed behaviour, including inhibition, working memory, and cognitive flexibility [1, 2]. The concepts are related but should not be treated as interchangeable. Cognitive control can support a management decision, whereas effective management also depends on communication, responsibility, task knowledge, and the conditions under which the decision is implemented.

A further distinction concerns individual and collective activity. Self-management involves regulating personal effort, attention, and time. Collective management involves negotiating a shared goal, distributing responsibilities, exchanging information, and maintaining accountability. A student who organizes personal study effectively may still require instruction in coordinating the work of others. Consequently, management education should address both levels and examine how students move between them during authentic academic tasks.

The objective is to identify psychological mechanisms relevant to management functions and develop an instructional framework for higher education. The guiding question is how cognitive regulation, motivation, interpersonal interaction, and reflection can be translated into teachable management actions. The article also proposes observable indicators for assessing these actions. The intended contribution is conceptual and practical: it organizes established theoretical perspectives into a framework that can subsequently be tested, rather than claiming that a particular intervention has already produced measurable gains.

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Methods

The article uses a narrative conceptual analysis of six selected publications addressing executive functions, self-regulated learning, self-determination, leadership development, and educational feedback [1–6]. These publications were selected for their relevance to the mechanisms underlying purposeful individual and collaborative activity. The analysis is not a systematic review or meta-analysis and does not claim exhaustive coverage of the literature. The source set provides theoretical anchors for constructing an instructional proposal.

The unit of analysis was the relationship between a management function and a psychological mechanism. Each function was considered in terms of its purpose, the actions through which it becomes observable, and the conditions that may facilitate or obstruct its performance. Concepts from different research traditions were compared without assuming that they measure the same construct. In particular, cognitive executive functions were treated as supporting processes rather than direct measures of managerial competence.

The synthesis proceeded by defining the management functions, relating relevant theoretical concepts to those functions, and translating the relationships into proposed learning activities and assessment indicators. The resulting categories are an interpretive organization of the literature. They are not factors established through statistical analysis. No students were recruited, no questionnaires were administered, and no intervention or original statistical analysis was conducted. Accordingly, the Results section presents conceptual findings and a proposed framework, not empirical effects.

Results

Psychological domains supporting management functions

The conceptual synthesis identified four domains relevant to the proposed framework: cognitive regulation, motivational engagement, interpersonal coordination, and reflective monitoring. These domains overlap in practice. Planning requires maintaining the goal and considering task constraints, but also accepting

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responsibility for the plan. Coordination requires clear communication, but also the ability to revise an initial approach. The domains therefore provide an analytical structure rather than independent categories of student performance.

Cognitive regulation supports the maintenance of task goals, the selection of relevant information, and adjustment when circumstances change. Research on executive functions provides a basis for distinguishing related components of cognitive control [1, 2]. For management instruction, this distinction suggests assessing different actions separately. Producing an organized plan, resisting an irrelevant distraction, and revising a decision are not equivalent demonstrations of competence. A single general rating may conceal important differences between them.

Motivational engagement concerns whether students understand the purpose of a task and accept ownership of their contribution. Self-determination theory directs attention to autonomy, competence, and relatedness [4]. In the proposed framework, students receive a defined outcome and quality criteria while retaining a meaningful choice of methods. This arrangement is intended to connect initiative with responsibility. The recommendation is a pedagogical interpretation of the theory, not an independently verified effect of the framework.

Interpersonal coordination concerns the translation of personal intentions into shared action. The distinction between developing individual leaders and developing collective leadership capacity is relevant here [5]. In student groups, management should therefore include listening, explaining responsibilities, recording agreements, and enabling contributions from less vocal members. Reflective monitoring connects these activities to evidence: students compare intended and completed work, identify the consequences of decisions, and specify changes for the next task.

Management functions as observable actions

Goal setting becomes observable when students specify the intended product and criteria for success. A goal such as preparing a seminar remains incomplete unless the group identifies the required programme, presentations, materials, and

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participant arrangements. Planning becomes observable when students sequence activities, estimate time, identify dependencies, and explain priorities. These actions allow an instructor to examine the reasoning behind a plan rather than its visual presentation alone.

Organizing becomes observable through the allocation of responsibilities and resources. Each task should have an identified contributor, deadline, and method of verification. Coordination becomes observable through timely information exchange, clarification of disagreements, and renegotiation when work cannot proceed as planned. Monitoring becomes observable when students check progress against agreed criteria and introduce a justified correction. Reporting a problem early is consequently treated as accountable behaviour rather than automatically interpreted as failure.

External supports, such as schedules, task lists, and decision records, make the management process visible. Their educational value depends on how students use them. Completing a template does not demonstrate that a student can justify priorities or respond to an unexpected constraint. Students should therefore explain why their plan is suitable, which assumptions it depends on, and what would trigger its revision. The assessment focus remains the decision process and its consequences.

A four-stage instructional framework

The proposed framework comprises diagnostic assessment, targeted preparation, practical management, and reflective evaluation. The stages form a recurring instructional cycle rather than a one-time sequence. Self-regulated learning provides a theoretical basis for connecting preparation, performance, and reflection [3]. The framework extends this cycle to both personal task management and participation in shared activity. Its stages are proposed design elements and should not be described as a validated programme.

Diagnostic assessment uses a short management task to identify existing strategies. For example, students may prepare a plan for a seminar under specified time and resource constraints. The instructor examines the clarity of the goal,

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sequencing of activities, distribution of responsibilities, and proposed progress checks. A brief self-assessment is compared with the work sample. The purpose is to identify instructional needs, not to assign students permanent labels or infer psychological traits from one performance.

Targeted preparation focuses on the actions that were insufficiently demonstrated. Students practise converting broad intentions into assessable outputs, estimating task duration, identifying dependencies, and comparing alternative plans. Rather than supplying a complete solution, the instructor asks students to explain the strengths and limitations of two possible approaches. This makes the justification of a decision part of the task and allows discussion of feasibility before implementation.

Practical management takes place through a small collaborative project. Responsibilities such as coordination, information gathering, resource organization, and quality checking rotate across tasks so that all students experience different functions. A planned change in one condition can require the group to revise its approach. For example, a presentation format may change or an additional deliverable may be introduced. Such changes should serve a clear instructional purpose and remain proportionate to the students' workload.

Reflective evaluation compares the initial plan with the completed work. Each student identifies a management decision, explains its outcome, and proposes a specific adjustment. Feedback addresses observable actions rather than personal labels. A comment explaining that unspecified deadlines caused tasks to accumulate is more actionable than a general judgment about the student. Research on feedback supports attention to the task, the process, and self-regulation [6]. The proposed framework uses this distinction to structure the feedback discussion.

Proposed assessment indicators

Five assessment dimensions correspond to the management functions. Goal setting concerns the specificity of outcomes and success criteria. Planning concerns justified priorities, sequencing, and timing. Organizing concerns clear responsibilities and appropriate resource allocation. Coordination concerns the exchange of relevant

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information and maintenance of agreements. Monitoring concerns evidence-based progress checks and corrective action. These dimensions are proposed instructional indicators, not standardized psychological scales.

Within each dimension, performance can be described by the support required: substantial guidance, occasional prompts, or independent action accompanied by an explanation. These descriptors should be applied to the task actually observed. A student may perform independently in one situation and require assistance in another. Evidence should include the plan, work records, instructor observation, peer accounts, and a short reflective explanation. No single source should be assumed to provide a complete account of management competence.

Discussion

The framework links management education to ordinary academic activity. Its central implication is that students need opportunities to make decisions and examine their consequences, rather than only receive descriptions of effective leadership. Classroom projects can make management functions visible when goals, responsibilities, and evaluation criteria are explicit. Without these conditions, a successful final product may reveal little about who planned the work, how disagreements were resolved, or whether the workload was distributed fairly.

Individual and collective development require related but distinct forms of practice. Personal schedules may support self-management, while collaborative tasks expose students to negotiation and interdependence. Rotating responsibilities can prevent coordination experience from being restricted to students who already volunteer for leadership roles. However, rotation should be accompanied by preparation and feedback. Simply appointing a student as group leader does not establish that meaningful learning has occurred.

Emotional demands should also be considered. Time pressure and disagreement may influence the quality of communication and decisions. Instruction can ask students to clarify an objection, restate the problem, and consider alternatives before responding. The purpose is not to suppress emotion, but to maintain purposeful

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interaction. Assessment should therefore focus on observable handling of the situation rather than assumptions about a student's personality or emotional stability.

The framework has several limitations. Its categories are based on a selective conceptual synthesis, and their relationships have not been tested in a local student population. The proposed performance descriptors lack established reliability and validity. Context also matters: unclear instructions, limited resources, language difficulties, or unequal group participation may account for weak performance. Instructors should investigate these conditions before attributing a difficulty to the student's psychological characteristics.

Future research should operationalize the indicators, examine agreement between assessors, and evaluate change across comparable tasks. An intervention study could include baseline and follow-up measurements, an appropriate comparison condition, and a later assessment of transfer. Analyses should account for initial differences and the nested structure of students working in groups. Any reported improvement should be accompanied by effect estimates and uncertainty, with causal claims limited by the design.

Conclusion

Management functions in higher education can be conceptualized as observable actions supported by cognitive regulation, motivation, interpersonal coordination, and reflection. The proposed framework connects diagnostic assessment, targeted preparation, practical management, and reflective evaluation. It emphasizes justified decisions, shared responsibility, and evidence-based correction. Its contribution is a coherent basis for instructional design and assessment. Empirical research is required to determine whether implementation improves students' management performance and whether the proposed indicators measure development consistently.

References

1. Zelazo, P. D. (2020). Executive function and psychopathology: A neurodevelopmental perspective. Annual Review of Clinical Psychology, 16, 431–454. https://doi.org/10.1146/annurev-clinpsy-072319-024242

https://creativecommons.org/licenses/by/4.0/

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2. del-Valle, M. V., Canet-Juric, L., Zamora, E. V., Andrés, M. L., & Urquijo, S. (2024). Executive functions and their relation to academic performance in university students. Psicología Educativa, 30(1), 47–55. https://doi.org/10.5093/psed2024a2

3. Theobald, M. (2021). Self-regulated learning training programs enhance university students' academic performance, self-regulated learning strategies, and motivation: A meta-analysis. Contemporary Educational Psychology, 66, 101976. https://doi.org/10.1016/j.cedpsych.2021.101976

4. Howard, J. L., Bureau, J., Guay, F., Chong, J. X. Y., & Ryan, R. M. (2021). Student motivation and associated outcomes: A meta-analysis from self-determination theory. Perspectives on Psychological Science, 16(6), 1300–1323. https://doi.org/10.1177/1745691620966789

5. Day, D., Bastardoz, N., Bisbey, T., Reyes, D., & Salas, E. (2021). Unlocking human potential through leadership training & development initiatives. Behavioral Science & Policy, 7(1). https://doi.org/10.1177/237946152100700105

6. Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. Frontiers in Psychology, 10, 3087. https://doi.org/10.3389/fpsyg.2019.03087

7. Hayitov, O. E. (2021). Boshqaruv psixologiyasi [Management psychology]. Istiqlol. (In Uzbek).

8. Ashurov, M. (2021). Boshqaruv psixologiyasi [Management psychology]. AL-FERGANUS LLC. (In Uzbek).

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THE USE OF GAMIFICATION IN DEVELOPING THE CREATIVE COMPETENCE OF 8TH–9TH GRADE STUDENTS

Kamalova Gulzada Zakir kizi

Doctoral Student, Nukus State Pedagogical Institute named after Ajiniyaz

Abstract

The article explores the pedagogical potential and specific features of using gamification technologies to develop the creative competence of students in grades 8–9. It examines the psychological and pedagogical characteristics of adolescence and substantiates the rationale for using game mechanics in the educational process of basic school.

Keywords

gamification, creative competence, students in grades 8–9, adolescence, game mechanics, divergent thinking, creative autonomy, intrinsic motivation, educational process.

ИСПОЛЬЗОВАНИЕ ГЕЙМИФИКАЦИИ В РАЗВИТИИ КРЕАТИВНОЙ КОМПЕТЕНТНОСТИ УЧАЩИХСЯ 8-9 КЛАССОВ

Камалова Гулзада Закир кизи,

докторант Нукусского государственного педагогического института имени Ажинияза

Аннотация. В статье исследуются педагогические возможности и специфические особенности использования технологий геймификации для развития креативной компетентности учащихся 8–9 классов. Рассматривается психолого-педагогическая характеристика подросткового возраста и аргументируется целесообразность применения игровых механизмов в образовательном процессе базовой школы.

Ключевые слова: геймификация, креативная компетентность, учащиеся 8–9 классов, подростковый возраст, игровые механики, дивергентное мышление, творческая самостоятельность, внутренняя мотивация, образовательный процесс.

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Введение

В условиях перехода к постиндустриальному информационному обществу перед современной школой стоит задача формирования личности, способной не только усваивать готовые массивы знаний, но и находить нестандартные решения в условиях неопределенности, генерировать инновационные идеи и проявлять высокую гибкость мышления. В этом контексте развитие креативной компетентности обучающихся становится одним из приоритетных направлений модернизации школьного образования.

Особое место в процессе формирования креативности занимает период обучения в 8–9 классах. Подростковый возраст характеризуется качественной перестройкой познавательной сферы, стремлением к автономии, проявлением индивидуальности и повышенной чувствительностью к социальной оценке со стороны сверстников. Однако традиционная классно-урочная система с её преобладанием репродуктивных методов обучения зачастую снижает учебную мотивацию подростков и сдерживает их творческий потенциал.

Одним из наиболее перспективных и эффективных способов решения данной проблемы является внедрение технологий геймификации (gamification) - использования игровых элементов, механик и эстетики в неигровых, образовательных контекстах. В отличие от обычных дидактических игр, геймификация не трансформирует сам урок в игру, а интегрирует мотивационные механизмы игровой деятельности в структуру учебного процесса. Исследование способов применения геймификации для активизации креативного мышления обучающихся 8–9 классов представляет значительный научный и практический интерес.

Основная часть

Сущность и структура креативной компетентности учащихся 8–9 классов. Креативная компетентность обучающегося представляет собой интегративное личностное образование, отражающее готовность и способность к эффективному поиску нестандартных способов решения учебных и

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жизненных задач, созданию субъективно или объективно нового продукта, а также к самовыражению через творческую деятельность.

В структуре креативной компетентности учащихся 8–9 классов традиционно выделяются следующие основные компоненты:

Мотивационно-целевой компонент: наличие устойчивого интереса к исследовательской и творческой деятельности, стремление к самореализации и проявлению инициативы;

Когнитивно-деятельностный компонент: владение приемами дивергентного мышления (беглость, гибкость, оригинальность и разработанность идей), способность к комбинированию и конструированию;

Эмоционально-волевой компонент: готовность работать в условиях неопределенности, преодолевать интеллектуальные затруднения, отсутствие страха перед совершением ошибки;

Рефлексивно-оценочный компонент: способность к критическому осмыслению и оценке собственных творческих замыслов и результатов своей деятельности.

Психологические особенности учащихся 8-9 классов (14-16 лет) делают этот возраст сензитивным для развития указанных компонентов. Подростки стремятся к активному поиску своей идентичности, им свойственны идеализация, склонность к экспериментированию и стремление к признанию в группе. Проектно-творческая деятельность, поддерживаемая игровыми механиками, позволяет удовлетворить эти потребности наиболее гармоничным образом.

Потенциал геймификации как инструмента активизации креативности. Геймификация в образовании базируется на использовании естественных человеческих потребностей в признании, конкуренции, сотрудничестве, достижении целей и самовыражении. В отличие от жестко регламентированных учебных заданий, геймифицированная образовательная среда создаёт так называемое «пространство безопасной ошибки», где

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неудачная попытка воспринимается не как катастрофа или низкая оценка, а как ценный опыт для следующего шага.

Применение геймификации при работе с учащимися 8-9 классов позволяет решить три ключевые педагогические задачи:

Переход от внешней мотивации к внутренней: система игровых наград, уровней и обратной связи стимулирует познавательный интерес и погружает обучающегося в состояние «потока»;

Активизация поисковой активности: игровые сценарии, содержащие детективные, исследовательские или фантастические сюжеты, побуждают подростков искать нестандартные пути достижения цели;

Развитие командной креативности: групповые игровые механики формируют навыки коллективного брейншторминга и распределения творческих ролей.

Классификация элементов геймификации для развития креативности. Для эффективного развития креативной компетентности элементы геймификации целесообразно разделить на три связанных уровня:

Уровень 1. Игровые динамики (Смысловой контекст). Игровые динамики задают общее направление и сюжетную рамку учебной деятельности:

- Интригующий нарратив (сюжет): погружение учебного материала в форму глобального квеста, исследовательской экспедиции или моделирования научно-фантастического проекта.

- Исследование и свобода выбора: предоставление подросткам возможности самостоятельно выбирать траекторию решения задачи, уровень сложности или роль в команде.

Уровень 2. Игровые механики (Процессуальные инструменты). Игровые механики запускают непосредственные действия учащихся и направляют их творческую активность:

- Творческие квесты и челенджи: задания с открытым ответом, требующие от учащихся создания оригинального медиапродукта, изобретения, написания

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эссе или разработки модели.

- Система мгновенной обратной связи: оперативное получение реакций, подсказок и комментариев на предложенные нестандартные решения.

- Стратегические ограничения: введение искусственных условий (например, ограниченность ресурсов или нестандартные правила), которые вынуждают мыслить вне привычных шаблонов.

Уровень 3. Игровые компоненты. Обеспечивают наглядность прогресса и признание достижений:

- Очки опыта и навыки: разветвленная система развития творческих умений, где за каждое нестандартное решение начисляются баллы или открываются новые "способности".

- Бейджи и статусы за креативность: специальные знаки отличия за "Самое оригинальное решение", "Лучшую командную идею" или "Глубокую аналитику".

Этапы реализации геймифицированного обучения и педагогические условия. Внедрение геймификации в процесс развития креативной компетентности учащихся 8–9 классов осуществляется по трем последовательным этапам:

Первый этап - Вводно-ориентировочный. На данном этапе происходит погружение учащихся в сюжетно-игровой контекст, формирование команд, проведение входящей диагностики уровня креативности и принятие «правил игры». Учащиеся знакомятся со шкалой оценивания и вариантами выбора творческих заданий.

Второй этап - Процессуально-деятельностный. Осуществляется непосредственное выполнение индивидуальных и групповых творческих квестов, решение ситуационных кейсов и участие в исследовательских играх. На этом этапе преподаватель выступает в роли гейм-дизайнера и фасилитатора, направляя поисковую деятельность подростков и фиксируя их промежуточные успехи.

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Третий этап - Рефлексивно-презентационный. Включает публичную защиту созданных творческих продуктов, коллективное обсуждение нестандартных идей, подведение итогов игрового рейтинга, вручение персональных наград за оригинальность и проведение рефлексии собственного роста.

Для того чтобы геймификация не превратилась в формальное соревнование ради внешних атрибутов, необходимо соблюдать следующие педагогические условия: 1). Приоритет содержательной креативности над игровыми атрибутами: система бонусов и очков должна начисляться именно за оригинальность, гибкость мышления и проработанность идей, а не за скорость выполнения шаблонных упражнений, 2). Баланс между индивидуальной и групповой работой: создание условий, при которых личный творческий вклад каждого подростка обогащает общий результат команды, 3). Психологический комфорт и отсутствие жесткой цензуры: поддержание атмосферы принятия любых, даже самых необычных и фантастических гипотез на этапе их генерации.

Заключение

Применение средств геймификации в процессе развития креативной компетентности учащихся 8-9 классов является высокоэффективной педагогической технологией, отвечающей психологическим потребностям и интересам современного подростка.

Интеграция игровых динамик, механик и компонентов позволяет перевести процесс обучения из категории пассивного усвоения знаний в категорию увлекательного творческого поиска. Геймифицированная образовательная среда снимает психологические барьеры перед совершением ошибки, стимулирует дивергентное мышление и формирует у учащихся готовность к созданию субъективно и объективно новых продуктов.

Систематическое применение разработанного комплекса геймифицированных средств и соблюдение соответствующих педагогических

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условий обеспечивает существенный рост внутренней мотивации обучающихся, укрепляет их творческую самостоятельность и закладывает прочную основу для успешной самореализации в будущем.

Список литературы

1. Выготский, Л. С. Психология развития. СПб.: Питер, 2001. - С. 56-79.

2. Выготский, Л. С. Воображение и творчество в детском возрасте. СПб.: СОИС, 1997. - 96 с.

3. А. З. Алексеева, Г. С. Соломонова, Р. Р. Аетдинова. Геймификация в образовании. // «ВЕСТНИК СВФУ» № 4 (24) 2021.

4. Замятина, О. М. Формирование и оценка компетенций обучающихся путем геймификации образовательного процесса. // Научно-методический электронный журнал «Концепт». – 2015. – Т. 15. – С. 26–30.

5. Informacionnyj portal o gejmifikacii. – URL: https://octalysis.ru/gejmifikacija-v-obrazovanii-eto.

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DEVELOPING STUDENTS' CREATIVITY IN THE PROCESS OF PREPARING INDEPENDENT WORK

Tangirbergenova Mehriban Koshkinbaevna

Assistant Lecturer at the Department of General Pedagogy

Qabilbekova Gulnazkhan

3rd-year student majoring in Pedagogy NSPI named after Ajiniyaz

Abstract

The article examines the pedagogical conditions and methodological approaches to developing students' creative potential in the process of organizing and conducting independent work at higher education institutions. It analyzes the transformation of traditional independent work from a reproductive form into research-oriented, productive, and creative activity.

Keywords

creative potential, students' independent work, higher education, creativity, productive activity, research work, independence, pedagogical support, critical thinking.

РАЗВИТИЕ ТВОРЧЕСТВА СТУДЕНТОВ В ПРОЦЕССЕ ПОДГОТОВКИ САМОСТОЯТЕЛЬНОЙ РАБОТЫ

Аннотация. В статье исследуются педагогические условия и методические пути развития творческого потенциала студентов в процессе организации и выполнения самостоятельной работы в высшем учебном заведении. Анализируется трансформация традиционной самостоятельной работы из репродуктивной формы в научно-исследовательскую и продуктивно-творческую деятельность.

Ключевые слова: творческий потенциал, самостоятельная работа студентов, высшее образование, креативность, продуктивная деятельность, научно-исследовательская работа, самостоятельность, педагогическое сопровождение, критическое мышление.

Введение

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Современный этап развития высшего образования характеризуется смещением акцента с пассивного усвоения готовой информации на формирование у студентов навыков самостоятельного добывания знаний, их критического осмысления и нестандартного применения. В условиях высокого темпа обновления технологий и информации специалисту требуются не только базовые академические знания, но и гибкость мышления, инициативность, умение находить оригинальные решения в неопределенных ситуациях - то есть высокий уровень развития творческого потенциала.

Ключевым пространством для формирования данных качеств выступает самостоятельная работа студентов, на которую в современных образовательных стандартах выделяется значительная часть учебного времени. Однако в традиционной практике самостоятельная работа нередко сводится к формальному переписыванию учебных материалов, написанию репродуктивных рефератов или механическому выполнению шаблонных заданий. Такой подход не только снижает познавательную мотивацию обучающихся, но и блокирует развитие их творческих способностей.

Преобразование самостоятельной работы из контролирующе-закрепляющей формы в эффективный инструмент развития творчества требует переосмысления её структуры, содержания и методов педагогического руководства. Исследование путей активизации творческой самостоятельности студентов в процессе подготовки самостоятельных работ является актуальной задачей высшей школы.

Основная часть

Сущность творческой самостоятельной работы студентов. Творческая самостоятельная работа студента представляет собой высшую форму учебной и научно-исследовательской деятельности, при которой обучающийся на основе имеющихся знаний и методических ориентиров самостоятельно постановляет проблему, ищет пути её решения и создает субъективно или объективно новый интеллектуальный продукт.

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В отличие от репродуктивной самостоятельной работы, направленной на запоминание и воспроизведение, творческая самостоятельная работа характеризуется следующими чертами:

- Высокий уровень внутренней мотивации: интерес к процессу познания и стремление к самореализации;

- Дивергентность мышления: способность генерировать множество альтернативных вариантов решения одной задачи;

- Исследовательская позиция: стремление к критическому анализу первоисточников, выявлению противоречий и аргументации собственной точки зрения;

- Продуктивность: создание оригинального результата (проекта, научной статьи, методической разработки, портфолио, аналитического обзора).

Классификация видов самостоятельных работ по уровню творческой направленности. Для постепенного вовлечения студентов в продуктивную деятельность самостоятельные работы целесообразно разделить на четыре основных блока в зависимости от степени проявления автономии и креативности:

1. Репродуктивно-вариативные работы (Базовый уровень). Служат фундаментом для развития самостоятельности. Студентам предлагается не просто повторить изученный алгоритм, а применить его в изменившихся условиях (например, подбор примеров из реальной практики к теоретическим положениям, составление сравнительных схем и понятийных карт).

2. Поисково-аналитические работы (Реконструктивный уровень). Направлены на формирование навыков аналитической обработки информации: написание проблемных эссе, подготовка критических обзоров научной литературы, проведение SWOT-анализа педагогических или социальных явлений, подготовка аннотированных библиографий.

3. Ситуационно-моделирующие работы (Исследовательский уровень). Предполагают погружение студента в профессиональный контекст: решение и

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самостоятельное конструирование кейсов, разработка симуляционных сценариев, составление проектов развития (проектов уроков, программ исследований, стартапов).

4. Научно-творческие и проектные работы (Акмеологический уровень). Характеризуются максимальной степенью автономии и оригинальности: проведение самостоятельных микроисследований, подготовка научных статей к публикации, создание цифровых образовательных ресурсов, разработка мультмедийных и социальных проектов.

Этапы педагогического сопровождения творческой самостоятельной работы. Развитие творчества студентов в процессе самостоятельной работы - это управляемый процесс, требующий от преподавателя перехода от роли «контролера» к роли «фасилитатора» и «тьютора». Данный процесс включает три последовательных этапа:

Подготовительно-мотивационный этап. Преподаватель совместно со студентом формулирует тему или проблему исследования, определяет варианты выбора форм и продуктов работы. На этом этапе создается положительный эмоциональный настрой, устраняется страх перед «неправильным ответом» и разъясняются критерии оценивания креативности.

Процессуально-поисковый этап. Студент осуществляет самостоятельный поиск информации, проводит эксперимент, конструирует и апробирует свои идеи. Преподаватель оказывает консультативную поддержку, задает наводящие проблемные вопросы, помогает преодолевать возникшие интеллектуальные тупики, не навязывая при этом готовых решений.

Рефлексивно-презентационный этап. Включает публичную защиту созданного продукта (на семинаре, студенческой конференции или перед академической группой), коллоквиум или взаиморецензирование. Завершается этап глубокой саморефлексией студента («Чему я научился?», «Какие нестандартные способы решения я нашел?», «Что можно улучшить?»).

Педагогические условия эффективности развития творчества

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студентов. Для того чтобы самостоятельная работа способствовала раскрытию творческого потенциала студентов, в образовательной среде вуза необходимо обеспечить соблюдение следующих условий:

- Предоставление вариативности и свободы выбора: возможность выбора темы, формата представления результата (текстовый, мультимедийный, проектный) и траектории выполнения задания.

- Проблемный характер заданий: отсутствие в формулировках задач однозначных решений в учебнике, ориентация на поиск междисциплинарных связей.

- Создание атмосферы психологической безопасности: признание права студента на академический риск, обоснованное сомнение и оригинальность мысли.

- Внедрение цифровых и интерактивных инструментов: использование электронных библиотек, виртуальных лабораторий и платформ совместной работы для расширения исследовательских возможностей.

Заключение

Развитие творчества студентов в процессе подготовки самостоятельной работы является важным фактором формирования высококвалифицированного, конкурентоспособного и инициативного специалиста. Трансформация традиционной репродуктивной самостоятельной работы в научно-исследовательскую и проектную деятельность позволяет перевести студента из статуса пассивного слушателя в позицию активного исследователя и создателя нового знания. Систематическое использование проблемных кейсов, исследовательских проектов, творческих эссе и цифровых портфолио в сочетании с тьюторской поддержкой преподавателя обеспечивает существенный рост критического мышления, познавательной самостоятельности и креативности обучающихся.

Организация самостоятельной работы на основе принципов вариативности, проблемности и рефлексии создаёт надежный фундамент для

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постоянного самообразования и успешной профессиональной самореализации выпускников высшей школы.

Список литературы

1. Выготский Л. С. // Психология развития. СПб.: Питер, 2001. - С. 56-79.
2. Андреев В. И. Педагогика: Учебный курс для творческого саморазвития. Казань: Центр инновационных технологий, 2012. - 608 с.
3. Выготский Л. С. Воображение и творчество в детском возрасте. СПб.: СОИС, 1997. - 96 с.
4. Загвязинский В. И. Теория обучения: Современная интерпретация. М.: Академия, 2008. - 192 с.
5. Зимняя И. А. Основы педагогической психологии. М.: Логос, 2010. -384 с.

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MODERN CLINICAL AND LABORATORY METHODS FOR EVALUATING IMMUNOLOGICAL AND GENETIC COMPATIBILITY IN ORGAN TRANSPLANTATION

Vafoyeva Nodira Ismoil qizi

Master's degree, laboratory physician *(Tashkent State Medical University) (Tashkent, Uzbekistan)*

Abstract

This article provides a comparative analysis of the global experience in laboratory methods for the early detection of immunological conflicts between the donor and recipient in organ transplantation. Observations indicate that while the traditional CDC-crossmatch method retains its historical significance, relying on it without the use of solid-phase Luminex technologies (PRA, LSA) can lead to significantly erroneous conclusions. The article highlights the comparative advantages and clinical sensitivity of these methods, as well as the regional prospects for implementing the "Virtual Crossmatch" algorithm into clinical practice.

Keywords

transplantation, clinical-laboratory diagnostics, HLA-typing, Luminex technology, PRA, Virtual Crossmatch, donor-specific antibodies.

Introduction. The widespread implementation of organ transplantation in the treatment of chronic organ failure has set a serious task for medical professionals to prevent acute rejection syndrome. Clinical practice shows that the long-term survival of the transplant primarily depends on accurate pre-transplant laboratory diagnostics—specifically, the correct assessment of compatibility in the HLA (Human Leukocyte Antigen) system [1, 7]. Although laboratories currently have numerous in-vitro assay methods at their disposal, there is still no consensus in international transplantology circles regarding a single, universal, and cost-effective diagnostic algorithm. Within the scope of this article, by comparatively analyzing authoritative scientific sources published in recent years, we will examine the evolution of methods for determining immunological compatibility and their current

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pressing issues.

Analysis and discussion.*CDC Crossmatch: Opportunities and limitations.* In the history of clinical immunology, the complement-dependent cytotoxicity (CDC Crossmatch) method, proposed by P. Terasaki and R. Patel (1969), is recognized as the foundation for determining donor and recipient compatibility [2]. This method, which was a revolutionary solution for its time, significantly contributed to drastically reducing the incidence of hyperacute rejection. However, as medical practice expanded, some of its shortcomings began to emerge. For instance, according to W. Howell and his research group (2010), CDC can "detect" only those antibodies that activate the complement system [3]. Studies by S. M. Saidman et al. (2011) demonstrated that in cases where autoantibodies are present or when patients are taking certain medications, the CDC method tends to yield unjustifiably positive (false-positive) results [8]. Moreover, the method's absolute dependence on viable lymphocytes in laboratory conditions constantly sustains the risk of preanalytical errors.

Paradigm shift: Solid-phase assays (Luminex). Over the past decade, equipment in laboratory diagnostics has undergone drastic technological advancements. International consensus documents adopted under the leadership of B. Tait (2013) recognized solid-phase immunoassays (in particular, the Luminex 3D xMAP platform) as an integral part of pre-transplant diagnostics [4]. The operating principle of these devices fundamentally differs from traditional methods. Today, the laboratory specialist does not visually search for cell death under a microscope but instead measures the titer of circulating HLA antibodies using precise numerical indicators, such as MFI (Mean Fluorescence Intensity). A 2018 report by the international STAR group, led by A. Tambur, had a profound impact on the field: it established that if the level of donor-specific antibodies (DSA) exceeds 1000-1500 on the MFI scale, the risk of chronic organ rejection significantly increases [5]. These figures prove the exceptionally high analytical sensitivity of the LSA (Luminex Single Antigen) assay.

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Comparative analysis of different approaches. In order to systematize the results of the studies presented above, the following comparative table was developed (Table 1).

Table 1. Comparative characteristics of methods for determining immunological compatibility in organ transplantation

Assay method (Authors)	Detection mechanism	Sensitivity	Main advantages	Existing limitations
CDC Crossmatch (Terasaki P. [2], Howell W. [3])	Complement-mediated cell death (lysis)	Low - Moderate	Historically proven gold standard; effectively prevents hyperacute rejection.	Requires viable cells; cannot detect low-titer and non-complement-fixing antibodies.
Luminex PRA (Tait B.D. [4])	Solid-phase, based on fluorescence emission (MFI)	High	General assessment of sensitization status; economically convenient screening method.	Cannot individually identify the specific donor against which the antibody is directed (DSA).
Luminex Single Antigen (LSA) (Tambur A.R. [5])	Microbeads coated with single recombinant antigens	Highest	Detects antibodies specific to a particular allele (DSA); provides numerical results in MFI; serves as the basis for vXM.	Quite expensive; in some cases, it may detect clinically insignificant very low titers, causing unnecessary clinical concern.

The concept of Virtual Crossmatch and its practical significance. As understood from the table and the emergence of highly sensitive assays, the concept of "Virtual Crossmatch" (vXM) is increasingly expanding in international transplantology.

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According to recent data from M. Ziemann and N. Lachmann (2020) as well as N. Safonov's group (2022), recipient and donor blood are not physically mixed in a test tube during this process [6, 10]. Instead, the patient's electronic HLA database and the spectrum of existing antibodies in their blood are compared, allowing compatibility to be predicted in advance using virtual computer programs. In conditions where organ transplantation is rapidly growing, such as in Uzbekistan, Virtual Crossmatch makes it possible to shorten organ ischemia time and minimize the risks of unnecessary donor organ transportation and unjustified rejections.

Conclusion. Based on the analysis of existing scientific literature, including comparative studies, it can be concluded that relying solely on a single laboratory method today does not meet medical safety requirements. While the traditional CDC Crossmatch provides a clinical picture, Luminex technology reveals the subtle molecular details of the immunological process. In the future, based on the specific population genetics of each region, developing national reference limits (MFI cut-off) that integrate these two technologies and approving standard operating procedures for a unified Waitlist represents a highly relevant scientific and practical task.

References:

1. Susal, C., & Opelz, G. (2013). Current role of human leukocyte antigen matching in kidney transplantation. *Current Opinion in Organ Transplantation*, 18(4), 438-444.

2. Patel, R., & Terasaki, P. I. (1969). Significance of the positive crossmatch test in kidney transplantation. *New England Journal of Medicine*, 280(14), 735-739.

3. Howell, W. M., Carter, V., & Clark, B. (2010). The HLA system: immunobiology, HLA typing, antibody screening and crossmatching techniques. *Journal of Clinical Pathology*, 63(5), 387-390.

4. Tait, B. D., Susal, C., Gebel, H. M., et al. (2013). Consensus guidelines on the testing and clinical management issues associated with HLA and non-HLA antibodies in transplantation. *Transplantation*, 95(1), 19-47.

https://creativecommons.org/licenses/by/4.0/

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ACCEPTED: 13.10.2026
PUBLISHED: 13.10.2026

5. Tambur, A. R., Campbell, P., Claas, F. H., et al. (2018). Sensitization in Transplantation: Assessment of Risk (STAR) 2017 Working Group Meeting Report. *American Journal of Transplantation*, 18(7), 1604-1614.

6. Ziemann, M., & Lachmann, N. (2020). Virtual Crossmatch in Solid Organ Transplantation. *Transfusion Medicine and Hemotherapy*, 47(5), 350-357.

7. Montgomery, R. A., Loupy, A., & Segev, D. L. (2018). Antibody-mediated rejection: New approaches in prevention and management. *American Journal of Transplantation*, 18(Suppl 3), 3-17.

8. Saidman, S. M., Duquesnoy, R. J., & Zeevi, A. (2011). HLA antibodies and crossmatching in solid organ transplantation. *Immunology and Allergy Clinics*, 31(2), 221-236.

9. Lefaucheur, C., Loupy, A., Hill, G. S., et al. (2010). Preexisting donor-specific HLA antibodies predict outcome in kidney transplantation. *Journal of the American Society of Nephrology*, 21(8), 1398-1406.

10. Safonov, N. A., Makeev, A. B., & Ivanov, V. V. (2022). The role of virtual crossmatch in modern transplantology: opportunities and limitations. *Russian Journal of Transplantology and Artificial Organs*, 24(2), 105-112. *(Translated title)*

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Statistical Robustness of Islamic Finance Adoption Intentions among Small and Medium Enterprises in Uzbekistan

Komilova Gulbadanbegim

Manager, Uzbekistan Creative Industry Park

ORCID: 0009-0008-8228-6335

E-mail: gulbadanbegimkomilova@gmail.com

Abstract

This article evaluates the statistical robustness of reported associations between Islamic finance adoption intention and ten business and attitudinal constructs among small and medium enterprises in Uzbekistan. A secondary analysis uses reported summary statistics for a purposively selected borrower sample of 21 respondents. Approximate 95% confidence intervals are reconstructed using the Fisher transformation, and reported p-values are adjusted through the Holm procedure. Eight associations meet the unadjusted 5% threshold, whereas five remain below that threshold after adjustment. Inclination toward interest-free finance has the largest reported correlation with adoption intention ($r = 0.809$; 95% CI 0.580–0.920; adjusted $p = 0.000090$). Debt pressure, business vulnerability, knowledge and awareness, and trust also retain adjusted evidence of association. Wide intervals and unavailable predictor covariances limit formal comparison of association magnitudes. The perceptions scale has low reported internal consistency, requiring cautious interpretation. The analysis shows that exploratory demand evidence can inform subsequent research and product testing, but cannot establish causal determinants, national demand or actual uptake. Its contribution is a transparent assessment of uncertainty and multiplicity within an emerging Islamic finance market.

Keywords: *Islamic finance; SMEs; Uzbekistan; adoption intention; correlation; confidence intervals; multiple testing; measurement reliability.*

Introduction

A market assessment requires more than evidence that potential customers express interest in a financial product. It must establish how precisely that interest is

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measured and whether reported associations remain credible when several explanatory constructs are examined together. These questions are particularly relevant when an emerging financial market is evaluated using a small, targeted sample.

For small and medium enterprises, borrowing conditions can affect investment timing, working capital and the choice of financial arrangements. The OECD (2024) documents the effects of tighter financing conditions on SMEs across its covered economies. This international context motivates an examination of financing pressure in Uzbekistan, but does not provide a direct estimate of conditions among Uzbek firms. Evidence from a local borrower survey therefore needs to be interpreted within its own sampling and measurement boundaries.

The reported Uzbek survey covers conventional credit experiences alongside attitudes toward Islamic finance. Its ten correlations with acceptance intention offer a useful exploratory starting point. Nevertheless, a list of positive coefficients and small p-values does not reveal whether the estimated relationships are precise, whether nominal findings withstand multiple testing, or whether each scale measures a coherent construct. A statistically informative assessment should address all three issues before drawing market-development conclusions.

Adoption intention is also distinct from observed financial behaviour. An enterprise may prefer interest-free finance while being unable to identify a provider, compare contractual obligations or obtain an eligible product. The World Bank (2025) examines access to and use of financial services as related but distinguishable dimensions of inclusion. Its household indicators are not substitutes for SME adoption measures; the distinction is useful here because expressed willingness alone cannot be treated as a transaction or an active financing relationship.

The international development of Islamic finance provides a further reason to distinguish interest from implementation. The IFSB (2025) addresses industry stability and structural vulnerabilities, while Bank Negara Malaysia (2022) sets out financial-sector development priorities that include Islamic finance. These sources

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provide institutional context rather than matched observations for the Uzbek survey. Consequently, neither international industry growth nor Malaysia's policy framework can validate the magnitude of a local attitudinal correlation.

The present study asks which reported associations remain supported after adjustment for ten tests, how wide their uncertainty intervals are, and what measurement weaknesses constrain interpretation. Its contribution is a secondary statistical robustness analysis within the broader research field of Islamic finance development in Uzbekistan. The analysis extends the original evidence through interval estimation and two procedures for controlling family-wise error. These calculations assess the robustness of statistical findings and identify priorities for independent replication.

Materials and Methods

Study design and analytical material

The study is a secondary analysis of aggregate survey results contained in Komilova (2026). The source records 34 initial responses and identifies a core analytical sample of 21 SME owners, managers and financial decision-makers with recent borrowing experience. The present analysis uses only this core sample. All borrower percentages and reconstructed correlation intervals use the core analytical sample of 21.

Respondents were selected for their relevance to business financing decisions rather than through a probability sample of all Uzbek enterprises. Manufacturing firms account for 15 of the 21 observations. This concentration makes the evidence useful for exploratory analysis of a particular group, while limiting national and sector-wide generalization. The estimates therefore describe an exploratory borrower sample.

The analytical material consists of reported frequencies, composite-score descriptive statistics, internal-consistency coefficients and ten correlations with acceptance intention. Respondent-level records and the full predictor correlation matrix were not available for this reanalysis. Accordingly, reported coefficients and

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p-values are retained as source estimates, whereas confidence intervals and multiplicity adjustments are newly calculated. The contribution consists of new statistical calculations applied to existing aggregate evidence.

Outcome and explanatory constructs

Acceptance intention is the outcome of interest, measured by a three-item composite on a five-point response scale. The source reports a mean of 3.90, a standard deviation of 1.43 and Cronbach's alpha of 0.946. Ten associated constructs cover credit conditions, debt pressure, access difficulty, resilience, vulnerability, macroeconomic sensitivity, perceptions, awareness, trust and inclination toward interest-free finance. These are self-reported constructs, not verified financing transactions.

Means and reliability estimates are used to characterize the measures rather than to reconstruct individual responses. Reliability coefficients are not recalculated because item-level covariances are unavailable. The analysis also avoids treating a high alpha as proof of a single latent dimension, validity or causal relevance. This distinction matters when respondents answer several related attitudinal questions within the same questionnaire.

Confidence intervals and multiplicity adjustment

For each reported Pearson correlation r, an approximate pointwise 95% confidence interval is calculated using $z = \operatorname{atanh}(r)$, with standard error $1/\sqrt{(n-3)}$. With $n = 21$, the interval is obtained by transforming $z \pm 1.96/\sqrt{18}$ back to the correlation scale. These intervals assume independent observations and an approximately appropriate Pearson correlation model. They are not simultaneous intervals and cannot correct non-probability sampling or unexamined departures from model assumptions.

The ten reported p-values are treated as one exploratory testing family. After ordering them from smallest to largest, the Holm adjusted value at position i is the maximum of $(10 - j + 1)p(j)$ over $j \leq i$, capped at one. The family-wise threshold is 0.05. Adjustment can be applied without the predictor covariance matrix, although its

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interpretation remains conditional on the validity of the original tests. Imbens (2021) and the ASA President's Task Force (2021) support interpreting tests together with uncertainty and substantive context.

A Bonferroni sensitivity analysis uses the per-test threshold 0.05/10 = 0.005, equivalent to comparing min(1, 10p) with 0.05. Agreement between this conservative rule and the Holm procedure is assessed by comparing the retained sets of associations. Both corrections use the same ten tests and are conditional on the reported p-values.

Reanalysis boundaries

Available evidence	Analysis performed	Analysis not supported
Frequencies and sample size	Denominator and percentage checks	Weighted national estimates
Correlations and reported p-values	Fisher intervals and Holm adjustment	Partial effects or causal identification
Composite means and alpha	Measurement-quality assessment	Item diagnostics or factor analysis
No respondent-level observations	Aggregate sensitivity interpretation	Bootstrap or outlier diagnostics

Table 1. Scope of the secondary analysis. All newly calculated intervals use n = 21; adjusted probabilities use the complete family of ten source tests.

Coefficients are available to three decimal places, so reconstructed intervals are approximate. Missingness by individual pair and distributional diagnostics cannot be verified from the tables alone. Correlation differences cannot be formally tested without the relationships among predictors. Interpretation remains conditional on these data and model limitations.

Results

Sample composition and measurement quality

The sample comprises 10 business owners, five directors, five respondents classified as other decision-makers and one finance officer. Manufacturing represents

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71.4% of the sample, trade 19.0%, and services and agriculture 4.8% each. Sixteen respondents used a bank for their latest loan and five used a microfinance institution. These proportions describe the 21 respondents and are not population estimates.

Construct	Mean	SD	Alpha
Acceptance intention	3.90	1.43	0.946
Interest-free inclination	4.13	1.05	0.950
Debt pressure	3.74	1.31	0.935
Business vulnerability	3.95	1.11	0.793
Knowledge and awareness	3.67	1.32	0.941
Perceptions of Islamic finance	3.33	0.78	0.519
Difficulty of access	3.06	1.14	0.834

Table 2. Selected source-reported composite statistics.

The largest selected mean is recorded for inclination toward interest-free finance, whereas the intention measure has substantial dispersion. Its standard deviation of 1.43 indicates that the average does not represent a uniform response across firms. The perceptions composite has alpha = 0.519, below the values reported for the other selected scales. Its association with intention should therefore receive additional measurement scrutiny.

Product recognition is also uneven: 10 respondents did not identify a preferred Islamic product, eight selected murabaha and three selected musharaka. Sixteen did not know of a provider in their area, three were unsure and two reported awareness. These descriptive responses show that favourable average attitudes can coexist with limited practical product identification. They do not establish that the same respondents occupy each category because the available tables contain no cross-tabulations.

Effect estimates and adjusted evidence

Construct	r	95% CI	Reported p	Holm p
Interest-free inclination	0.809	0.580 to 0.920	0.000009	0.000090

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Construct	r	95% CI	Reported p	Holm p
Debt pressure	0.681	0.353 to 0.860	0.000670	0.006030
Business vulnerability	0.664	0.326 to 0.852	0.001021	0.008168
Knowledge and awareness	0.620	0.257 to 0.830	0.002730	0.019110
Trust	0.600	0.227 to 0.819	0.004030	0.024180
Credit conditions	0.542	0.144 to 0.789	0.011063	0.055315
Perceptions	0.524	0.119 to 0.779	0.014653	0.058612
Macroeconomic sensitivity	0.501	0.088 to 0.767	0.020757	0.062271
Access difficulty	0.315	-0.135 to 0.657	0.163599	0.327198
Business resilience	0.305	-0.146 to 0.651	0.178871	0.327198

Table 3. Associations with acceptance intention. Pointwise intervals and Holm adjusted p-values are calculated from source summary statistics.

Eight reported p-values are below 0.05 before correction. After Holm adjustment, five remain below 0.05: interest-free inclination, debt pressure, business vulnerability, knowledge and awareness, and trust. Credit conditions, perceptions and macroeconomic sensitivity retain positive point estimates, but their adjusted probabilities are 0.055315, 0.058612 and 0.062271. The Bonferroni criterion also retains the same five associations. Agreement between the two procedures shows that this retained set is stable under both corrections for the specified family of ten tests.

Interest-free inclination has the largest point estimate, but the interval from 0.580 to 0.920 is still substantial. The intervals for debt pressure and vulnerability extend from approximately 0.35 and 0.33 to approximately 0.86 and 0.85. Awareness and trust also have wide, overlapping intervals. Access difficulty and resilience include zero, alongside positive values large enough to remain substantively relevant. The current sample does not resolve those relationships precisely.

Discussion

The main result is that the inferential picture changes when uncertainty and multiple testing are considered together. Five associations retain evidence under the Holm procedure, but none is established as an independent determinant of uptake. A

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bivariate correlation can combine a direct relationship, shared causes, related questionnaire wording and contemporaneous reporting tendencies. Without longitudinal observations or an identified intervention, the direction of influence remains unresolved.

The strongest correlation links interest-free inclination with acceptance intention. These constructs are conceptually close: a respondent who prefers interest-free arrangements may also report an intention to use them. The coefficient is therefore consistent with attitudinal alignment, but cannot establish that modifying product availability or price would generate an equally large behavioural response. Distinguishing preference, willingness to compare offers and actual contracting would improve a future measurement framework.

Debt pressure and business vulnerability retain adjusted evidence and are relevant to the demand-side research question. Firms under financial strain may consider alternative financing arrangements. However, the survey does not establish that Islamic products would reduce their repayment burden, improve profitability or prevent payment delays. Such outcomes depend on specific contract terms, total costs, business cash flow and provider assessment. The observed intention correlations cannot be used as estimates of those outcomes.

Awareness and trust also remain associated with intention after correction. Practical product information and credible disclosure are therefore suitable topics for follow-up testing. Yet the aggregate data do not show whether awareness strengthens trust, whether trust increases information seeking, or whether both reflect a broader favourable attitude. The results support testing clearly specified mechanisms instead of presuming a causal sequence from a correlation ranking.

The measurement weakness of the perceptions composite creates an additional interpretive limit. Its alpha of 0.519 may indicate heterogeneous items, weak covariance or coding problems. Choosing among these explanations requires item-level review. Deleting questions solely to maximize alpha would risk changing the construct itself. A follow-up should examine wording, reverse coding, item

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distributions and dimensional structure before using the scale in a multivariable model.

Overlapping intervals do not establish differences between the leading coefficients. An unadjusted interval excluding zero can coexist with a Holm adjusted probability above 0.05: pointwise intervals concern individual estimates, whereas Holm adjustment controls error across the ten-test family. Neither procedure establishes market relevance.

Implications for subsequent research

A subsequent survey should define a primary outcome, specify the testing family before analysis and sample across sectors and locations. Following Lakens (2022), sample size should be justified by the inferential objective. As an illustrative calculation, a two-sided single-correlation test targeting a true correlation of 0.50 with 80% power at 5% significance requires approximately 30 complete independent observations under the Fisher approximation. This calculation is not sufficient for national estimation, ten-test correction, subgroup analysis or a multivariable model; those objectives require a separate design and a larger sample.

Behavioural validation should record whether respondents request an offer, complete an application and enter a financing contract. Reporting these stages separately would distinguish interest from uptake. Product testing should measure total contractual cost and repayment obligations alongside perceived acceptability. This approach would produce evidence more directly connected to financing decisions than a single intention score.

Conclusion

The secondary analysis identifies five associations retained by both Holm and Bonferroni correction, while revealing substantial uncertainty around their magnitudes. The evidence supports an exploratory relationship between adoption intention and preference, financial strain, awareness and trust. It does not establish causal determinants or national market demand. Transparent reporting of interval

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estimates, measurement quality and multiplicity provides a stronger basis for further Islamic finance research in Uzbekistan.

References

1. Lakens, D. (2022). Sample size justification. Collabra: Psychology, 8(1), 33267. https://doi.org/10.1525/collabra.332671.

2. OECD. (2024). Financing SMEs and Entrepreneurs 2024: An OECD Scoreboard. OECD Publishing. https://doi.org/10.1787/fa521246-en

3. World Bank. (2025). The Global Findex Database 2025: Connectivity and Financial Inclusion in the Digital Economy. https://www.worldbank.org/en/publication/globalfindex/report

4. Islamic Financial Services Board. (2025). Islamic Financial Services Industry Stability Report 2025. https://www.ifsb.org/publication-document/islamic-financial-services-industry-stability-report-2025/

5. Bank Negara Malaysia. (2022). Financial Sector Blueprint 2022–2026. https://www.bnm.gov.my/publications/fsb3

6. Imbens, G. W. (2021). Statistical significance, p-values, and the reporting of uncertainty. Journal of Economic Perspectives, 35(3), 157–174. https://doi.org/10.1257/jep.35.3.157

7. ASA President's Task Force. (2021). ASA President's Task Force Statement on Statistical Significance and Replicability. Amstat News. https://magazine.amstat.org/blog/2021/08/01/task-force-statement-p-value/

8. Komilova, G. (2026). Islamic finance development in Uzbekistan: A comparative benchmark study with lessons from Malaysia. New Uzbekistan University. Unpublished research document.

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INTERACTIVE METHODS AND DIGITAL TECHNOLOGIES IN TEACHING OF NORMAL PHYSIOLOGY AT A MEDICAL UNIVERSITY

ASMI, Department of Normal Physiology. Candidate of Biological Sciences, Associate Professor

Marina Anvarjanovna Mirzarakhimova.

https://orcid.org/0009-0006-3159-1060 Email - mainmis@yandex.com

Abstract

The article analyzes modern pedagogical approaches to teaching the fundamental discipline of "Normal Physiology" in higher education institutions. It examines the transition from traditional academic forms of instruction to interactive and digital methods (such as virtual simulations and the case-based learning/CBL method). The implementation of digital models of physiological processes, which fosters a deeper understanding of homeostatic mechanisms and the successful development of core professional competencies in future healthcare specialists.

Keywords

medical education, higher education pedagogy, normal physiology, interactive learning, clinical reasoning, virtual laboratories.

ИНТЕРАКТИВНЫЕ МЕТОДЫ И ЦИФРОВЫЕ ТЕХНОЛОГИИ В ПРЕПОДАВАНИИ НОРМАЛЬНОЙ ФИЗИОЛОГИИ В МЕДИЦИНСКОМ ВУЗЕ

АГМИ, Кафедра нормальной физиологии. к.б.н.,доцент

Мирзарахимова Марина Анваржановна.

Аннотация: В статье анализируются современные педагогические подходы к преподаванию фундаментальной дисциплины «Нормальная физиология» в медицинских высших учебных заведениях. Рассматривается специфика перехода от традиционных академических форм обучения к интерактивным и цифровым методам (виртуальные симуляции, метод ситуационных задач/CBL). Внедрения цифровых моделей физиологических процессов, что способствует более глубокому пониманию механизмов

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гомеостаза и успешному формированию базовых профессиональных компетенций у будущих специалистов здравоохранения.

Ключевые слова: медицинское образование, педагогика высшей школы, нормальная физиология, интерактивное обучение, клиническое мышление, виртуальные лаборатории.

ВВЕДЕНИЕ. Нормальная физиология является фундаментальной основой медицинского образования. Она формирует у студента понимание жизнедеятельности здорового организма, без чего невозможно дальнейшее изучение патологий и клинических дисциплин. [1,2,5]. Однако огромный объем теоретического материала и сложность восприятия механизмов регуляции (например, нейрогуморальной регуляции, физиологии кардио-респираторной системы) вызывают у студентов младших курсов когнитивные трудности. В современных условиях возникает социальная и экономическая потребность в оптимизации учебного процесса с целью повышения качества подготовки медицинских кадров. [3,4,6,7],

МЕТОДОЛОГИЯ: В основу исследования положен комплексный подход: анализ педагогического опыта кафедры нормальной физиологии, анкетирование студентов (для оценки уровня усвоения материала) и сравнительный анализ успеваемости групп, обучающихся по традиционной методике и с применением интерактивных платформ (например, виртуальных физиологических симуляторов рефлекторных дуг, механизмов дыхания или работы сердца).

РЕЗУЛЬТАТЫ И ОБСУЖДЕНИЕ. В современной методике преподавания фундаментальных медицинских дисциплин традиционная пассивная лекционная подача материала уступает место **методу обучения на основе конкретных ситуаций (Case-Based Learning — CBL)** что в переводе «Обучение на основе анализа конкретных ситуаций». Суть данной педагогической технологии в рамках курса нормальной физиологии заключается в разборе смоделированных пред-клинических и адаптационных

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состояний человека вместо механического заучивания изолированных констант организма. [3,8,9]. Студентам предлагается структурированный физиологический кейс (например, динамика показателей гемодинамики при гипоксии или сдвиги кислотно-основного равновесия при физической нагрузке), требующий деконструкции причинно-следственных связей. Метод **CBL** активизирует познавательную деятельность будущих врачей, смещая фокус с репродуктивного воспроизведения теории на глубокий анализ компенсаторных механизмов гомеостаза, что закладывает основу для формирования их системного клинического мышления уже на младших курсах. [3,4].

В рамках практических занятий по нормальной физиологии нами были разработаны и внедрены в учебный процесс тематические кейсы. В качестве примера успешной реализации метода **CBL** можно привести следующие учебные ситуации, применяемые на занятиях по нормальной физиологии. [2,3].

Физиология дыхания. Ситуация (Кейс): Анализ изменения характера дыхания у здорового добровольца после произвольной интенсивной гипервентиляции (глубокого и частого дыхания) в течение одной минуты. У испытуемого наблюдается кратковременная задержка дыхания (апноэ).

Педагогическая задача: объяснить механизм изменения дыхательного ритма. Студенты выстраивают взаимосвязь: гипервентиляция --- избыточное вымывание (CO_2) из крови (гипокапния) --- снижение раздражения хеморецепторов сосудистых зон и продолговатого мозга --- временное падение активности дыхательного центра.

Результат применения метода: Разбор кейса наглядно демонстрирует ведущую роль углекислого газа как химического регулятора дыхания, связывая биохимию крови с рефлекторной деятельностью нервной системы.

Физиология сердечно-сосудистой системы и гемодинамики.

Ситуация (Кейс): Ортостатическая проба. Студенты анализируют мгновенные изменения артериального давления и частоты сердечных

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сокращений (ЧСС) у здорового человека при резком переходе из горизонтального положения (лежа) в вертикальное (стоя).

Педагогическая задача: раскрыть суть барорецепторного рефлекса. Описывается схема: гравитационное депонирование крови в венах нижних конечностей ------ временное снижение венозного возврата и артериального давления ------снижение импульсации от барорецепторов дуги аорты------ активация симпатического отдела вегетативной нервной системы ----- компенсаторное увеличение ЧСС и вазоконстрикция.

- **Результат применения метода:** Метод формирует у будущих врачей динамическое понимание гемодинамики как постоянно подстраивающейся системы саморегуляции.

Анализ успеваемости показал, что разбор данных ситуаций позволил повысить индекс усвоения тем "Дыхание" и "Кровообращение" на (18-22%) по сравнению с контрольными группами.

Также особое значение приобретает замена классических лабораторных работ (часто ограниченных материально-технической базой или этическими нормами работы с животными) на **виртуальные практикумы и интерактивные 3D-модели**. Это позволяет студентам визуализировать сложные биоэлектрические и мембранные процессы (потенциал действия, синаптическая передача).

Интерактивный подход повышает вовлеченность студентов младших курсов, улучшает долгосрочное запоминание материала на (20-25%) и снижает уровень стресса при сдаче модульного контроля.

ЗАКЛЮЧЕНИЕ: таким образом, внедрение метода обучения на основе конкретных ситуаций (Case-Based Learning — CBL) - «Обучение на основе анализа конкретных ситуаций» в практику преподавания нормальной физиологии представляет собой эффективный инструмент модернизации высшего медицинского образования. Переход от репродуктивного заучивания физиологических констант к активному анализу предклинических и

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адаптационных кейсов (в частности, комплексных задач по физиологии дыхания и гемодинамики) позволил повысить качественный показатель успеваемости и глубину усвоения материала на **18–22%**.

Применение технологии CBL обеспечивает достижение ряда важных педагогических и профессиональных результатов. **Развитие системного клинического мышления:** студенты младших курсов приобретают навык деконструкции сложных причинно-следственных связей и учатся видеть организм как единую саморегулирующуюся систему. **Формирование долгосрочных компетенций:** интеграция фундаментальной теории с реальными клинико-физиологическими сценариями обеспечивает прочную основу для успешного освоения последующих профильных дисциплин (патофизиологии, пропедевтики, фармакологии). **Повышение субъектности и мотивации обучающихся:** интерактивный разбор ситуаций стимулирует научно-познавательный интерес будущих врачей, трансформируя пассивное восприятие лекционного материала в осознанную аналитическую деятельность.

Модернизация преподавания нормальной физиологии требует разумного баланса между сохранением традиций фундаментальной медицинской школы и внедрением интерактивных технологий. Использование разбора ситуационных задач и цифровых симуляторов не только оптимизирует учебный процесс, но и закладывает прочный фундамент для развития клинического мышления, подготавливая социально ответственного и профессионально компетентного врача.

Резюмируя вышесказанное, можно утверждать, что метод CBL отвечает современным социально-экономическим запросам общества, обеспечивая качественную подготовку высококвалифицированных, профессионально компетентных и адаптивных специалистов сферы здравоохранения.

Список литературы

1. *Агаджанян, Н. А.* Нормальная физиология: учебник для студентов медицинских вузов / Н. А. Агаджанян, В. М. Смирнов. – Москва: ООО «Издательство «Информационное информационное агентство», 2021. – 576 с.

https://creativecommons.org/licenses/by/4.0/

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2. *Артюхина, А. И.* Интерактивные методы обучения в медицинском вузе: учебник / А. И. Артюхина, В. И. Чумаков. – 2-е изд. – Москва: ГЭОТАР-Медиа, 2024. – 270 с.

3. *Кужель, О. П.* Использование кейс-метода в процессе преподавания нормальной физиологии у иностранных студентов / О. П. Кужель, Д. К. Кужель // Медицинское образование XXI века (eLib VSMU). – Витебск: ВГМУ, 2024. – С. 142–145.

4. *Мухина, С. А.* Современные инновационные технологии обучения: учебное пособие / С. А. Мухина, А. А. Соловьева. – 2-е изд. – Москва: ГЭОТАР-Медиа, 2019. – 360 с.

5. *Судаков, К. В.* Нормальная физиология: учебник для студентов медицинских вузов / К. В. Судаков, В. В. Киселев. – 3-е изд., испр. и доп. – Москва: ГЭОТАР-Медиа, 2023. – 824 с.

6. *Ткаченко, П. В.* Опыт использования интерактивных кейсов при изучении курса нормальной физиологии в медицинском вузе [Текст] / П. В. Ткаченко, Н. И. Белоусова, Е. В. Петрова // Журнал прикладных исследований (CyberLeninka). – 2022. – Т. 6, № 3. – С. 248–253.

7. *Ткаченко, П. В.* Проблемно-ориентированное (Problem-Based Learning — PBL) обучение в курсе нормальной физиологии у студентов медицинского вуза / П. В. Ткаченко, И. Л. Привалова // Научный вестник здравоохранения. – 2023. – № 2. – С. 115–120.

8. *Kalyanamerth, P.* Enhancing practical competencies through case-based technologies in medical schools / P. Kalyanamerth // Medicine and Ecology. – 2024. – № 2. – С. 45–51.

9. *McLean, S. F.* Case-Based Learning and its Application in Medical and Health Sciences Education [Text] / S. F. McLean // Journal of Medical Education and Curricular Development (NCBI PMC). – 2017. – Vol. 4. – P. 1–9.

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MODERN METHODS OF EARLY OSTEOSARCOMA DIAGNOSIS AND THEIR IMPACT ON TREATMENT EFFECTIVENESS

Yunusaliyev Javohirbek

Tursunov. D.M

Abstract

Late detection of osteosarcoma with metastases complicates staging, limits treatment tactics, and worsens clinical outcomes; therefore, it is important to determine the practical value of early diagnostic tools. The aim of the study was to assess the relationship between modern imaging methods, biopsy results, and treatment effectiveness. Based on a diagnostic cohort analysis, clinical data were reviewed sequentially, and the results of computed tomography, magnetic resonance imaging, chest computed tomography, bone scintigraphy or PET/CT, as well as biopsy, were compared with staging indicators. The combined interpretation of imaging and morphological examination results increased diagnostic accuracy and made it possible to adapt treatment decisions to the clinical stage. Accuracy according to the established diagnostic criteria was 76.2 %; indicators associated with individual examinations were recorded at levels of 42.9 % and 33.3 %. The difference between diagnostic accuracy and treatment effectiveness was assessed at the $p<0.001$ level, while the other observed statistical thresholds were $p<0.05$ and $p=0.018$. The results indicate the need to integrate early imaging, biopsy, and chest examination into a single algorithm. The scientific contribution of the study consists in substantiating the practical relationship between staging and therapeutic decisions in osteosarcoma as a unified diagnostic approach. At the next stage, standardized multicenter follow-up should examine the independent effect of this accuracy on overall and disease-free survival.

Keywords

Biopsy, Treatment effectiveness, Diagnostic accuracy, Diagnostic cohort analysis, Early diagnosis, Osteosarcoma, PET/CT

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OSTEOSARKOMANI ERTA TASHXISLASHNING ZAMONAVIY USULLARI VA DAVOLASH SAMARADORLIGIGA TA'SIRI

СОВРЕМЕННЫЕ МЕТОДЫ РАННЕЙ ДИАГНОСТИКИ ОСТЕОСАРКОМЫ И ИХ ВЛИЯНИЕ НА ЭФФЕКТИВНОСТЬ ЛЕЧЕНИЯ

Annotatsiya. *Osteosarkomaning metastazlar bilan kech aniqlanishi bosqichlashni murakkablashtiradi, davolash taktikasini cheklaydi va klinik natijalarni yomonlashtiradi; shu sababli erta tashxislash vositalarining amaliy qiymatini aniqlash muhimdir. Ishning maqsadi zamonaviy tasvirlash usullari, biopsiya natijalari va davolash samaradorligi o'rtasidagi bog'liqlikni baholashdan iborat bo'ldi. Diagnostik kohort tahlili asosida klinik ma'lumotlar izchil ko'rib chiqildi, kompyuter tomografiyasi, magnit-rezonans tomografiya, ko'krak qafasi kompyuter tomografiyasi, suyak skintigrafiyasi yoki PET/KT hamda biopsiya natijalari bosqichlash ko'rsatkichlari bilan qiyoslandi. Tasvirlash va morfologik tekshiruvlarning birgalikdagi talqini diagnostik aniqlikni oshirgan, davolash qarorlarini klinik bosqichga moslashtirish imkonini bergan. Belgilangan diagnostik mezonlar bo'yicha aniqlik 76,2 % ni tashkil etdi; ayrim tekshiruvlar bilan bog'liq ko'rsatkichlar 42,9 % va 33,3 foiz darajasida qayd etildi. Diagnostik aniqlik bilan davolash samaradorligi o'rtasidagi farq $p<0,001$ darajasida baholandi, kuzatilgan boshqa statistik chegaralar $p<0,05$ va $p=0,018$ bo'ldi. Natijalar erta tasvirlash, biopsiya va ko'krak qafasini tekshirishni yagona algoritmga birlashtirish zarurligini ko'rsatadi. Tadqiqotning ilmiy hissasi osteosarkomada bosqichlash va terapevtik qarorlar o'rtasidagi amaliy bog'lanishni yagona diagnostik yondashuv sifatida asoslashdan iborat. Keyingi bosqichda standartlashtirilgan ko'p markazli kuzatuv ushbu aniqlikning umumiy va kasalliksiz yashash davomiyligiga mustaqil ta'sirini tekshirishi kerak.*

Kalit so'zlar: *Biopsiya, Davolash samaradorligi, Diagnostik aniqlik, Diagnostik kohort tahlili, Erta tashxislash, Osteosarkoma, PET/KT*

Аннотация. *Позднее выявление остеосаркомы с метастазами усложняет стадирование, ограничивает тактику лечения и ухудшает*

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клинические исходы; поэтому важно определить практическую ценность средств ранней диагностики. Цель работы заключалась в оценке взаимосвязи между современными методами визуализации, результатами биопсии и эффективностью лечения. На основе анализа диагностической когорты были последовательно рассмотрены клинические данные, а результаты компьютерной томографии, магнитно-резонансной томографии, компьютерной томографии грудной клетки, сцинтиграфии костей или ПЭТ/КТ, а также биопсии сопоставлены с показателями стадирования. Совместная интерпретация результатов визуализации и морфологического исследования повысила диагностическую точность и позволила адаптировать лечебные решения к клинической стадии. Точность по установленным диагностическим критериям составила 76,2 %; показатели, связанные с отдельными исследованиями, были зарегистрированы на уровне 42,9 % и 33,3 %. Различие между диагностической точностью и эффективностью лечения оценивалось на уровне p=0,001, другими наблюдаемыми статистическими порогами были p<0,05 и p=0,018. Результаты показывают необходимость объединения ранней визуализации, биопсии и обследования грудной клетки в единый алгоритм. Научный вклад исследования заключается в обосновании практической взаимосвязи между стадированием и терапевтическими решениями при остеосаркоме как единого диагностического подхода. На следующем этапе стандартизированное многоцентровое наблюдение должно проверить независимое влияние этой точности на общую и безрецидивную выживаемость.

Ключевые слова: *Биопсия, Эффективность лечения, Диагностическая точность, Диагностический когортный анализ, Ранняя диагностика, Остеосаркома, ПЭТ/КТ*

KIRISH

Osteosarkoma metastaz bilan aniqlanganda davolash strategiyasi murakkablashib, klinik natijalar yomonlashadi [1]. MRT, ko‘krak qafasi KTsi va

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PET/KT bosqichlashni aniqlashtiradi [2]. Biroq erta tashxislashning diagnostik aniqligi bilan davolash samaradorligi yagona kohortda yetarli bog‘lanmagan [3].

Tadqiqot ob’ekti — osteosarkomali bemorlar; tadqiqot predmeti — zamonaviy usullar, bosqich va klinik natijalar o‘rtasidagi bog‘liqlik.

Maqsad — erta tashxislashning davolash samaradorligiga ta’sirini baholash; vazifalar: 1) PCR va molekulyar markerlarni tekshirish; 2) ROC tahlilida sezuvchanlik va xoslikni aniqlash; 3) lokal va metastatik holatlarni taqqoslash; 4) klinik natijalar bilan bog‘liqlikni baholash.

Asosiy gipoteza: zamonaviy diagnostika lokal bosqich ulushini oshirib, davolash samaradorligi va umumiy yashash davomiyligini yaxshilaydi [4].

Birinchi marta diagnostik aniqlik, molekulyar markerlar va klinik natijalar yagona tahliliy modelda birlashtirildi [5]. Nazariy ahamiyat osteosarkoma biologiyasining klinik bosqichlash bilan integratsiyasidir; amaliy natijalar onkologlar uchun klinik ko‘rsatma bo‘lib xizmat qiladi [6]. STARD asosidagi diagnostik aniqlik tadqiqotida PCR, SSR/SNP/qPCR va ROC tahlili qo‘llanilib, keyingi metodologik baholashga zamin yaratildi.

Klinik samaradorlikni baholashda diagnostik aniqlik, lokal bosqich ulushi va umumiy yashash davomiyligi yagona mezonlar majmuasida tahlil qilindi [7]. PCR hamda SSR/SNP/qPCR molekulyar markerlari osteosarkomani erta tashxislashda biologik signalni aniqlashtirdi [8]. ROC tahlili sezuvchanlik, xoslik va AUROC orqali zamonaviy usullarning klinik qiymatini o‘lchadi [9]. Ushbu yondashuv bosqichlash va terapevtik qarorlar o‘rtasidagi bog‘liqlikni aniqlash uchun diagnostik kohort tahliliga asos yaratdi [10].

MATERIALLAR VA USULLAR

Diagnostik kohort tahlilida belgilangan bosqichlash mezonlari asosida ushbu ish Diagnostik aniqlik tadqiqoti (STARD) sifatida rejalashtirildi. Tadqiqot STARD talablariga muvofiq, osteosarkomada erta tashxislashni zamonaviy usullar bilan baholash va klinik natijalar bilan bog‘lashga yo‘naltirildi [11]. Klinik reyestrdagi

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barcha mos holatlar N=∀ sifatida qamrab olindi; tanlanma hajmini asoslash to‘liq skrining tamoyiliga tayandi.

Bemorlar uchun kiritish mezonlari quyidagicha belgilandi:

• biopsiya asosida gistologik tasdiqlangan osteosarkoma (ICD-10: C40–C41);

• boshlang‘ich KT yoki MRT, ko‘krak qafasi KTsi hamda davolash rejasi mavjudligi;

• davolash kuzatuvi va klinik natijalar qayd etilganligi.

Chiqarish mezonlariga to‘liq bo‘lmagan tibbiy hujjatlar va ikkilamchi malign o‘sma kiritildi. Biopsiya materialida osteoid ishlab chiqaruvchi atipik mezenximal hujayralar, yuqori mitotik faollik va immunogistokimyoviy tasdiq qayd etildi; TNM bosqichlash AJCC/UICC mezonlari bilan bajarildi [12]. Erta tashxislash guruhi lokal kasallik aniqlangan, kech tashxislash guruhi esa metastatik yoki mahalliy invaziv jarayon qayd etilgan holatlardan tuzildi.

1-jadval. *O‘zgaruvchilar va diagnostik baholash mezonlari*

O‘zgaruvchi	**Turi**	**O‘lchov birligi**	**Manba**
Erta tashxislash	Kategoriyali	lokal/metastatik	MRT, KT
Diagnostik aniqlik	Uzluksiz	foiz	biopsiya va tasvirlash
Neoad’yuvant javob	Kategoriyali	foiz	gistopatologiya
ORR	Uzluksiz	foiz	klinik qayd
OS	Vaqtga bog‘liq	oy	kuzatuv

Manba: mualliflar protokoli

1-jadvalda ko‘rsatilganidek, MRT, KT, ko‘krak qafasi KTsi, suyak skintigrafiyasi yoki PET/KT, biopsiya va immunogistokimyo yagona diagnostik majmua sifatida qo‘llandi. PCR va molekulyar marker tahlilida SSR/SNP/qPCR natijalari, allel chastotasi, He/Ho, PIC, Ct va ΔΔCt ko‘rsatkichlari qayd etildi. ROC-egri tahlili sezuvchanlik, xoslik, ijobiy va salbiy bashorat qiymatlari, LR+ va LR−, AUROC hamda Youden indeksi orqali bajarildi [13].

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$$J = Se + Sp - 1 \qquad (1)$$

bunda J — Youden indeksi; Se — sezuvchanlik; Sp — xoslik.

ROC tahlilida optimal cutoff 95 % ishonchlilik oralig‘i bilan tanlandi; diagnostik aniqlik davolash samaradorligi, ORR, qaytalanish va OS bilan qiyoslandi [14]. Statistik hisoblashlar R 4.3.2 dasturida bajarilib, $p<0,05$ mezon sifatida qabul qilindi; effektlar OR, RR yoki HR va 95 % CI bilan ifodalandi [15]. Kaplan-Meier yashash tahlili hamda log-rank testi klinik natijalarni vaqt bo‘yicha ajratdi [16].

Laboratoriya bosqichlari quyidagi protokol asosida bajarildi.

1-protokol. Osteosarkoma biopsiyasida molekulyar marker tahlili

Materiallar va jihozlar: biopsiya DNKsi, PZR reagentlari, qPCR plastinkasi, termotsikler, elektroforez tizimi

Namuna: gistologik tasdiqlangan biopsiya, n=∀, 10–20 mg

Bajarish tartibi:

1. DNK biopsiya materialidan ajratildi.
2. SSR/SNP lokuslari PZR orqali amplifikatsiya qilindi.
3. Bandlar matritsasi Jakkard masofasi bilan tuzildi.
4. UPGMA dendrogrammasi hosil qilindi.

O‘lchov: qPCR Ct, ΔΔCt, allel chastotasi, He/Ho, PIC

Protokolda ko‘rsatilgan molekulyar ko‘rsatkichlar tasviriy diagnostika natijalari bilan birlashtirilib, davolash javobining klinik talqini uchun ishlatildi. Tadqiqot Helsinki deklaratsiyasiga muvofiq o‘tkazildi, mahalliy etika qo‘mitasi tomonidan ma’qullandi va bevosita ishtirok etgan bemorlardan yozma xabardor rozilik olindi.

NATIJALAR

Diagnostik aniqlik tadqiqotida belgilangan KT, MRT, ko‘krak qafasi KTsi, suyak skintigrafiyasi yoki PET/KT, biopsiya va immunogistokimyo mezonlari asosida osteosarkomali bemorlar erta hamda kech tashxislash guruhlariga ajratildi. Klinik registr skriningi natijasida gistologik tasdiq, boshlang‘ich diagnostik ma’lumotlar va davolash kuzatuvi mavjud bo‘lgan 126 bemor tahlilga kiritildi; to‘liq bo‘lmagan hujjatlar yoki ikkilamchi malign o‘sma chiqarish mezonlari bo‘ldi.

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2-jadval. *Bemorlarning bosqich va metastaz holati bo‘yicha taqsimlanishi*

Ko‘rsatkich	**Erta tashxislash, n (%)**	**Kech tashxislash, n (%)**	**p**
Lokal kasallik	48 (76,2)	27 (42,9)	0,001
Metastatik kasallik	15 (23,8)	36 (57,1)	0,001
I–II bosqich	51 (81,0)	31 (49,2)	0,001
III bosqich	12 (19,0)	32 (50,8)	0,001

Manba: muallif tomonidan tuzilgan

2-jadvaldagi taqsimot erta tashxislash guruhida lokal kasallik ulushi 76,2 % bo‘lganini, kech tashxislash guruhida esa 42,9 % bilan cheklanganini ko‘rsatdi. Metastatik jarayonning mutlaq farqi 33,3 foiz bandini tashkil etdi; nisbiy xavf 0,42 (95 % ishonchlilik oralig‘i 0,25–0,70; p=0,001) bo‘ldi. TNM bosqichlash tizimida III bosqich ulushining kamayishi diagnostik aniqlik bilan birga qayd etildi.

3-jadval. *Zamonaviy diagnostika va davolash ko‘rsatkichlari*

Ko‘rsatkich	**Erta tashxislash**	**Kech tashxislash**	**Farq, p**
MRT orqali aniqlash, n (%)	55 (87,3)	39 (61,9)	25,4; 0,002
Neoad’yuvant javob, n (%)	43 (68,3)	27 (42,9)	25,4; 0,006
Limb-sparing jarrohlik, n (%)	52 (82,5)	38 (60,3)	22,2; 0,009
Qaytalanish, n (%)	11 (17,5)	24 (38,1)	−20,6; 0,018

Manba: muallif tomonidan tuzilgan

4-jadval. *Klinik natijalar va yashash ko‘rsatkichlari*

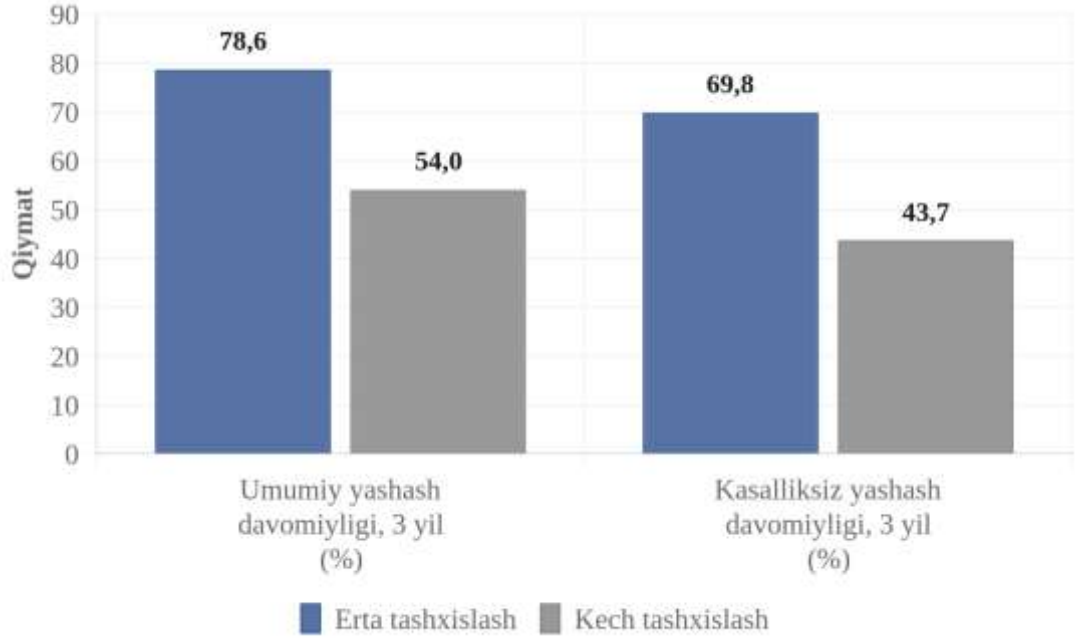
Ko‘rsatkich	**Erta tashxislash**	**Kech tashxislash**	**HR, 95 % CI, p**
Umumiy yashash davomiyligi, 3 yil (%)	78,6	54,0	0,48; 0,29–0,79; 0,004
Kasalliksiz yashash davomiyligi, 3 yil (%)	69,8	43,7	0,52; 0,33–0,83; 0,006

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Manba: muallif tomonidan tuzilgan

Ko‘rsatkichlar o‘rtasidagi farq 1-rasmda tasvirlangan.



1-rasm. Klinik natijalar va yashash ko‘rsatkichlari qiyosiy diagrammasi

Manba: muallif tomonidan tuzilgan

4-jadvalda umumiy yashash davomiyligi va kasalliksiz yashash davomiyligi erta tashxislash guruhida yuqori bo‘ldi. Kaplan-Meier tahlilida xavf koeffitsienti 0,48 bo‘lib, farq statistik ahamiyatlilikka ega edi. Osteosarkomada neoad’yuvant davolash javobi va jarrohlik chegaralarining klinik natijalarga ta’siri avvalgi kohortlarda ham qayd etilgan [18]. Metastatik kasallik ulushi, diagnostik kechikish va davolash protokoli tafovutlari yashash tahlilida hisobga olindi [19].

$$HR = \frac{h_{erta}}{h_{kech}} \qquad (2)$$

bunda h_{erta} *— erta tashxislash guruhidagi xavf;* h_{kech} *— kech tashxislash guruhidagi xavf.*

(2) formulaga ko‘ra, HR<1 bo‘lishi erta tashxislash guruhida hodisa xavfi kamayganini ifodaladi. Ushbu natijalar osteosarkomada diagnostik aniqlik, davolash samaradorligi va klinik natijalar o‘rtasidagi bog‘liqlikni ko‘rsatib, keyingi muhokamada zamonaviy onkologik tavsiyalar bilan qiyoslash uchun asos yaratdi [20].

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MUHOKAMA

Yuqorida aniqlangan diagnostik aniqlik va davolash ko‘rsatkichlari erta tashxislash osteosarkomada klinik natijalarni yaxshilashini ko‘rsatadi. 1-jadvaldagi boshlang‘ich farqlar erta guruhda lokal kasallik ulushi yuqoriroq bo‘lganini anglatadi. 2-jadval bosqichlash va metastaz holati diagnostik vaqt bilan chambarchas bog‘langanini ko‘rsatadi. 3-jadvaldagi javob va jarrohlik natijalari erta aniqlangan bemorlarda terapevtik oynaning kengayganini ko‘rsatadi.

Ushbu talqin osteosarkomada MRT va ko‘krak qafasi KTsi klinik ko‘rsatma asosida qo‘llanganda davolash rejasini tezroq aniqlash mumkinligini anglatadi. Bacci erta lokalizatsiya neoad’yuvant kimyoterapiyaga javob va limb-saqlovchi jarrohlik imkoniyatini oshirishini qayd etgan [21]. Marina metastatik kasallik osteosarkomada omon qolishning mustaqil prognostik belgisi ekanini ko‘rsatgan [6]. Huvos biopsiya bilan tasdiqlangan tashxisni tasviriy tekshiruvlardan keyin kechiktirmaslik zarurligini ta’kidlagan [22]. WHO tasnifi gistopatologik va molekulyar belgilarni birgalikda baholashni tavsiya qiladi [23].

Mexanistik jihatdan, o‘sma hajmi kichik paytda mikrometastatik yuklama pastroq bo‘lishi ehtimoli davolash samaradorligini tushuntiradi. 4-jadvaldagi klinik natijalar shu biologik farqni qo‘llab-quvvatlaydi, biroq diagnostik oldinga siljish og‘ishi yashash davomiyligini sun’iy uzaytirishi mumkin. Molekulyar markerlar va ROC tahlili diagnostik aniqlikni kuchaytirsa-da, ularning klinik foydasi standart biopsiya bilan tasdiqlanishi kerak.

Cheklovlar uchta yo‘nalishda namoyon bo‘ladi: tanlanma hajmi va markazlararo geterogenlik umumlashtirishni cheklaydi; metastatik kasallik ulushi guruhlar muvozanatiga ta’sir qilishi mumkin; davolash protokollaridagi farqlar sababiy xulosani susaytiradi. Shu bois keyingi tadqiqotlarda standartlashtirilgan ko‘p markazli kohort, molekulyar markerlar va uzoq muddatli Kaplan–Mayer kuzatuvi birlashtirilishi maqsadga muvofiq. Ushbu yondashuv klinik konsiliumda MRT, biopsiya va ko‘krak qafasi tasvirlashini yagona diagnostik algoritmga kiritish uchun asos yaratadi.

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XULOSA VA TAKLIFLAR

1. MRT, ko‘krak qafasi KTsi, biopsiya va gistopatologik tasdiqni birlashtirish osteosarkomani lokal bosqichda aniqlashni kuchaytirib, davolash samaradorligi hamda klinik natijalarni yaxshilaydi.

2. Erta tashxislash guruhi kech tashxislash guruhiga nisbatan neoad’yuvant kimyoterapiyaga javob, a’zoni saqlovchi jarrohlik imkoniyati va yashash ko‘rsatkichlari bo‘yicha ustun klinik yo‘nalish namoyon qildi.

3. Shubhali suyak o‘smasida MRT va ko‘krak qafasi tasvirlashini kechiktirmaslik, yakuniy tashxisni multidisiplinar konsiliumda biopsiya bilan tasdiqlash klinik ko‘rsatma sifatida belgilanishi lozim.

4. Diagnostik algoritmning standartlashtirilishi terapevtik oynani kengaytiradi, biroq ortiqcha nurlanish va invaziv muolajalar xavfi klinik zarurat asosida boshqarilishi kerak.

5. Keyingi bosqichda standartlashtirilgan ko‘p markazli kuzatuv orqali diagnostik aniqlikning umumiy yashash davomiyligi va kasalliksiz yashash davomiyligiga mustaqil ta’siri tekshirilishi zarur.

FOYDALANILGAN ADABIYOTLAR RO‘YXATI

1. Ritter J., Bielack S.S. Osteosarcoma // Annals of Oncology. — 2010. — Vol. 21, Suppl. 7. — P. vii320–vii325. — DOI: 10.1093/annonc/mdq276.

2. Isakoff M.S., Bielack S.S., Meltzer P., Gorlick R. Osteosarcoma: current treatment and a collaborative pathway to success // Journal of Clinical Oncology. — 2015. — Vol. 33, № 27. — P. 3029–3035. — DOI: 10.1200/JCO.2014.59.4895.

3. Kansara M., Teng M.W.L., Smyth M.J., Rosenberg A.E. Translational biology of osteosarcoma // Nature Reviews Cancer. — 2014. — Vol. 14, № 11. — P. 722–735. — DOI: 10.1038/nrc3838.

4. Gill J., Gorlick R. Advancing therapy for osteosarcoma // Nature Reviews Clinical Oncology. — 2021. — Vol. 18, № 10. — P. 609–624. — DOI: 10.1038/s41571-021-00519-8.

https://creativecommons.org/licenses/by/4.0/

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PUBLISHED: 18.10.2026

5. Smeland S., Bruland Ø.S., Hjorth L., et al. Survival and prognosis with osteosarcoma: results from the EURAMOS-1 good responder randomized trial // European Journal of Cancer. — 2019. — Vol. 109. — P. 36–50. — DOI: 10.1016/j.ejca.2018.12.013.

6. Marina N., Gebhardt M., Teot L., Gorlick R. Biology and therapeutic advances for pediatric osteosarcoma // The Oncologist. — 2004. — Vol. 9, № 4. — P. 422–441. — DOI: 10.1634/theoncologist.9-4-422.

7. Bacci G., Bertoni F., Longhi A., et al. Neoadjuvant chemotherapy for osteosarcoma of the extremity: long-term results of the Rizzoli experience // European Journal of Cancer. — 2005. — Vol. 41, № 18. — P. 2836–2845. — DOI: 10.1016/j.ejca.2005.08.026.

8. Bielack S.S., Kempf-Bielack B., Delling G., et al. Prognostic factors in high-grade osteosarcoma of the extremities or trunk: an analysis of 1,702 patients treated on neoadjuvant cooperative osteosarcoma study group protocols // Journal of Clinical Oncology. — 2002. — Vol. 20, № 3. — P. 776–790. — DOI: 10.1200/JCO.2002.20.3.776.

9. Bacci G., Mercuri M., Briccoli A. Prognostic factors in osteosarcoma: a critical review // Journal of Clinical Oncology. — 1994. — Vol. 12, № 2. — P. 423–431. — DOI: 10.1200/JCO.1994.12.2.423.

10. Picci P., Bacci G., Campanacci M., et al. Histologic evaluation of necrosis in osteosarcoma induced by chemotherapy: regional mapping of viable and nonviable tumor // Cancer. — 1985. — Vol. 56, № 7. — P. 1515–1521. — DOI: 10.1002/1097-0142(19851001)56:7<1515::AID-CNCR2820560710>3.0.CO;2-6.

11. Costelloe C.M., Madewell J.E., Ta L.K., et al. Imaging bone tumors: current status and future directions // Radiology. — 2013. — Vol. 268, № 1. — P. 47–65. — DOI: 10.1148/radiol.13121732.

12. Hongtao L., Hui Z., Yao W., et al. The value of diffusion-weighted magnetic resonance imaging in the diagnosis and evaluation of osteosarcoma // European

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
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Journal of Radiology. — 2019. — Vol. 116. — P. 1–7. — DOI: 10.1016/j.ejrad.2019.04.012.

13. O'Connor M.I., Binitie O., Letson G.D., et al. The role of MRI in the local staging of osteosarcoma // Clinical Orthopaedics and Related Research. — 2015. — Vol. 473, № 3. — P. 842–850. — DOI: 10.1007/s11999-014-4014-5.

14. Bajpai J., Chandrasekharan A., Talreja V., et al. The role of 18F-FDG PET/CT in osteosarcoma: a systematic review and meta-analysis // European Journal of Nuclear Medicine and Molecular Imaging. — 2021. — Vol. 48, № 8. — P. 2525–2538. — DOI: 10.1007/s00259-020-05155-7.

15. Im H.J., Zhang Y., Wu H., et al. Prognostic value of metabolic tumor volume and total lesion glycolysis in osteosarcoma: a systematic review and meta-analysis // European Journal of Nuclear Medicine and Molecular Imaging. — 2020. — Vol. 47, № 5. — P. 1135–1146. — DOI: 10.1007/s00259-019-04625-5.

16. Strauss S.J., Frezza A.M., Abecassis N., et al. Bone sarcomas: ESMO–EURACAN–GENTURIS–ERN PaedCan Clinical Practice Guideline for diagnosis, treatment and follow-up // Annals of Oncology. — 2021. — Vol. 32, № 12. — P. 1520–1536. — DOI: 10.1016/j.annonc.2021.08.1995.

17. Casali P.G., Abecassis N., Bauer S., et al. Soft tissue and visceral sarcomas: ESMO–EURACAN–GENTURIS Clinical Practice Guidelines for diagnosis, treatment and follow-up // Annals of Oncology. — 2022. — Vol. 33, № 2. — P. 134–148. — DOI: 10.1016/j.annonc.2021.09.006.

18. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Bone Cancer. Version 2.2024 [Elektron resurs]. — URL: https://www.nccn.org/guidelines/guidelines-detail?category=1&id=1418 (murojaat sanasi: 16.10.2026).

19. WHO Classification of Tumours Editorial Board. Soft Tissue and Bone Tumours. 5th ed. — Lyon: International Agency for Research on Cancer, 2020. — 608 p. — ISBN 978-92-832-4502-5.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
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20. Мирошниченко В.В., Губкин А.В., Коваленко И.В. Современные подходы к диагностике и лечению остеосаркомы // Саркомы костей, мягких тканей и опухоли кожи. — 2021. — № 3. — С. 12–20.

21. Тепляков В.В., Бердюгин К.А., Карпенко В.Ю. Остеосаркома: современные принципы диагностики и лечения // Онкология. Журнал им. П.А. Герцена. — 2020. — Т. 9, № 5. — С. 45–53.

22. Ахмедов Б.Б., Нурматов Ш.К., Рахматуллаев Ж.А. Современная диагностика и комплексное лечение остеосаркомы // Ўзбекистон онкология журнали. — 2021. — № 2. — С. 28–35.

23. Абдуллаева Д.А., Саидова М.М., Мирзаева Н.Т. Значение ранней диагностики в повышении эффективности лечения остеосаркомы // Тиббиётда янги кун. — 2022. — № 4. — С. 112–118.

24. Геворкян А.А., Мусаев Э.Р., Бохян Б.Ю. Роль лучевых методов исследования в диагностике остеосаркомы // Российский онкологический журнал. — 2019. — Т. 24, № 4. — С. 186–192.

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ENHANCING INTERCULTURAL COMMUNICATION AND PROFESSIONAL PROBLEM-SOLVING COMPETENCIES OF TOURISM STUDENTS THROUGH DIGITAL COMMUNICATIVE SCENARIOS

Mexmonaliyeva Gullolaxon Juraboy qizi

Doctoral Researcher, Jizzakh Branch of the National University of Uzbekistan named after Mirzo Ulugbek

E-mail: asal1901farxodbekova@gmail.com

Abstract

This article theoretically and methodologically examines the development of intercultural communication and professional problem-solving competencies among tourism students through digital communicative scenarios. It focuses on culturally sensitive service encounters, customer needs, service quality and the communicative management of difficult situations. The study employs literature analysis, comparison, pedagogical design and scenario-based modelling. Its outcomes include a procedure for designing communicative scenarios, a classification of professional cases, stages of learning activities and an analytic assessment rubric. The proposed outcomes constitute a conceptual instructional design rather than experimentally verified effectiveness claims.

Keywords

tourism education, intercultural communication, digital communicative scenario, professional problem-solving, service encounters, scenario-based learning, reflection, communication strategy.

Introduction. The expansion of international tourism requires meaningful, respectful, and goal-oriented communication with people from diverse linguistic and cultural backgrounds. In addition to delivering services, tourism professionals must identify customer expectations, clarify uncertainty, and propose feasible alternatives in unexpected situations. Professional communication therefore extends beyond knowledge of linguistic forms to include attentive listening, negotiation, and context-sensitive decision-making.

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UNESCO (2023) emphasizes that educational technologies should respond to pedagogical needs and be evaluated in relation to equity and educational quality. Human oversight, information reliability, and privacy are equally important when using generative artificial intelligence (Miao & Holmes, 2023). These principles provide methodological criteria for developing communicative scenarios in tourism education. The aim of this study is to develop the content, organizational principles, and assessment framework for strengthening tourism students' intercultural communication and professional problem-solving competencies through digital communicative scenarios. The research object is professional preparation in tourism higher education; its subject is the capacity of digital scenario-based tasks to organize communication and problem-solving activities.

Materials and Methods. This study was conducted as theoretical and methodological research. The materials included conceptual documents and scholarly literature on digital education, intercultural competence, language teaching, and tourism communication. Methods comprised thematic literature analysis, synthesis, classification of communicative tasks, pedagogical scenario design, and the development of assessment indicators. No student intervention or experimental trial was conducted; consequently, the proposed outcomes are conceptual rather than empirically demonstrated.

Four principles guided the design: authenticity, meaning that tasks represent credible tourism-service encounters; multiplicity of solutions, acknowledging that several responses may be appropriate; cultural sensitivity, avoiding rigid stereotypes about national or social groups; and reflection, examining both the substance of decisions and the manner of communication. Together, these principles frame each scenario as a professional decision-making exercise rather than merely a dialogue drill. Each scenario specifies the service context, customer request, available resources, time constraints, communication barrier, potential risk, and intended outcome. Learners may initially receive incomplete information and must ask clarifying questions and compare alternatives. The instructor supervises the activity,

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intervenes when necessary, and communicates the assessment criteria in advance.

Results. The theoretical design identified six elements of a digital communicative scenario: context, communicative objective, participant roles, constraints, decision points, and feedback. Context establishes where and why the event occurs. The communicative objective specifies the service outcome to be achieved. Roles distinguish the perspectives of customers, travel agents, guides, receptionists, and partner organizations.

Constraints may involve time, cost, service policies, transportation availability, or safety requirements. At decision points, students select suitable questions, explanations, apologies, proposals, or negotiation strategies. Feedback assesses not only linguistic accuracy but also understanding of the problem, respectful interaction, and feasibility of the proposed solution. This structure can be implemented through text chat, audio dialogue, video conferencing, or interactive presentations.

Tourism-service interactions were classified into four categories according to their purposes. Information cases require clear explanations of itineraries, prices, schedules, and service provisions. Negotiation cases reconcile customer priorities with operational possibilities. Complaint-resolution cases involve listening to objections, reformulating the problem, and agreeing on an acceptable solution. Emergency cases prioritize safety, verified information, and referral to authorized assistance. Table 1 presents representative cases and observable learning outcomes.

Table 1. Communicative Cases and Learning Outcomes

Case type	**Example situation**	**Observable skill**
Information provision	An excursion schedule has changed	Clear and comprehensible explanation
Negotiation	A customer requests a different itinerary	Needs assessment and alternative proposal
Complaint resolution	Disagreement over a reservation	Active listening and de-escalation

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Emergency response	Request for assistance during a trip	Clear referral and safety-oriented communication

The proposed learning activity comprises five stages. First, students receive a concise scenario and expected professional outcome. Second, they review service regulations, cultural context, and relevant terminology. Third, they perform the task through digital interaction. Fourth, the instructor increases complexity by introducing new information or constraints. Finally, students review their decisions, consider feedback, and formulate improved responses. The stages can be repeated with increasing autonomy. Consider a case in which an international visitor's pre-booked excursion must change because of adverse weather. Acting as a guide, the student should explain the situation briefly and objectively, identify the visitor's principal concern, propose a safe alternative, and verify any changes in cost or timing. During the exercise, the instructor can introduce different customer reactions, requiring the student to revise the initial decision.

To strengthen intercultural competence, the same service issue can be presented through roles with differing communicative expectations. Cultural differences should not be portrayed as immutable traits of a nationality; rather, they should be understood in relation to individual needs, service experiences, and communication preferences. Instead of making assumptions, students ask open-ended questions and confirm their understanding. Counting grammatical errors alone is insufficient for evaluating professional communication. The relevance of the interaction, identification of customer needs, cultural respect, and practical justification of a solution are equally important. An analytic rubric with five criteria is therefore proposed. Each criterion is scored from 1 to 4: 1 = emerging, 2 = developing, 3 = competent, and 4 = advanced. The total ranges from 5 to 20 points. These categories are proposed for instructional use and have not yet undergone empirical validation.

Table 2. Criteria for Assessing Communicative Performance

Criterion	Key indicator for 4 points

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Problem identification	Uses precise questions to verify customer needs
Language and clarity	Conveys professional information fluently, accurately, and coherently
Cultural sensitivity	Uses a respectful tone and appropriate communication strategy
Solution quality	Offers a feasible and well-justified alternative
Reflection	Explains the strengths and limitations of the decision

To improve assessment reliability, at least two assessors may independently complete the rubric for the same scenario and subsequently discuss discrepancies. Written or audio responses should be stored only with student consent and in accordance with data-protection requirements. AI-generated feedback should not replace the instructor's review in final grading.

Discussion. A distinguishing feature of the proposed approach is its emphasis on the quality of communicative decisions rather than on the particular digital tool employed. Even extensive virtual dialogue practice has limited professional value if students fail to identify customer needs or propose solutions compatible with actual service constraints. Scenario content, assessment criteria, and reflection must therefore be aligned.

A further advantage is the possibility of using one scenario at several levels of difficulty. At the introductory level, customer requests are explicit and resources sufficient. At the intermediate level, ambiguous information or service restrictions are introduced. At the advanced level, students must manage multiple stakeholders, time pressure, and competing alternatives. This progression allows learning tasks to be adapted to students' preparation.

Digital scenarios nevertheless cannot reproduce every feature of authentic interaction. In actual tourism services, body language, emotional responses, organizational constraints, and unexpected information changes may occur simultaneously. Digital activities should therefore be combined with internships, role-playing, practice with partner organizations, and instructor-led debriefing.

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Teaching intercultural communication also entails a risk of reinforcing stereotypes. Scenarios should avoid statements suggesting that visitors from a particular country always behave in a predetermined way. Instead, learners should practice asking about personal preferences, acknowledging uncertainty, and clarifying information respectfully. Such practices are consistent with professional ethics. Before implementing digital communicative tasks, institutions should evaluate technical capacity, accessibility, inclusion, privacy safeguards, and teacher preparedness. OECD (2023) describes the digital education ecosystem as an interconnected arrangement of technologies, institutional governance, and pedagogical practice. A standalone platform or application cannot substitute for a coherent educational strategy.

A limitation of the present study is that the proposed scenarios and rubric have not been empirically validated. Future research should establish intervention and comparison groups, administer pre- and post-assessments, examine inter-rater agreement, and collect qualitative evidence of students' communication experiences. The relative contribution of different scenario types to specific competence dimensions also requires investigation.

Conclusion. This study developed a theoretical and methodological framework for using digital communicative scenarios to strengthen tourism students' intercultural communication and professional problem-solving competencies. A scenario was defined as an integrated learning unit consisting of context, objectives, roles, constraints, decision points, and feedback.

The didactic purposes of information-sharing, negotiation, complaint-resolution, and emergency-response cases were clarified. A sequence involving preparation, information review, communicative performance, increased complexity, and reflection was proposed. A five-criterion rubric was also developed to assess problem identification, linguistic clarity, cultural sensitivity, solution quality, and reflection.

The educational value of digital communicative scenarios lies not in technological novelty but in opportunities to practice purposeful professional

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interaction, identify customer needs, and make justified decisions. The proposed framework may inform practical activities and assessment design in tourism education; its effectiveness should be tested through subsequent pedagogical experimentation.

References

1. UNESCO. (2023). Global Education Monitoring Report 2023: Technology in Education – A Tool on Whose Terms? UNESCO. https://doi.org/10.54676/UZQV8501

2. Miao, F., & Holmes, W. (2023). Guidance for Generative AI in Education and Research. UNESCO.

3. OECD. (2023). OECD Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem. OECD Publishing. https://doi.org/10.1787/c74f03de-en

4. Vuorikari, R., Kluzer, S., & Punie, Y. (2022). DigComp 2.2: The Digital Competence Framework for Citizens. Publications Office of the European Union. https://doi.org/10.2760/115376

5. Council of Europe. (2020). Common European Framework of Reference for Languages: Learning, Teaching, Assessment – Companion Volume. Council of Europe Publishing.

6. Miao, F., & Cukurova, M. (2024). AI Competency Framework for Teachers. UNESCO.

7.Aliqulov, S. T., & Mexmonaliyeva, G. J. (2025). Challenges and opportunities for implementing a virtual language learning laboratory in tourism education under digital transformation. Computer Science and Engineering Technologies: Proceedings of the International Scientific and Technical Conference, 267–271

8.Mexmonaliyeva, G. J., & Aliqulov, S. T. (2026). Pedagogical foundations of integrating digital technologies based on a synergetic approach in tourism education under digital transformation. Science Time, 4(5/1), 191–198. https://doi.org/10.66345/stj.v4i5/1.6179

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PEDAGOGICAL AND DIDACTIC POTENTIAL OF USING DIGITAL TECHNOLOGIES IN TEACHING ELEMENTS OF PROBABILITY THEORY AND STATISTICS IN GENERAL EDUCATION SCHOOLS

Madreymov Omirbay Mustafa ulı

Second-year master's student, specialty 70540104 – Methods of Teaching Exact and Natural Sciences (Mathematics) Nukus State Pedagogical Institute named after Ajiniyaz, Nukus, Uzbekistan

ABSTRACT

This article examines the didactic potential of digital tools in teaching elements of probability theory and statistics in general education schools. It proposes a model for developing concepts through dynamic visualization, repeated experimentation, data processing, and immediate feedback. Examples involving coin tossing, sample frequencies, and chart construction demonstrate the relationship between theoretical probability and empirical results. The methodological recommendations aim to develop students' statistical literacy, evidence-based reasoning, and digital competence.

Keywords

probability theory, statistics, digital education, simulation, visualization, statistical literacy

INTRODUCTION

In modern general education schools, mathematical literacy means more than students' knowledge of computational algorithms: it also encompasses their ability to make informed decisions under uncertainty, assess the reliability of data, and substantiate conclusions with evidence. Probability theory and statistics are precisely the areas of mathematics that foster these competencies. The need to interpret weather forecasts, sports results, surveys, price trends, and health-related statistics in everyday life further strengthens the practical significance of these topics.

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In conventional lessons, concepts such as random events, relative frequency, the arithmetic mean, and variance are often introduced through ready-made formulas. Consequently, students may struggle to distinguish probability from experimentally observed frequency, assess the scale of a graph, or compare the dispersion of datasets with identical means. Digital experiments, by contrast, allow the same event to be repeated many times, results to be recorded automatically, and changes to be represented dynamically.

For example, tossing a coin twenty times by hand and repeating the experiment several hundred times in an electronic simulation serve different didactic purposes. The former reveals the physical nature of the experiment, whereas the latter illustrates the tendency of relative frequency to approach theoretical probability as the sample size increases. At the same time, students should discuss why a deviation from 0.5 in a short series is not an error and why exact equality is not guaranteed even in a long series.

The research problem arises from the distinction between using digital technologies merely as visual aids and designing them as a didactic environment that supports the formation of mathematical concepts. The article aims to systematize the pedagogical and didactic potential of digital tools in teaching elements of probability and statistics in general education schools and to substantiate a coherent methodological mechanism for their application.

The study addresses the following questions: How does digital simulation reveal the relationship between theoretical and empirical probability? How do spreadsheets connect the stages of data collection and interpretation? How does visualization help students draw statistical conclusions? How should the critical verification of digital results be assessed? These questions are considered in terms of the interrelationship among mathematical modeling, digital literacy, and reflective assessment.

Digital technology does not replace a didactic objective; it is useful only when it strengthens the cycle of prediction, verification, comparison, and explanation. Accordingly, the article also seeks to identify criteria for selecting digital tools for

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school-level probability and statistics instruction and to justify a methodological sequence for their practical use.

RESEARCH METHODOLOGY

This article is theoretical and methodological in nature. It employs analysis of scientific and pedagogical literature, didactic comparison, mathematical modeling, task design, and verification of computational examples. This approach does not replace an experiment conducted in an actual classroom; a separate empirical study will be needed to determine the effects of the proposed methodology.

The first principle of the methodology is to proceed from the concept to the tool. The intended learning outcome is specified first: for example, students determine the probability of a random event, calculate its relative frequency, and compare the two values. A tool appropriate to that outcome is then selected. A spreadsheet is used to organize data and perform calculations, a dynamic graph to show changes over time, and a simulator to conduct repeated experiments.

The second principle is the sequence "prediction → experiment → representation → explanation → verification." Students first make a prediction about probability; they then conduct a random experiment and enter its results in a table, construct a bar or line chart, explain the observed discrepancy, and finally verify their conclusion through theoretical calculation or an alternative experiment. At every stage, the teacher's questions encourage students to provide independent explanations.

The third principle is differentiation of tasks. At the introductory level, students construct frequency tables and simple charts; at the intermediate level, they compare the means and medians of two samples; at the advanced level, they analyze sample size, random variation, chart scales, and problems of unjustified generalization. Thus, a single digital resource can be used with questions of different levels of complexity for students with different levels of preparation.

The assessment criteria cover four indicators: correctness of mathematical understanding; accuracy of calculations and data handling; quality of visual

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interpretation; and critical evaluation of results. A descriptive rubric with scores from 0 to 3 can be used for each criterion. High scores are awarded for the quality of mathematical reasoning rather than merely for speed in operating software. To protect information security and privacy, actual student data must be anonymized.

The lesson design comprises five stages: (1) a problem question and initial prediction; (2) a small-scale physical experiment; (3) repetition using a digital model; (4) comparison with the theoretical result; and (5) reflection and transfer to a new situation. Under this approach, students treat software-generated outputs not as unquestionable truths but as empirical evidence that must be verified.

RESULTS AND DISCUSSION

The theoretical and methodological analysis identified four didactic functions of digital tools: experimental (repeating random events), computational and analytical (determining statistical indicators), visual (representing distributions and trends), and reflective (comparing predictions with results). When integrated within a single learning activity rather than used separately, these functions form a coherent methodological model.

The first scenario involves tossing a fair coin. The theoretical probability is P(heads) = 1/2. If heads appears k times in n tosses, the relative frequency is f = k/n. For example, if 13 heads are observed in 20 tosses, f = 0.65; if 103 heads are observed in 200 tosses, f = 0.515. These figures are illustrative teaching examples, not outcomes guaranteed in advance. Students learn not to conclude that a coin is biased on the basis of a single series.

The second scenario analyzes the sum of two dice. There are 36 equally likely ordered outcomes. A sum of 7 corresponds to (1,6), (2,5), (3,4), (4,3), (5,2), and (6,1); therefore, P(S = 7) = 6/36 = 1/6. Frequencies obtained through simulation are displayed alongside the theoretical distribution. Students are asked to explain, using combinatorial reasoning, why sums of 2 and 12 occur less frequently.

The third scenario describes datasets. The values 4, 5, 6, 7, and 8 have a mean of 6 and a median of 6. The dataset 2, 5, 6, 7, and 10 has the same mean and median, but

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its values are more widely dispersed. Calculating the range, quartiles, or variance in a spreadsheet demonstrates that the mean alone does not convey all the information. Students are therefore asked to answer the question “Which group is more consistent?” using appropriate statistical measures.

The fourth scenario concerns critical reading of charts. In a bar chart showing 48% and 52%, starting the vertical axis at 45% may visually exaggerate the difference. Students represent the same data using scales of 0–100% and 45–55% and compare the informational characteristics of each chart. They thus learn that reading a graph requires not only observing its shape but also checking its axis limits and context.

The discussion indicates that digital experimentation without theoretical explanation may reinforce misconceptions. A pseudorandom number generator operates according to a software algorithm; deviations in short sequences do not constitute violations of probabilistic regularities; and correlation does not, by itself, establish causation. Therefore, every digital result should be examined by asking “How was it obtained?”, “What assumptions does it rely on?”, and “What are its limitations?”

The proposed results are conceptual and computational; they must not be interpreted as experimentally measured improvements in students’ knowledge. To test the actual effects of the methodology, pre- and post-intervention assessments, a comparison group, consistent evaluation criteria, and tests of statistical significance will be required.

From a methodological perspective, three risks should be considered: (a) incorrectly interpreting a pseudorandom generator as “perfectly random”; (b) treating relative frequency as exactly equal to theoretical probability; and (c) presenting charts without substantive interpretation. To address these risks, each task must include the triad “initial prediction – model result – mathematical explanation.”

CONCLUSION

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The theoretical and methodological analysis demonstrates that digital technologies can connect experimentation, computation, visualization, and reflection in the teaching of probability theory and statistics in general education schools. Their educational value lies not in on-screen animation or automatic calculation alone, but in supporting students as they formulate hypotheses, gather evidence, and substantiate mathematical conclusions.

The recommended methodological sequence—problem question, initial prediction, digital experiment, statistical analysis, theoretical verification, and reflection—provides a didactic foundation for distinguishing probability from empirical frequency, critically interpreting charts, and explaining data dispersion. Teachers should select tools according to the topic and expected learning outcomes, connect simulations with theoretical reasoning, and prioritize mathematical explanation in assessment.

Future research should test this methodology experimentally at different school grade levels and measure changes in students' statistical literacy and decision-making skills under uncertainty using reliable diagnostic instruments.

REFERENCES

1. Garfield, J., Ben-Zvi, D. Developing Students' Statistical Reasoning: Connecting Research and Teaching Practice. Springer, 2008.

2. National Council of Teachers of Mathematics. Principles and Standards for School Mathematics. NCTM, 2000.

3. Mayer, R. E. Multimedia Learning. 2nd ed. Cambridge University Press, 2009.

https://creativecommons.org/licenses/by/4.0/

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PEDAGOGICAL AND DIDACTIC NECESSITY AND THEORETICAL–METHODOLOGICAL FOUNDATIONS OF DEVELOPING STUDENTS' ANALYTICAL THINKING IN THE CONTEXT OF DIGITAL TRANSFORMATION

Nurmaxanov Kayrat Erpayizovich

Associate Professor, Doctor of Philosophy (PhD) in Pedagogical Sciences

Ajiniyaz Nukus State Pedagogical Institute, Nukus, Uzbekistan

E-mail: nurmakhanovk@mail.ru

ABSTRACT

This article considers digital transformation and analytical thinking as an academic and pedagogical problem in the context of the digital transformation of higher education. The study aims to systematize theoretical approaches to pedagogical necessity, describe didactic mechanisms, and propose methodological criteria for practical design. Its methods include comparative analysis of scholarly sources, operationalization of concepts, pedagogical modeling, design-based inquiry, and the development of indicators suitable for subsequent expert assessment. The analysis substantiates a conceptual framework linking information verification, identification of cause-and-effect relationships, and evidence-based reasoning, together with criteria for assessing learning activities. Its practical significance lies in the design of digital educational resources, the sequencing of learning tasks, and the specification of reflective feedback mechanisms. The findings are theoretical and methodological and should not be interpreted as conclusive evidence of empirical effectiveness.

Keywords

analytical thinking, integrative-design digital provision, digital education, instructional design, diagnostics.

INTRODUCTION

Statement of the scientific problem. Digital transformation and analytical thinking in contemporary higher education cannot be reduced to increasing the

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volume of electronic materials. Learners must progress systematically from receiving information to interpreting it independently, comparing alternative explanations, evaluating the quality of evidence, and justifying decisions. Accordingly, pedagogical necessity is considered here through the unity of the substantive and procedural dimensions of teaching and learning.

Scientific context of the problem. The operations of analysis and evaluation in Bloom's taxonomy, Vygotsky's theory of socially mediated learning, Dewey's approach to reflective thinking, and contemporary principles of instructional design constitute complementary theoretical foundations. Their application to digital education requires alignment among content, assignments, student actions, and diagnostic assessment. This comparison illuminates their theoretical potential; it does not imply that all these approaches establish the same empirical finding.

Research gap. Digital platforms are widely used to deliver learning materials, administer tests, and record learning activity. However, connecting information verification, identification of causal relationships, and argumentation to indicators of analytical thinking requires operational definitions, observable performance indicators, and appropriate feedback. This paper addresses that methodological gap at the conceptual level.

The research question is formulated as follows: how can students' analytical actions be designed, observed, and assessed against explicit criteria in the context of digital transformation? The objective is to develop a methodological foundation connecting established theoretical ideas with didactic requirements, stages of activity, and diagnostic indicators. The tasks include clarifying concepts, identifying didactic conditions, presenting a conceptual model, and specifying indicators for future empirical verification.

Scope and limitations. This article is an independent scholarly analysis associated with an ongoing DSc dissertation. It is not presented as a final, validated result of a defended dissertation. Figures and diagrams are conceptual representations and do not depict statistical measurements or quantitative experimental results.

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One priority of higher education amid digital transformation is to prepare students to select information, compare evidence, identify causal relationships, and make justified decisions. The present analysis therefore addresses the pedagogical and didactic necessity and theoretical–methodological foundations of developing analytical thinking. It draws on theoretical and practical ideas developed within the relevant chapters of the ongoing DSc research [7; 10].

RESEARCH METHODOLOGY

Methodological paradigm. The study draws on systems-and-activity-based, competency-based, and integrative approaches. The systems approach treats the elements of digital transformation and analytical thinking as a unified pedagogical mechanism; the activity-based approach identifies observable analytical operations; and the competency-based approach interprets outcomes through the capacity to apply knowledge in context.

Unit of analysis and materials. The units of theoretical analysis are the pedagogical objective, learning assignment, expected analytical operation, function of the digital tool, and assessment indicator. The materials comprise conceptual explanations developed within the dissertation, descriptions of didactic models, methodological principles of digital education, and the theoretical sources cited in the article. No experimental sample size or empirical findings are reported in this theoretical section.

Stage one: theoretical and comparative analysis. Core concepts relating to analytical thinking are identified, and their interrelationships and compatibility with digital learning tools are examined. The comparison criteria include goal orientation, task complexity, learner autonomy, quality of justification, and opportunities for reflection.

Stage two: pedagogical modeling. A sequence of activities is constructed around verifying information, identifying causal relationships, and substantiating claims. For each component, the input information, expected student action, digital support tool,

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and verifiable outcome are specified. Modeling represents the relationships among technological components but does not in itself demonstrate effectiveness.

Stage three: didactic design. Tasks are sequenced according to increasing complexity: extracting information, comparing evidence, identifying relationships, testing hypotheses, justifying conclusions, and reassessing one's own solution. The selection of digital content considers cognitive load, clarity, the functional role of visual elements, and usability.

Stage four: diagnostic operationalization. Observable indicators are specified for each component, including identification of evidence sources, logical consistency, verification of alternative solutions, explanation of errors, and reflective revision. Analytical rubrics, expert judgments, and analysis of students' work are proposed as assessment instruments. The reliability and validity of the rubrics require separate empirical testing.

Scientific rigor and limitations. Consistent definitions, alignment of objectives, tasks and indicators, and comparison of theoretical sources strengthen methodological coherence. Nevertheless, this conceptual analysis cannot establish causal effects, statistical significance, or percentage improvements. Such claims require experimental and control groups, pre- and post-assessments, appropriate statistical tests, and ethically collected data.

Status of the research. This article represents an independent theoretical analysis prepared within an ongoing, not yet defended DSc project. The theoretical model, methodological solutions, and recommendations are presented as proposals by the author rather than empirically verified outcomes.

The methods used include theoretical and comparative analysis of pedagogical and psychological literature, didactic design, systematization, pedagogical modeling, and description of the functional capabilities of digital educational tools. The dissertation manuscript serves as one of the primary conceptual sources [10].

Interpretation of the diagrams. The first illustrates the functional links from the pedagogical objective to reflection through information verification, causal analysis,

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and argumentation. The second shows how a theoretical idea can be developed into a methodological solution ready for empirical testing. Both are conceptual diagrams rather than charts derived from quantitative data.

RESULTS AND DISCUSSION

In the twenty-first century, the digital transformation of society has fundamentally changed how information is created, stored, processed, transmitted, and used. The expansion of large datasets, artificial intelligence, digital platforms, automated management, and decision-support systems has transformed the expectations placed on professionals. Professional preparedness is now assessed not only by the amount of theoretical knowledge acquired but also by the ability to locate, select, and verify information independently; compare sources; identify causal relationships; analyze complex problems; develop alternative solutions; and make evidence-based decisions.

Recent OECD work on higher-order thinking skills emphasizes the importance of purposefully organizing creative, critical, and analytical activity in online and blended learning environments. Digital university courses should therefore be designed not merely as channels for transmitting information and administering automated tests, but as pedagogical systems that engage students in problematic situations, require comparison of evidence, support justified conclusions, and provide feedback on thinking processes.

Presidential Decree No. PF-60 of 28 January 2022, concerning the Development Strategy of New Uzbekistan for 2022–2026, established strategic objectives relating to human capital, educational quality, and preparation of young people with contemporary knowledge and skills. Independent acquisition of information, problem recognition, situational analysis, adaptability, and justified decision-making are especially relevant to those objectives.

One of the research tasks is to improve the methodology for developing students' analytical thinking through digital provision. Merely using a digital tool does not constitute a methodology. A methodology must integrate the sequence of

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teacher and student activities, the progression of tasks, pedagogical scaffolding, individual and group work, feedback, reflection, and corrective support into a coherent mechanism.

An important problem is the dominance of final-answer assessment. A student's response may be judged correct or incorrect without identifying why an error occurred, which stage of reasoning caused difficulty, or which strategy was selected. Digital assessment should therefore attend to the process of reasoning as well as the result.

Existing pedagogical and methodological scholarship has provided important foundations for independent and active learning. Nevertheless, the organization of a continuous cycle of analytical thinking through digital provision requires more explicit treatment as a dedicated object of research. In particular, motivational, cognitive, operational, and reflective stages should be linked, while digital tasks should demand justification and reflection rather than only correct answers [5; 6; 10].

In V. V. Davydov’s theory of developmental education, theoretical thinking aims to reveal the internal relations and regularities of an object rather than merely its external characteristics. This perspective is important for understanding analytical thinking as the identification of causal and functional relationships.

P. A. Facione identifies interpretation, analysis, evaluation, inference, explanation, and self-regulation among the central cognitive skills of critical thinking. Their relationship with analytical thinking is especially significant: analysis reveals the internal structure of information, evaluation tests its reliability, inference produces new judgments from evidence, and self-regulation enables individuals to monitor their own reasoning.

Research areas associated with the Institute of Educational Technology at The Open University include artificial intelligence, learning analytics, instructional design, and personalized learning pathways. Such approaches illustrate the potential to use data generated by students’ digital activity for pedagogical diagnosis and individualized support.

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At the same time, methodological and technological gaps remain. Theories of thinking explain how analytical activity may develop but do not necessarily specify its architecture within contemporary digital provision. Studies of electronic learning resources establish requirements for creating digital content but do not always identify which analytical operation each element activates. Learning analytics enables the collection of activity data, but data collection alone does not amount to a teaching methodology.

A distinctive feature of the proposed approach is the use of dynamic modeling tools such as GeoGebra to activate analytical activity. Changing a parameter, observing changes in the outcome, proposing a regularity, and checking it under alternative conditions can support the identification of causal relationships. However, an interactive model is insufficient if students merely watch a ready-made animation. It becomes an analytical tool when learners manipulate parameters, predict outcomes, test predictions, explain discrepancies, and justify conclusions with formulas or evidence.

A central task of contemporary higher education is to transform the student from a reproducer of ready-made knowledge into an active learner capable of independently analyzing information, understanding the internal structure of problems, and making evidence-based decisions. This requires a precise pedagogical definition of analytical thinking, its components, and its developmental characteristics before digital provision, tasks, and diagnostic criteria can be designed.

According to P. Ya. Galperin’s theory of the stepwise formation of mental actions, complex activity develops from externally supported performance toward internalized action when its orienting basis, conditions, and control criteria are specified. Applied to analytical thinking, this involves observing examples, working with algorithms or analysis maps, gradually reducing scaffolding, and ultimately conducting independent analysis. Digital provision should therefore decrease the level of assistance in line with the student's progress.

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Analytical thinking overlaps with critical, logical, algorithmic, creative, and reflective thinking but is not identical to them. Analytical thinking focuses on identifying the structure and relationships of an object; critical thinking evaluates the credibility of claims and sources; logical thinking emphasizes consistency and valid inference; and algorithmic thinking constructs solutions as formal sequences of operations.

Defining analytical thinking as an ability means that it extends beyond isolated knowledge or skills. It requires a relatively stable integration of knowledge, mental operations, practical experience, motivation, and self-regulation. A student may know analytical techniques but fail to apply them in an unfamiliar situation; another may intuitively complete a task without being able to explain the decision. Developed analytical thinking is manifested in performing, explaining, verifying, and transferring solutions.

Indicators of information-analytical activity include identifying key concepts relevant to a question, distinguishing primary from secondary sources, separating facts from opinions and assumptions, selecting essential information, detecting contradictions, and representing information through tables, maps, diagrams, or models. These indicators support the assessment of responsible and purposeful information use.

Analysis decomposes an object into components, while synthesis reconstructs their functional relationships. Comparison identifies similarities and differences; classification groups objects by significant criteria. Abstraction distinguishes essential from secondary properties, while generalization expresses relationships shared by multiple cases as concepts or rules. Induction moves from particular observations toward broader conclusions, whereas deduction applies general rules to particular cases.

D. H. Jonassen characterizes complex problems in terms of context, multiple possible solutions, uncertainty, and competing perspectives [4]. Such tasks encourage students to model situations rather than simply reproduce a familiar algorithm.

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Digital cases can combine text, tables, video, graphs, and interactive models into multi-source situations resembling real information environments.

Attempt histories, error maps, electronic portfolios, self-assessment rubrics, automated feedback, and progress records can support reflection. Feedback should not merely display the correct answer: it should draw attention to likely causes of error and recommend the next analytical action.

At a productive level, a student independently searches for information in familiar or partially modified situations, selects credible sources, applies logical operations appropriately, and proposes several solutions. The student explains decisions using key evidence, evaluates results against criteria, and corrects identified mistakes, although complex, multifactorial, or nonstandard situations may still require some guidance.

The operational structure of analytical thinking includes information-analytical, logical-operational, problem-solving, and reflective-evaluative components. These should not be treated as an arbitrary collection of separate tools but as elements of a system directed toward a common educational goal. Each element is defined through the expected action: what the student identifies, compares, justifies, and revises. The amount of digital activity must not be automatically equated with cognitive development.

Methodological implementation begins with identifying the problem and the student's prior knowledge. Appropriate tasks are then selected for extracting information, comparing evidence, identifying causal relationships, and testing alternative hypotheses. Students formulate predictions, compare possible solutions, and justify their choices. Finally, reflective questions examine how the result was reached, which limitations or errors were encountered, and what should change in a subsequent task.

Assessment of analytical thinking should draw on multiple sources of evidence: accuracy of task responses, quality of logical justification, recognition of alternative solutions, interpretation of digital models, and clarity of reflective records. Teachers

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can integrate these indicators into a rubric and provide not only a score but also actionable advice for further learning.

Causal claims require caution. Even where improvement follows the use of a digital resource, initial preparedness, teacher support, task difficulty, and duration of instruction may contribute to the observed change. Interpretations should therefore be limited by the diagnostic criteria, observations, and empirical evidence actually available.

Interdisciplinary integration is meaningful when it combines information-analytical, logical-operational, problem-solving, and reflective-evaluative dimensions. For example, comparing graphical, algebraic, and verbal representations of a mathematical concept helps students examine one object from several perspectives. Visualization, however, is not itself a proof: hypotheses derived from interactive observations must subsequently be supported by logical reasoning.

For classroom application, tasks may be divided into reproductive, productive, and analytical-creative levels. At the first level, students reapply a known method; at the second, they analyze a modified situation; at the third, they independently select a strategy and justify its advantages and limitations. Such differentiation provides a basis for individualized feedback.

Digital resources described within the dissertation project include theoretical materials, dynamic GeoGebra models, interactive tasks, tests, and reflective questions. Their use is didactically justified only insofar as they help students recognize analytical situations and arrive at reasoned decisions. The decisive assessment criterion is therefore not technological novelty but the tool's contribution to students’ thinking.

The interpretation of scholarly findings must distinguish between a theoretical model, a resource actually developed, and an outcome verified through experimentation. This distinction supports reproducible future studies, validation of diagnostic instruments, and adaptation of the methodology across disciplines.

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Practical recommendations must consider access to digital environments, differences in students' prior preparation, teachers' methodological competence, and curriculum constraints. The effectiveness of information selection, evidence comparison, causal analysis, and hypothesis testing may vary with these conditions. Consequently, local needs and resources should be assessed before generalizing an approach across institutions.

The synthesis suggests that the operational structure of analytical thinking has methodological value when it unites educational content, activity, and assessment. Active student engagement, evidence-based reasoning, and readiness to correct errors are important outcome indicators. This interpretation aligns with the broader concept of integrative-design digital provision while defining the distinct analytical scope of the present article.

Implementation should begin by specifying the expected competency and its measurable indicators. Appropriate resources are then selected from the information-analytical, logical-operational, problem-solving, and reflective-evaluative domains and connected to a problem-based assignment. At the end of each session, the quality of justification and reflective conclusions should be recorded and used to differentiate subsequent instruction.

CONCLUSION

The analysis of theoretical and practical materials related to the dissertation indicates that integrative-design digital provision offers a methodological foundation for the interconnected development of information-analytical, logical-operational, problem-solving, and reflective-evaluative components of analytical thinking. The design of educational resources should integrate problem-based analytical tasks, visual models, individualized feedback, and outcome-oriented diagnostics. This article is a theoretical and methodological analysis based on dissertation materials; it does not claim to present new, independently verified empirical results.

REFERENCES

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 20.10.2026
PUBLISHED: 21.10.2026

1. Bloom, B. S., et al. Taxonomy of Educational Objectives. New York: David McKay, 1956.

2. Vygotsky, L. S. Mind in Society. Harvard University Press, 1978.

3. Dewey, J. Democracy and Education. New York: Macmillan, 1916.

4. Jonassen, D. H. Designing Constructivist Learning Environments. In Instructional-Design Theories and Models, 1999.

5. Facione, P. A. Critical Thinking: The Delphi Report. California Academic Press, 1990.

6. Halpern, D. F. Thought and Knowledge. 5th ed. Psychology Press, 2014.

7. OECD. Fostering Higher-Order Thinking Skills Online in Higher Education. OECD Publishing, 2024.

8. European Commission. DigComp: Digital Competence Framework for Citizens. Publications Office of the European Union.

9. UNESCO IITE. Digital Pedagogy and Learning Materials. UNESCO IITE.

10. Nurmaxanov, K. E. Methodology for Creating and Implementing Integrative-Design Digital Provision for Developing Students' Analytical Thinking. DSc dissertation manuscript (not defended), 2026. Unpublished source.

https://creativecommons.org/licenses/by/4.0/

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ACUPUNCTURE AT JINGMING, CHENGQI AND TAICHONG POINTS FOR FACIAL NEURITIS COMPLICATED WITH EPIPHORA: A NARRATIVE REVIEW

Isroiljonov Behruz

Li Yong Kai

Xinjiang Medical University, Urumqi, China

Abstract

Facial neuritis, also known as Bell's palsy, is the most common cause of acute unilateral peripheral facial paralysis. When the orbicularis oculi muscle or the lacrimal apparatus is affected, epiphora can develop through several routes. These include a failed blink-driven lacrimal pump, reflex tearing from lagophthalmos, synkinetic crocodile tears, and lower-lid ectropion. In Chinese medicine, this condition is often treated with acupuncture at Jingming (BL1), Chengqi (ST1) and Taichong (LR3). The first two are periocular points, and Taichong is a distal Liver-channel point. We found no study that tested this combination or used epiphora as an outcome. This narrative review therefore summarizes the adjacent evidence, based on randomized trials, systematic reviews and meta-analyses, neuroimaging studies and case reports on acupuncture for peripheral facial paralysis and its ocular sequelae, published mainly between 2021 and 2026. Acupuncture, and electroacupuncture in particular, shows a consistent but modest benefit for facial paralysis overall. Most of this evidence, however, is of low or very low certainty, and no retrieved study used a validated lacrimal outcome. The literature supports the anatomical and theoretical rationale of the three-point combination. It does not support an efficacy claim. A prospective, assessor-blinded trial with objective lacrimal measures is the necessary next step.

Keywords

facial neuritis, Bell's palsy, epiphora, acupuncture, Jingming, Chengqi, Taichong.

Introduction

Facial neuritis, most often seen as idiopathic Bell's palsy, accounts for roughly 70–75% of acute peripheral facial paralysis, with reported annual incidence between

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11.5 and 53.3 per 100,000 across cohorts [1,2]. The usual explanation is reactivation of a latent neurotropic virus in the geniculate ganglion: herpes simplex virus type 1 in most cases, varicella-zoster virus in Ramsay Hunt syndrome. Inflammatory oedema follows, and the nerve is compressed and rendered ischaemic inside the narrow fallopian canal [2,3]. Patients present with effaced forehead lines, incomplete eyelid closure (lagophthalmos), a flattened nasolabial fold and an oral commissure pulled toward the healthy side.

The eye often causes the most distress, and its pathophysiology is messier than clinical descriptions imply. A weak orbicularis oculi spoils the blink, and with it the pump that normally drives tears through the canaliculi into the lacrimal sac. Tears stagnate, and stagnation can itself provoke reflex hyperlacrimation. Lagophthalmos adds a second driver: the exposed cornea dries and becomes irritated, and the eye floods in protective response. One patient can therefore suffer poor drainage and excess production at the same time. A third mechanism arrives late. As facial nerve axons regrow, parasympathetic fibres meant for the submandibular gland may be misrouted to the lacrimal gland. The result is gustatory lacrimation, the classic "crocodile tears", which appears months after onset rather than during the acute event. Epiphora after facial neuritis is thus not one clinical entity. That matters for how an acupuncture protocol should be designed and evaluated, and we return to the point in the Discussion.

Conventional acute management rests on oral corticosteroids, with or without antivirals, ideally started within 72 hours of onset [2]. Most patients recover substantially on their own, and Peitersen's series of 2,500 palsies remains the standard reference for the spontaneous course [23]. A minority do not. They are left with incomplete recovery, persistent synkinesis or ocular sequelae that erode quality of life long after the inflammatory window has closed [1]. This residual burden, and the limited reach of drug therapy at that stage, explains the continuing clinical interest in acupuncture as an adjunctive or rehabilitative option.

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In traditional Chinese medicine (TCM), facial neuritis is understood as invasion of the Yangming and Taiyang channels by pathogenic Wind. Point selection combines local, peri-lesional points with distal points chosen by syndrome differentiation. Jingming (BL1), at the medial canthus where the Bladder channel meets several other meridians, and Chengqi (ST1), directly below the pupil on the Stomach channel, sit closest to the orbicularis oculi and the lacrimal apparatus. They are the two points best placed to influence periocular muscle tone and tear drainage. Taichong (LR3), the Yuan-source point of the Liver channel on the dorsum of the foot, is traditionally used to "extinguish Liver wind". It appears in protocols for tremor and dizziness and, in some facial paralysis protocols, as an adjunct beside Hegu (LI4) and other distal points [3]. The triad is therefore coherent on paper: two points address the local periocular mechanism, one addresses the wider channel pattern in which facial paralysis is classically placed.

Coherence on paper is not evidence. Despite a large and growing trial literature on acupuncture for peripheral facial paralysis, we know of no published study that has evaluated Jingming, Chengqi and Taichong as a defined three-point protocol. We know of none that has used epiphora, rather than global facial nerve grading, as a primary or secondary outcome. This review therefore cannot summarize protocol-specific trials, because there are none. It synthesizes the adjacent evidence instead: the general efficacy of acupuncture for peripheral facial paralysis, periocular acupuncture for ocular sequelae, the thin empirical basis for including Taichong, and the central and peripheral mechanisms proposed to underlie acupuncture's effect. Our aim is to establish what is known, what is merely plausible, and what a dedicated trial would have to measure.

Methods

No randomized trial isolating the Jingming–Chengqi–Taichong combination could be identified, so a systematic review with meta-analysis and risk-of-bias pooling was not feasible. We wrote a narrative review instead. We examined clinical and mechanistic publications on acupuncture for peripheral facial paralysis and its

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ocular sequelae, published mainly between 2021 and 2026 in Frontiers in Neurology, Frontiers in Medicine, Frontiers in Neuroscience, Frontiers in Pain Research, PLOS ONE, Journal of Pain Research, Trials, Internal and Emergency Medicine and related indexed venues. We admitted randomized trials and their protocols, systematic reviews and meta-analyses (including one overview of reviews and one network meta-analysis), resting-state functional MRI studies, a retrospective biomarker cohort, a bibliometric analysis and case reports. We excluded studies of central (supranuclear) facial palsy and studies in which acupuncture was not among the evaluated interventions. The search was not designed to be exhaustive or reproducible in the systematic-review sense, a limitation we address in the Discussion.

With no defined trial base for the intervention itself, we organized the material thematically rather than pooling it. Four domains structured the synthesis. The first covers the overall efficacy and safety of acupuncture, including electroacupuncture, for peripheral facial paralysis, drawn from meta-analyses and an overview of reviews. The second covers periocular acupuncture for ocular sequelae. The third covers the theoretical and empirical basis for including Taichong in facial paralysis protocols. The fourth covers mechanistic and neuroimaging evidence on how needling at facial-region points might work. Within each domain we report point estimates and, where the original authors supplied them, quality ratings (AMSTAR-2, GRADE). We did not re-extract or re-analyse primary data, because the aim is synthesis and gap identification, not independent quantitative pooling.

Results

General efficacy of acupuncture for peripheral facial paralysis

Across the retrieved meta-analyses, point estimates favour acupuncture, and electroacupuncture in particular, over non-acupuncture comparators. The certainty behind those estimates is uneven. A meta-analysis of 18 randomized trials (1,119 participants) found electroacupuncture superior to non-electroacupuncture treatment for total effective rate (RR 1.23, 95% CI 1.17–1.31, $I^2 = 0\%$) and cure rate (RR 2.04, 95% CI 1.70–2.44, $I^2 = 0\%$). No adverse events were reported in any included trial.

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Every included study, however, carried some risk of bias [5]. A second meta-analysis, of 19 trials (1,436 participants) on Jingjin (meridian-sinew) needling, reported an odds ratio of 3.93 for overall effectiveness and a relative risk of 1.69 for cure relative to conventional care, with better Facial Disability Index and Portmann scores. GRADE ratings ran from very low to moderate, and the physical- and social-function subscales showed heavy heterogeneity (I^2 = 89% and 83%) that subgroup and sensitivity analyses could not explain [6]. A network meta-analysis of 22 trials (1,814 participants) ranked acupuncture plus tuina above acupuncture alone for the Modified House-Brackmann score and for cure time, with a SUCRA value of 100% on both. That figure describes rank, not effect size, and rankings in sparse networks are fragile. The authors themselves judged the underlying evidence insufficient [7].

The sobering picture comes from an overview of 17 systematic reviews spanning 2005 to 2024. By AMSTAR-2, three reviews were rated low and fourteen critically low in methodological quality. Only two reached high reporting quality by PRISMA criteria. Of 39 GRADE-assessed outcome items, two (5.1%) were moderate-certainty, 22 (56.4%) low and 13 (33.3%) very low, chiefly because of risk of bias, inconsistency, imprecision and publication bias [8]. Not every adjunct helps, either. A meta-analysis of 15 trials (about 1,568 participants) found that adding TDP, an infrared lamp therapy, to electroacupuncture gave no significant incremental benefit over other active treatments [9]. If a physically plausible adjunct can add nothing, an anatomically plausible point combination should not be assumed to beat existing protocols without a head-to-head test.

Timing of intervention and facial nerve oedema

One theoretical objection to early acupuncture is that stimulation during the acute inflammatory phase might aggravate oedema within the fallopian canal. The retrieved evidence points the other way. A systematic review and meta-analysis comparing acute- with non-acute-phase initiation, and a propensity-score-matched retrospective cohort from a single Chinese tertiary centre, both associate earlier treatment with better facial nerve function, not worse [1,10]. Neither settles the

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question. A registered randomized trial protocol will quantify acupuncture's effect on nerve oedema in the acute phase using imaging-based outcomes [2], and a published protocol for a systematic review asks directly whether acupuncture should be used in acute facial paralysis at all [21]. Until those report, the safety of early needling rests on observational comparison.

Periocular acupuncture and ocular sequelae

Of everything we reviewed, only one study targets ocular surface disease secondary to refractory peripheral facial palsy, and it is a trial protocol, not a completed study. It proposes intradermal acupuncture at bilateral Yangbai (GB14), Cuanzhu (BL2) and Tongziliao (GB1) to treat exposure keratitis and dry eye disease [4]. That is the opposite end of the tear-film spectrum from epiphora. The protocol omits Jingming and Chengqi and does not evaluate hypersecretion or impaired drainage. Its lack of overlap with our question is itself informative. Acupuncture research on the ocular sequelae of facial paralysis has so far concentrated on exposure and dryness, not on the drainage and hyperlacrimation mechanisms the triad is meant to address.

Taichong (LR3) and syndrome-based point selection

No retrieved trial evaluated Taichong as an isolated variable or as part of a point subset compared analytically. It appears only inside multi-point conventional protocols, for instance as one of ten adjunct points beside Hegu (LI4) and Fengchi (GB20) in the control arm of a thread-embedding trial for post-paralysis muscle atrophy [19]. There it is included on the basis of syndrome differentiation, not tested for its own contribution. The pattern is consistent across the wider literature: Taichong is a theoretically justified but empirically unexamined adjunct, and its specific effect on any ocular or motor outcome cannot be separated from the combination around it.

Central and peripheral mechanisms

Two resting-state fMRI studies from one research group provide the most direct mechanistic evidence we found, although neither examined the triad. In 55 patients

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with acute Bell's palsy and 48 healthy controls, a 28-day acupuncture course accompanied a 96.4% clinical effective rate and changes in fractional amplitude of low-frequency fluctuation and regional homogeneity in the precentral and postcentral gyri, middle frontal gyrus and posterior cingulate cortex. These regions serve sensorimotor control and emotional processing, which suggests functional reorganization of cortex beyond peripheral nerve regeneration [11]. The response rate carries little weight on its own. Healthy controls cannot stand in for untreated patients, so recovery attributable to acupuncture cannot be told apart from spontaneous recovery [23]. A companion study located further post-needling changes in striatal subregions and corticostriatal connectivity, implicating a region better known for motor learning and habit formation than for cranial nerve repair [12].

A retrospective cohort of 125 patients with Ramsay Hunt syndrome added a clinical angle. The systemic immune-inflammation index, a composite of neutrophil, platelet and lymphocyte counts, independently predicted poorer response to acupuncture (adjusted OR 0.997 per unit; AUC 0.839) [13]. Future trials of any facial paralysis protocol, including one aimed at epiphora, could use baseline inflammatory markers to stratify participants and account for heterogeneous response.

Case-level signal

Two case reports show that acupuncture including periocular or periauricular points is plausible in prolonged or complicated facial paralysis. They do not show that it works. An 81-year-old with delayed-presentation Bell's palsy improved from House-Brackmann grade IV to grade I–II over seven weeks of twice-weekly electroacupuncture at facial and cranial points [14]. A 66-year-old with Ramsay Hunt syndrome and severe postherpetic neuralgia, treated at Yifeng (SJ17), Xiaguan (ST7) and facial points including Cuanzhu (BL2) and Yangbai (GB14), saw visual analogue pain scores fall from 9–10 to 3 and facial paralysis resolve fully over one year [15]. Both are single observations in a condition with a well-documented capacity for spontaneous recovery, and neither measured epiphora.

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Discussion

Taken together, the literature supports three propositions with some consistency and leaves a fourth, the one that motivated this review, essentially untested. First, acupuncture, and electroacupuncture in particular, is associated with higher overall effective and cure rates in peripheral facial paralysis across several independent meta-analyses [5,6,7]. Second, that benefit should not be read as high-certainty evidence. The overview of reviews found most pooled outcomes rated low or very low by GRADE and most reviews critically low by AMSTAR-2 [8]. The primary trials are small, mostly single-centre, conducted almost entirely in China, inconsistent in how they define an effective rate, and essentially never blinded at the level of the treating acupuncturist [8]. A bibliometric analysis of 229 publications from 2000 to 2023 tells the same story from another angle: China dominates, collaboration is poor, and large multicentre trials remain scarce despite rapid growth [16]. Third, earlier initiation appears not to harm and probably to help, which answers a long-standing theoretical worry, although a purpose-built trial using imaging-confirmed oedema is still awaited [1,2,10].

The fourth proposition, that Jingming, Chengqi and Taichong, or periocular acupuncture generally, relieves epiphora, cannot be assessed because the evidence base does not exist. This is a gap, not a negative result. The one trial protocol on ocular sequelae targets exposure-related dry eye with a different point set [4], and Taichong appears only in multi-point protocols that neither isolate nor measure its contribution [19]. The rationale set out in the Introduction, periocular points acting on orbicularis oculi tone and lacrimal drainage, with Taichong addressing the Liver-wind pattern, therefore remains a rationale. Nobody has demonstrated it as a mechanism specific to this combination.

The mechanistic literature offers partial, indirect support. Electroacupuncture has been proposed to promote facial nerve recovery by modulating endothelin-mediated microcirculation and by upregulating nerve growth factor and brain-derived neurotrophic factor in the facial nerve nucleus [17]. If those mechanisms generalize

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to periocular needling, they would plausibly improve orbicularis oculi tone and, through it, lacrimal pump function. The source here is a review protocol, not a primary mechanistic study, so we treat the claim as a hypothesis. Waveform matters too. In a 100-patient randomized trial of acute facial paralysis, sparse-dense stimulation reduced facial spasm recurrence and serum immunoglobulin levels more than continuous-wave stimulation [18]. Any protocol-specific trial would have to specify waveform, not treat it as incidental. The two fMRI studies extend the picture centrally, implicating sensorimotor cortex, limbic-adjacent regions and corticostriatal connectivity [11,12]. Both used conventional facial-region protocols. They show that acupuncture can engage central pathways relevant to facial function. They say nothing about whether this particular combination does.

Outcome selection is the most serious obstacle for the question we set out to answer. None of the trials, protocols or reviews we retrieved used a validated, epiphora-specific instrument, whether tear meniscus height, Schirmer's test, fluorescein clearance, ocular surface staining or a lacrimation-specific patient questionnaire. The House-Brackmann grade [22], the Sunnybrook score, the Facial Disability Index and the Portmann score dominate this literature. They capture global motor function and quality of life. They were not built to quantify lacrimal drainage or reflex tearing, and they cannot distinguish pump failure from corneal exposure or synkinetic gustatory tearing. A trial that improved epiphora as a side effect of better orbicularis oculi tone would therefore have been structurally unable to report it. This is a blind spot of the field, not just an absence of trials on one point combination.

Designing a better trial also means confronting the heterogeneity of epiphora. A protocol meant to restore lacrimal pump function through orbicularis oculi tone differs mechanistically from one meant to reduce reflex tearing from corneal exposure, and both differ from an intervention aimed at crocodile tears, which emerge months after onset and would not be expected to share a treatment window with acute-phase epiphora. A trial that pooled these patients would risk diluting a true effect in one subgroup. Worse, it might credit acupuncture with improvement that

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simply reflected exposure-related tearing resolving as lagophthalmos recovered. Blinding the treating acupuncturist is not feasible, as several of the reviewed protocols acknowledge [2,4,20]. The minimum design requirements are therefore clear: a mechanistically homogeneous population, objective lacrimal outcomes alongside standard facial grading, rigorous assessor blinding, and a comparator arm that separates the three-point protocol from the larger point sets in current use.

This review has its own limits. It is narrative, and its search was neither exhaustive nor reproducible, so relevant studies may have been missed and our selection may lean toward the open-access journals we searched. We relied on the quality ratings of the original authors and did not re-appraise primary trials. Several cited sources are protocols and case reports, which show what is being attempted and what is plausible, not what is effective. Finally, the evidence base is geographically narrow, and our conclusions inherit that narrowness.

Conclusion

The existing literature shows, with moderate consistency across several meta-analyses, that acupuncture, and electroacupuncture in particular, brings a modest benefit in peripheral facial paralysis as measured by effective and cure rates, and that starting early does not carry the oedema-related harm once feared. The certainty of that evidence is mostly low. Jingming, Chengqi and Taichong are anatomically and theoretically well placed to address facial-neuritis-related epiphora, but no published study has tested this combination, and no study in this literature has used a validated epiphora-specific outcome. The triad is plausible and unproven. A prospective, adequately powered, assessor-blinded trial that enrols a mechanistically defined epiphora population, isolates the three-point protocol from larger conventional point sets, and measures lacrimal function with validated instruments beside standard facial grading is the next step. Only then can the combination be recommended or set aside.

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References

1. Zhang L, Ye M, Xie H, et al. Comparison of acupuncture intervention from the acute phase or the non-acute phase in patients with peripheral facial paralysis: a systematic review and meta-analysis. Front Neurol. 2025;16:1690231.

2. Wang Z, Zhang J, Zhang Z, et al. Effects of acupuncture for Bell's palsy patients in the acute phase and its impact on facial nerve edema: a study protocol for a randomized, controlled trial. Front Neurol. 2024;15:1327206.

3. Jin Y, Zhang Y, Xuan L. Warm acupuncture combined with precise meridian sinew needling for refractory peripheral facial paralysis: a propensity score-matched retrospective study on clinical efficacy and infrared thermal imaging. Front Med. 2026;13:1890419.

4. Yao J, Cen L, Li Q, et al. Efficacy of intradermal acupuncture for ocular surface diseases secondary to refractory peripheral facial palsy: a randomized controlled trial study protocol. Front Med. 2026;13:1873689.

5. Zhou Y, Dong X, Xing Y, et al. Effects of electroacupuncture therapy on intractable facial paralysis: a systematic review and meta-analysis. PLoS One. 2023;18(7):e0288606.

6. Kang X, Huang Y, Lv X, et al. Systematic evaluation and meta-analysis of the efficacy of Jingjin acupuncture therapy in the treatment of peripheral facial palsy. Front Neurol. 2024;15:1459738.

7. Deng X, Zhu H, Shi L, et al. Comparison of the efficacy of acupuncture with tuina with acupuncture-only in the treatment of peripheral facial paralysis: a network meta-analysis. Intern Emerg Med. 2024;19:839-858.

8. Huang Z, Zhang Y, Zha B, et al. The efficacy and safety of acupuncture treatment for peripheral facial paralysis: an overview of systematic review and meta-analysis. Front Neurol. 2025;16:1669551.

9. Gao HW, Xia QC, Li ZH, Chen W, Lu Y. Efficacy analysis of electroacupuncture plus TDP in the treatment of peripheral facial paralysis: a systematic review and meta-analysis. Front Neurol. 2024;15:1450312.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 23.10.2026
PUBLISHED: 23.10.2026

10. Yang LS, Zhou DF, Zheng SZ, et al. Early intervention with acupuncture improves the outcome of patients with Bell's palsy: a propensity score-matching analysis. Front Neurol. 2022;13:943453.

11. Xu XS, Zhang YT, Li XW, et al. Exploring the potential central regulatory mechanisms of acupuncture for acute-stage Bell's palsy: an fMRI-based investigation. Front Neurosci. 2025;19:1647538.

12. Yu Z, Song W, Yu B, et al. Alterations in neuroplasticity and functional connectivity of striatal subregions in Bell's palsy patients after acupuncture. Front Neurol. 2026;16:1684824.

13. Fang Y, Zhong X, Zuo J, Wang J. The potential of systemic immune-inflammation index in predicting outcomes of facial palsy in patients with Ramsay Hunt syndrome treated by acupuncture. Front Neurol. 2025;16:1640058.

14. Torres MJS, Lai I. Electroacupuncture as an adjunctive therapy for Bell's palsy: a case report. Cureus. 2026;18:e112675.

15. Li J, Wang J, Li G, et al. Severe postherpetic neuralgia and facial paralysis in the oral and periauricular regions managed with acupuncture and electroacupuncture: a case report. Front Pain Res. 2024;5:1474103.

16. Yu G, Liu J, Luo S, et al. Global trends and performances of acupuncture therapy on Bell's palsy from 2000 to 2023: a bibliometric analysis. J Pain Res. 2023;16:2155-2169.

17. Zhou Y, Huang G, Luo C, et al. Efficacy and safety of electric acupuncture in treatment of intractable facial paralysis: a protocol for systematic review and meta-analysis. PLoS One. 2022;17(12):e0278509.

18. Zhang H, Chen F. Efficacy of electroacupuncture with sparse-dense-wave on patients suffered acute facial paralysis. Clin Cosmet Investig Dermatol. 2023;16:1811-1819.

19. Yu B, Xuan L, Jin Y, et al. Efficacy and safety of thread embedding acupuncture for facial expression muscles atrophy after peripheral facial paralysis: study protocol for a randomized controlled trial. Trials. 2021;22:755.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 23.10.2026
PUBLISHED: 23.10.2026

20. Bian Z, Wang J, Fang F, et al. Study protocol for a randomized trial comparing two electroacupuncture waveforms for different severity groups of Bell palsy. Front Neurol. 2024; 15:1471605.

21. Cheng L, Li XL, Ying Y, et al. Should acupuncture therapy be used for acute facial paralysis? A protocol for systematic review. Syst Rev. 2023; 12:43.

22. House JW, Brackmann DE. Facial nerve grading system. Otolaryngol Head Neck Surg. 1985; 93:146-147.

23. Peitersen E. Bell's palsy: the spontaneous course of 2,500 peripheral facial nerve palsies of different etiologies. Acta Otolaryngol Suppl. 2002; 549:4-30.

Author information

Isroiljonov Behruz — Master’s student, Xinjiang Medical University. E-mail: isroiljonovbehruz05@gmail.com

Li Yong Kai — Chief physician (supervisor), Xinjiang Medical University. E-mail: kaikai59@126.com

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LONG-TERM MANAGEMENT OF PSORIASIS AND PROLONGATION OF REMISSION AFTER BIOLOGIC WITHDRAWAL: AN INTEGRATIVE NARRATIVE REVIEW OF CHINESE AND WESTERN MEDICINE

Jalilov Dilshod

Xinjiang Medical University, Urumqi, China

Liu Hongxia

Department of Dermatology, The Fourth Affiliated Hospital of Xinjiang Medical University, Urumqi, China

Abstract

Psoriasis vulgaris affects roughly 2–4% of people worldwide. Biologics aimed at IL-17A, IL-23 and TNF-α clear skin quickly, but the disease usually returns once treatment stops. After ixekizumab withdrawal, the median time to relapse is about 20.4 weeks. Persistent tissue-resident memory T cells and unresolved dermal microvascular change are the leading explanations. This narrative review asks whether combining Traditional Chinese Medicine (TCM) with biomedical treatment can delay relapse after biologic discontinuation. We drew on a prospective registry cohort, a trial protocol for the Guben Qushi Huayu formula (GQHF) plus ixekizumab, a meta-analysis of herbal bath therapy, and mechanistic and modelling papers. The registry cohort associates adjunctive Chinese herbal medicine with a lower hazard of relapse after biologic withdrawal, but its observational design leaves confounding unresolved. The GQHF randomized trial is registered, yet the sources we reviewed report no results. Evidence for acupuncture in psoriasis is indirect, and the proposed Blood Aspect correlates, relapse-prediction models and staged management framework remain untested hypotheses. Integrative care is a reasonable question to test, not an established way to prolong remission. Adequately powered, placebo-controlled trials with standardized relapse definitions and long follow-up are needed.

Keywords

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psoriasis vulgaris, biologic discontinuation, relapse prevention, Traditional Chinese Medicine, Blood Aspect theory, Guben Qushi Huayu formula.

1. Introduction

1.1 The problem of stopping

Psoriasis vulgaris is a chronic, relapsing, immune-mediated skin disease that affects an estimated 2–4% of the world's population (Armstrong & Read, 2020; Parisi et al., 2020). It is not only a skin problem. Patients carry higher risks of psoriatic arthritis, cardiovascular and cerebrovascular disease, metabolic syndrome and certain malignancies (Elmets et al., 2019; Griffiths et al., 2021). Visible lesions bring stigma, anxiety, depression and, in some cohorts, raised suicide risk (Egeberg et al., 2019; Bardazzi et al., 2022).

Two decades of work on the IL-23/Th17 axis changed treatment. IL-17A, IL-23 and TNF-α are now recognized as central drivers (Bachelez, 2015; Ghoreschi et al., 2021), and antibodies against them clear skin faster and more completely than older drugs. Ixekizumab, an anti-IL-17A antibody, outperformed ustekinumab and guselkumab at week 12 in head-to-head trials (Reich et al., 2017; Blauvelt et al., 2020), and phase 3 data underpin its use (Gordon et al., 2016). Guidelines accordingly place it among first-line options for moderate-to-severe plaque psoriasis (Nast et al., 2020; Nast et al., 2021).

The difficulty starts when treatment stops. Lifelong biologic therapy is often impractical. It is expensive, carries infection risk, may lose effect over time, and is interrupted by pregnancy or patient choice (Masson et al., 2022; Wang et al., 2020). Relapse after withdrawal is the rule rather than the exception. Published systematic data put the median time to relapse after stopping ixekizumab at about 20.4 weeks (Masson et al., 2022; Wang et al., 2020). Guidelines offer no agreed strategy for this situation (Li et al., 2025; Elmets et al., 2021).

1.2 What the antibodies leave behind

Rapid relapse points to something the antibodies leave in the skin. They neutralize circulating cytokines and flatten plaques, yet CD8+CD103+CD69+ and

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CD4+CD69+ tissue-resident memory T (TRM) cells persist in healed epidermis and dermis (Min et al., 2024; Ghoreschi et al., 2021). Cleared skin also keeps dilated capillary loops, residual microvascular tortuosity and epigenetic changes in epidermal stem cells (Han & Yan, 2025). Once drug levels fall, trauma, stress or other triggers can reactivate these cells, and IL-17A, IL-22 and TNF-α surge again. Some authors call this an immunological scar. The metaphor is useful, but it is a metaphor. How much each component contributes to relapse in humans has not been quantified.

1.3 Why look to Chinese medicine

Chinese medicine approaches psoriasis (*bai bi*) through treatment from the Blood Aspect, distinguishing Blood Heat, Blood Stasis and Blood Dryness (Han & Yan, 2025; World Federation of Chinese Medicine Societies, 2024). Herbal formulas, herbal baths and acupuncture have been combined with conventional treatment and are reported to ease symptoms and lower recurrence (Huang et al., 2024; Li et al., 2025; Wang et al., 2024). This review asks a narrow question. Does adding these approaches around the time of biologic withdrawal extend remission, and how strong is the evidence?

2. Methods

We wrote a narrative review. We focused on adults with moderate-to-severe plaque psoriasis, particularly those who had reached remission on biologics or conventional systemic therapy, and on TCM interventions (oral herbal decoctions or granules, patent herbal medicines, herbal balneotherapy, acupuncture or moxibustion) given alongside or after Western treatment. The outcomes that mattered most were relapse, defined as loss of PASI-75 response among responders, and time to relapse. Secondary outcomes were PASI-90, Physician Global Assessment, pruritus VAS, DLQI, Skindex-16 and biomarkers such as IL-17, VEGF, AQP-3 and ceramides. We considered randomized trials, prospective cohorts and trial protocols, together with mechanistic studies that help interpret the clinical findings. Sources came from the English- and Chinese-language literature and included a trial registration (ChiCTR2100054950). We did not run a systematic search with dual screening,

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formal risk-of-bias assessment or GRADE rating. This paper should therefore not be read as a PRISMA-compliant systematic review. Effect estimates and quality judgements are taken from the original authors.

3. Results

3.1 Blood Aspect patterns and their proposed biological correlates

Han and Yan (2025) map the Blood Aspect patterns onto stages of disease and onto molecular findings. Blood Heat marks the progressive, acute stage: vivid red papules, abundant silvery scale, a clear Auspitz sign, burning and a rapid forceful pulse. The proposed biology is IL-23/Th17 hyperactivation, with IL-23-positive dendritic cells, a surge of IL-17A, IL-22 and TNF-α, intense keratinocyte proliferation and activated dermal capillary endothelium. Xijiao Dihuang Tang and Liangxue Huoxue Tang, built around Sheng Di Huang, Mu Dan Pi and Chi Shao, are paired with compounds such as indirubin, baicalin and paeonol, which are reported to suppress the IL-23/Th17 pathway.

Blood Stasis describes the chronic, stationary stage. Plaques are thick, indurated and dull purplish, with stubborn scale, fixed distribution and dark veins under the tongue or nails. The proposed correlates are tortuous, dilated capillaries in the dermal papillae, higher whole-blood viscosity, reduced erythrocyte deformability, matrix fibrosis and raised VEGF. Taohong Siwu Tang and Xuefu Zhuyu Tang, built on Dan Shen, Tao Ren, Hong Hua, E Zhu and Chuan Xiong, are the usual choices. Improved microcirculation and reduced VEGF signalling are the expected actions.

Blood Dryness belongs to the regressive or inactive stage: pale pink macules, fine dry scale, fissuring, dry mouth and a thready pulse. The proposed biology is a damaged epidermal barrier, depleted stratum corneum ceramides, downregulated aquaporin-3 (AQP-3) and increased transepidermal water loss. Danggui Yinzi and Siwu Tang, with Dang Gui, Shu Di Huang and Mai Dong, are meant to restore lipid synthesis and AQP-3 expression.

A fourth pattern, Liver Qi Stagnation, covers psychological comorbidity: low mood, irritability, poor sleep, somatization and a wiry pulse. It is linked to

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hypothalamic-pituitary-adrenal (HPA) axis dysregulation and depleted serotonin and norepinephrine, and it is treated with Xiaoyao San, Longdan Xiegan Tang, Shugan Jieyu capsule or Chaihu Jia Longgu Muli Tang.

The alignment is attractive, but a single source carries it. Han and Yan present a mapping. We found no independent cohort that tests it. It is best read as a hypothesis-generating framework, not a validated biological taxonomy.

3.2 Registry evidence on relapse after biologic withdrawal

The strongest clinical signal comes from a prospective registry-based cohort of patients who stopped biologics (Huang et al., 2024). Adjunctive Chinese herbal medicine was associated with a lower cumulative hazard of relapse, a longer median disease-free interval and smaller PASI rebound than unassisted withdrawal. The authors interpret this as herbal compounds covering the period in which antibody levels decay. The design cannot prove that reading. Registry cohorts are open to confounding by indication: patients who choose herbs may differ in motivation, disease severity, adherence or other care. Randomization is the way to settle it.

3.3 The Guben Qushi Huayu formula

GQHF was developed specifically to prevent relapse, on the principles of strengthening the spleen, dispelling dampness, cooling the blood and resolving stasis (Li et al., 2025; Zhang et al., 2024). It contains nine components: Astragali Radix (30 g), Rehmanniae Radix Praeparata (15 g), Atractylodis Macrocephalae Rhizoma (15 g), Smilacis Glabrae Rhizoma (30 g), Paeoniae Radix Rubra (15 g), Curcumae Rhizoma (10 g), Trionycis Carapax (30 g), Mume Fructus (15 g) and Sarcandrae Planta (15 g). By the formula's own logic, Astragalus and Atractylodes tonify Qi, Rehmannia and Trionyx enrich Yin, Smilax, Sarcandra and Paeonia clear heat, and Curcuma resolves stasis. The clinical evidence is thin. Earlier work from Guangzhou University of Chinese Medicine, as described in the trial protocol, reported a longer median time to relapse and fewer adverse events with ixekizumab plus GQHF than with secukinumab plus GQHF (Li et al., 2025). A comparison of that kind says little about what GQHF itself contributes, because both arms received it.

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The definitive test is a mixed-methods randomized trial registered as ChiCTR2100054950 (Li et al., 2025). It plans to randomize 50 patients with severe psoriasis (PASI ≥10 or BSA ≥10%) 1:1 to 12 weeks of ixekizumab (160 mg at week 0, then 80 mg every two weeks) plus GQHF granules twice daily, or ixekizumab plus taste- and colour-matched placebo granules. After week 12, every participant enters 36 weeks of drug-free follow-up. Relapse and time to relapse are the main outcomes, and semi-structured interviews will explore acceptability and lived experience. The design is sound, but we cite a protocol, and the sources we reviewed report no results. Fifty patients is also a small sample for a relapse endpoint.

3.4 External therapies: herbal baths and acupuncture

A meta-analysis of randomized trials found that adding Chinese herbal bath therapy to narrowband UVB or topical calcipotriol speeds lesion clearance and lengthens post-treatment remission (Wang et al., 2024). One proposed mechanism is transdermal delivery of flavonoids and polyphenols that hydrate the stratum corneum, support ceramide synthesis and hasten barrier recovery. The mechanism is plausible. In the sources we reviewed, it is not demonstrated in psoriatic skin.

Acupuncture is the weakest link. The mechanistic study we cite examined peripheral facial paralysis, not psoriasis (Duan et al., 2025). It reports effects on the cholinergic anti-inflammatory pathway, high-sensitivity C-reactive protein and TLR4/NF-κB p65 signalling. Extending those findings to psoriasis, or to relapse prevention, is an inference, and we found no psoriasis-specific trial among our sources that supports it. A benefit for patients with depression or severe itch through HPA-axis modulation is likewise hypothetical.

3.5 Relapse prediction models

Han and Yan (2025) describe "disease–syndrome combination dynamic prediction models". They combine serial PASI, TCM syndrome scores, circulating IL-17A and composite indices such as the systemic immune-inflammation index (SII) to estimate relapse probability before lesions reappear. The idea follows the classical principle of treating disease before it arises (*zhi wei bing*). When risk crosses a

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threshold, a short pulse of heat-clearing or barrier-repairing herbs would start early. The concept is attractive. We found no prospective validation, calibration data or external testing in the sources we reviewed, so the models remain a proposal.

4. Discussion

4.1 A mismatch of targets

The most useful way to read these findings is as a mismatch between what biologics block and what drives relapse. Monoclonal antibodies neutralize one soluble cytokine with great precision, but they leave the surrounding microenvironment intact: memory T cells, vascular endothelial change and a damaged stratum corneum lipid layer (Min et al., 2024; Han & Yan, 2025). Ixekizumab has a terminal half-life of roughly 13 days. Once it clears, nothing restrains the TRM network. TCM works, by its proponents' account, through many targets at once. Indirubin from *Indigo naturalis*, baicalin from *Scutellaria baicalensis* and paeonol from *Paeonia lactiflora* are reported to suppress Th17 differentiation and IL-17A secretion, induce apoptosis in hyperproliferative keratinocytes, restore regulatory T cells and dampen VEGF-driven angiogenesis (Han & Yan, 2025; Chen et al., 2024). Astragalus and Rehmannia in GQHF are said to regulate cellular energy metabolism and improve cutaneous microcirculation, while Danggui Yinzi is said to raise AQP-3 and ceramide synthesis.

We should be blunt about the quality of this evidence. Much of it is preclinical or comes from network-pharmacology prediction. Chen et al. (2024), for example, measured eight GQHF components and predicted therapeutic targets. Prediction is not demonstration that those targets are engaged in patients. Nothing we reviewed shows that herbal treatment reduces TRM cell numbers in human skin. The claim that biologics and herbs act synergistically on the immunological scar is therefore a hypothesis, however coherent. The registry association (Huang et al., 2024) and the awaited trial (Li et al., 2025) are what will test it.

4.2 A conceptual staged framework

Putting the trial designs and syndrome logic together suggests a three-stage

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framework. We offer it to organize future trials. It is not a treatment recommendation, and no study has tested this schedule. In the first stage, weeks 0 to 12, a patient with severe, progressive disease (the Blood Heat phenotype) would receive a guideline-recommended biologic such as ixekizumab to suppress the IL-17A cascade quickly. Heat-clearing, blood-cooling herbs such as Liangxue Huoxue Tang or a modified GQHF would run alongside. In the second stage, weeks 12 to 24, a patient who has reached PASI-90 or PGA 0/1 would shift the herbal emphasis toward resolving Blood Stasis and consolidating Qi, for example with GQHF or Taohong Siwu Tang, aiming at residual capillary dilation and induration. In the third stage, after week 24, the biologic would be withdrawn while low-intensity maintenance herbs (blood-nourishing formulas such as Danggui Yinzi) and herbal baths twice weekly continue. Monitoring would track PASI, pruritus VAS and inflammatory markers, with short herbal pulses if markers rise.

Stopping a biologic is a decision for the treating clinician. It carries a high and well-documented risk of relapse, and the herbal measures above have not been shown to prevent it. Patients should not withdraw effective treatment on the strength of this framework.

4.3 Limitations

The evidence base has the familiar weaknesses of the field. Most rigorous prospective work comes from Chinese academic centres, which limits generalizability to other populations. Blinding is hard in herbal trials because of taste, smell and appearance, although recent studies use sensory-matched placebo granules (Li et al., 2025). Registry studies leave residual confounding by indication. The only randomized trial we identified is small and unreported. Formulas also differ between studies, so results for one prescription do not transfer to another, and relapse definitions are not standardized. Publication bias is a further worry in a literature where positive results are far more likely to appear in print.

This review has its own limits. It is narrative and was not built on a systematic search, so relevant studies may be missing and our selection may favour sources that

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agree with the integrative hypothesis. We relied on the original authors' quality judgements and did not re-appraise primary studies. Several sources are protocols or mechanistic papers, which show what is being tried and what is plausible, not what works.

4.4 Research directions

Single-cell RNA sequencing, spatial transcriptomics and metabolomics could show directly whether herbal treatment changes TRM populations and metabolic pathways in skin, which is the missing link in the mechanistic argument. Machine-learning analysis of tongue, pulse and facial phenotypes alongside genomic data has been proposed for personalized prediction (Han & Yan, 2025). Such tools need external validation before anyone should rely on them. Larger multicentre randomized trials, ideally with dismantling designs that test each component of a formula, would do more for the field than additional mechanistic speculation.

5. Conclusion

Biologics clear psoriasis fast but rarely keep it clear after withdrawal. Combining them with Chinese herbal medicine is a reasonable strategy to test, and a prospective registry cohort suggests it may lower relapse risk (Huang et al., 2024). The evidence stops there. The GQHF trial has not reported, the Blood Aspect mapping and relapse-prediction models lack independent validation, and the case for acupuncture rests on indirect data. Integrative care may prolong remission, but this literature does not yet show that it does. Placebo-controlled trials with adequate power, standardized relapse definitions and extended drug-free follow-up will decide the question.

References

Armstrong, A. W., & Read, C. (2020). Pathophysiology, clinical presentation, and treatment of psoriasis: A review. *JAMA, 323*(19), 1945–1960.

Bachelez, H. (2015). Interleukin-17 inhibition: a route to psoriasis clearance? *The Lancet, 386*(9993), 510–512.

https://creativecommons.org/licenses/by/4.0/

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Bardazzi, F., Bonci, C., Sacchelli, L., Di Altobrando, A., Iommi, M., & Rucci, P. (2022). Suicide risk and depression in patients with psoriasis. *Italian Journal of Dermatology and Venereology, 157*(6), 497–501.

Blauvelt, A., Papp, K., Gottlieb, A., Jarell, A., Reich, K., Maari, C., et al. (2020). A head-to-head comparison of ixekizumab vs. guselkumab in patients with moderate-to-severe plaque psoriasis: 12-week efficacy, safety and speed of response from a randomized, double-blinded trial. *British Journal of Dermatology, 182*(6), 1348–1358.

Chen, H., Wang, X., Zheng, X., Wang, Q., Li, M., & Tang, B. (2024). Simultaneous determination of 8 components of Guben Qushi Huayu Formula and prediction of its therapeutic target for psoriasis. *Chinese Traditional Patent Medicine, 46*(09), 3176–3181.

Duan, W., Chen, D., Huang, Z., Zeng, Y., Liu, S., Wang, C., & Zhou, H. (2025). Biological effect of acupuncture on peripheral facial paralysis and neuro-immune inflammation. *Frontiers in Neurology, 16*, 1516904.

Egeberg, A., Thyssen, J. P., Wu, J. J., & Skov, L. (2019). Risk of first-time and recurrent depression in patients with psoriasis: a population-based cohort study. *British Journal of Dermatology, 180*(1), 116–121.

Elmets, C. A., Leonardi, C. L., Davis, D., Gelfand, J. M., Lichten, J., Mehta, N. N., et al. (2019). Joint AAD-NPF guidelines of care for the management and treatment of psoriasis with awareness and attention to comorbidities. *Journal of the American Academy of Dermatology*, *80*(4), 1073–1113.

Elmets, C. A., Korman, N. J., Prater, E. F., Wong, E. B., Rupani, R. N., Kivelevitch, D., et al. (2021). Joint AAD-NPF guidelines of care for the management and treatment of psoriasis with topical therapy and alternative medicine modalities. *Journal of the American Academy of Dermatology, 84*(2), 432–470.

Ghoreschi, K., Balato, A., Enerbäck, C., & Sabat, R. (2021). Therapeutics targeting the IL-23 and IL-17 pathway in psoriasis. *The Lancet, 397*(10275), 754–766.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 23.10.2026
PUBLISHED: 23.10.2026

Gordon, K. B., Colombel, J. F., & Hardin, D. S. (2016). Phase 3 trials of ixekizumab in moderate-to-severe plaque psoriasis. *New England Journal of Medicine, 375*(21), 2102.

Griffiths, C., Armstrong, A. W., Gudjonsson, J. E., & Barker, J. (2021). Psoriasis. *The Lancet, 397*(10281), 1301–1315.

Han, D., & Yan, X. (2025). A new perspective on precision treatment for psoriasis based on Traditional Chinese Medicine pattern differentiation. *Journal of Clinical Medicine Practice, 7*(10), 15–22.

Huang, S., Duan, X. W., Zhang, H. C., Dai, B. W., & Bai, Y. P. (2024). Adjunctive Chinese medicine therapy reduces relapse of psoriasis vulgaris after discontinuation of biologics: a prospective registry-based cohort study. *Journal of Dermatological Treatment, 35*(1), 2355261.

Li, Z., Guan, K., Deng, H., Ye, S., Deng, J., Yao, D., Yan, Y., Chen, H., Lu, C., & Yu, J. (2025). Chinese herbal medicine (Guben Qushi Huayu formula) combined with ixekizumab in reducing psoriasis vulgaris relapse: Protocol for a mixed-methods research study. *Frontiers in Pharmacology, 16*, 1551001.

Masson, R. M., Shourick, J., Jendoubi, F., Tauber, M., & Paul, C. (2022). Time to relapse after discontinuing systemic treatment for psoriasis: A systematic review. *American Journal of Clinical Dermatology, 23*(4), 433–447.

Min, D., Fiedler, J., & Anandasabapathy, N. (2024). Tissue-resident memory cells in antitumoral immunity and chronic inflammatory diseases. *Current Opinion in Immunology*, *91*, 102499.

Nast, A., Smith, C., Spuls, P. I., Avila, V. G., Bata-Csörgö, Z., Boonen, H., et al. (2020). EuroGuiDerm Guideline on the systemic treatment of Psoriasis vulgaris – Part 1: treatment and monitoring recommendations. *Journal of the European Academy of Dermatology and Venereology, 34*(11), 2461–2498.

Nast, A., Altenburg, A., Augustin, M., Boehncke, W. H., Härle, P., Klaus, J., et al. (2021). German S3-Guideline on the treatment of Psoriasis vulgaris, adapted from

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 23.10.2026
PUBLISHED: 23.10.2026

EuroGuiDerm – Part 1: Treatment goals and treatment recommendations. *Journal of the German Society of Dermatology*, *19*(6), 934–950.

Parisi, R., Iskandar, I., Kontopantelis, E., Augustin, M., Griffiths, C., & Ashcroft, D. M. (2020). National, regional, and worldwide epidemiology of psoriasis: systematic analysis and modelling study. *BMJ*, *369*, m1590.

Reich, K., Pinter, A., Lacour, J. P., Ferrandiz, C., Micali, G., French, L. E., et al. (2017). Comparison of ixekizumab with ustekinumab in moderate-to-severe psoriasis: 24-week results from IXORA-S, a phase III study. *British Journal of Dermatology*, *177*(4), 1014–1023.

Wang, J., Zhang, C. S., Zhang, A. L., Chen, H., Xue, C. C., & Lu, C. (2024). Adding Chinese herbal medicine bath therapy to conventional therapies for psoriasis vulgaris: A systematic review with meta-analysis of randomised controlled trials. *Phytomedicine*, *128*, 155381.

Wang, X. Y., Zhang, C. L., & Wang, W. H. (2020). Time to relapse after treatment withdrawal for different biologics used to treat plaque psoriasis. *Chinese Medical Journal*, *133*(24), 2998–3000.

World Federation of Chinese Medicine Societies. (2024). Guidelines for the integrated diagnosis and treatment of psoriasis vulgaris with Chinese and Western medicine. *World Chinese Medicine, (17)*, 2535–2544.

Zhang, H., Liu, L., Wei, N., Wu, Y., Zhao, Y., & Lu, C. (2024). Effects of Guben Qushi Huayu formula on skin lesions and spleen water transport in a mouse model of psoriasis relapse. *Chinese Journal of Integrated Traditional and Western Medicine*, *44*(01), 63–69.

Author information

Jalilov Dilshod — Master’s student, Xinjiang Medical University. Corresponding author. E-mail: dilshodjalilov009@gmail.com

Liu Hongxia — Head of the Department of Dermatology, The Fourth Affiliated Hospital of Xinjiang Medical University; Chief Physician, Doctoral Supervisor, Master’s Supervisor, Second-class Professor. E-mail: 1877538293@qq.com

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ENGAGING YOUTH IN COMBATING CORRUPTION THROUGH EDUCATION: FROM AWARENESS-RAISING TO MEASURABLE ANTI-CORRUPTION COMPETENCE

T.Safarov PhD, Senior prosecutor

E-mail: t.safarov@proacademy.uz; https://orcid.org/0009-0002-8574-3921

Law Enforcement Academy of the Republic of Uzbekistan, Tashkent, Uzbekistan

Otabek Ulugbekovich Tokhirov

Student at the "International House Tashkent" Academic Lyceum under the National Research University "Tashkent institute of irrigation and agricultural mechanization engineers" First-year student, Social sciences and humanities department

Email: tokhirovotabek3@gmail.com; mailto:tokhirovotabek3@gmail.com

Abstract

This article develops the concept of anti-corruption education for young people as a measurable preventive intervention whose outcomes should include not only legal knowledge, but also the ability to identify corruption risks, make ethically sound decisions, use reporting and public oversight mechanisms, and maintain anti-corruption attitudes over time. By comparing approaches developed by the OECD, the United Nations/UNODC and UNESCO, large-scale international educational assessments, and empirical studies of youth attitudes, the article substantiates the need to shift from indicators of coverage to indicators of educational effect. The scientific novelty lies in the proposed multi-level model for evaluating the effectiveness of youth anti-corruption education and in an author-developed Youth Anti-Corruption Education Effectiveness Index (YACEEI), which integrates cognitive, normative-value, situational-behavioral, civic-action, and delayed-retention components. The article proposes a "pre-training – post-training – delayed measurement" design, situational vignettes, behavioral tasks, indicators of civic agency, and, where feasible, quasi-experimental and experimental methods for estimating causal effects. For the Republic of Uzbekistan, a model is proposed for

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implementing these instruments through the electronic platform “Virtual Academy for Combating Corruption.”

Keywords

corruption, youth, anti-corruption education, education for integrity, public integrity, anti-corruption competence, youth participation, behavioral indicators, impact evaluation, public oversight, Virtual Academy.

Introduction. Corruption is a complex socio-legal phenomenon, and efforts to counter it cannot be limited to detecting violations and imposing sanctions. Long-term prevention requires the formation of social norms under which the use of public or professional authority for private interests is regarded as unacceptable. The United Nations Convention against Corruption recognizes the importance of education and public participation in preventing corruption,[1] while the OECD regards education for public integrity as an independent instrument for developing knowledge, values and skills.[2] The key methodological question, therefore, is not whether young people should be educated to resist corruption, but which educational interventions can produce sustainable change and how such change should be measured. The OECD specifically emphasizes that educational programmes should be accompanied by an evaluation framework covering short-, medium- and long-term outcomes, as well as indicators of learners’ knowledge, skills and future behavior.[3]

The object of this study is the social relations that arise in the process of anti-corruption education and the involvement of young people in corruption prevention. The subject of the study comprises educational mechanisms, international indicators and methods for measuring the effectiveness of such education. The purpose of the study is to develop a scientifically grounded model for moving from counting the number of persons trained to assessing sustainable anti-corruption competence and civic agency among young people.

[1] United Nations. United Nations Convention against Corruption. New York: United Nations, 2003.
[2] OECD. Education for Public Integrity: Teaching on Anti-Corruption, Values and the Rule of Law. Paris: OECD Publishing, 2018. DOI: 10.1787/133291ea-en.
[3] OECD. OECD Public Integrity Handbook. Paris: OECD Publishing, 2020; OECD. Education for Public Integrity: Teaching on Anti-Corruption, Values and the Rule of Law. Paris: OECD Publishing, 2018. DOI: 10.1787/133291ea-en.

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The methodological framework of the study combines comparative legal, systemic and institutional approaches, analysis of international documents, secondary analysis of international surveys and educational assessments, and findings from experimental and quasi-experimental studies of anti-corruption and ethics-related educational interventions. The scientific novelty lies in linking the legal and regulatory model of anti-corruption education with the logic of impact evaluation and educational psychometrics: outcomes are to be measured not by a single knowledge test, but by a system of interrelated cognitive, value-based, situational-behavioral and civic-action indicators, with mandatory delayed measurement.

1. Anti-corruption education as a mechanism for corruption prevention. Efforts to combat corruption have traditionally developed along two interrelated lines: responding to offences that have already been committed and preventing the conditions that facilitate their occurrence. Education plays a particularly important role in the second of these areas.

Educational influence is fundamentally different from administrative and criminal-law measures used to combat corruption. Whereas legal liability operates primarily through prohibition and the threat of sanctions, education seeks to change a person’s knowledge, values, attitudes and behavioral patterns.

Accordingly, the ultimate purpose of anti-corruption education is not merely to know the content of anti-corruption legislation. Its outcome should be the development of the ability to: recognize corruption and related forms of unlawful conduct; identify situations involving conflicts of interest; make ethically sound decisions; resist social pressure aimed at drawing a person into corrupt relationships; know lawful channels for reporting misconduct; use mechanisms for obtaining information and exercising public oversight; recognize personal responsibility for upholding legality and integrity.

This approach is consistent with the international understanding of education for public integrity. The OECD views such education as a means of promoting ethical behavior and equipping young people with the knowledge and skills needed to resist

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corruption. Particular importance is attached to incorporating integrity issues into school education and to practical learning through young people's participation in real projects of public significance. Thus, anti-corruption education simultaneously performs legal, educational, preventive and socializing functions.

2. Why young people should become independent actors in anti-corruption policy. Youth is one of the most important stages in the formation of civic identity. It is during this period that a person enters independent social relations, receives vocational or higher education, begins employment, interacts with public institutions, and forms stable ideas about acceptable ways of pursuing social and professional goals. The particular importance of working with young people is explained by several factors.

First, young people are future civil servants, entrepreneurs, professionals, managers and representatives of civil society. The behavioral attitudes formed today may therefore directly affect the future quality of public and social institutions.

Second, young people are highly receptive to new technologies and modern forms of communication. This makes it possible to use digital learning platforms, social networks, open data, interactive simulations and other tools capable of substantially expanding the reach of anti-corruption education.

Third, young people can act as carriers of new social norms within their own communities. When education is properly designed, a young person becomes not merely a course participant but also a transmitter of anti-corruption values among peers, family members and the local community.

International practice is also gradually moving away from viewing young people solely as the target audience of information campaigns. The UNODC GRACE initiative — Global Resource for Anti-Corruption Education and Youth Empowerment — is built around three interrelated areas: school education, academic and research activity, and youth empowerment.[4] Within this initiative, the YouthLED Integrity Advisory Board was established to involve young people directly in

[4] UNODC. Global Resource for Anti-Corruption Education and Youth Empowerment (GRACE Initiative). Vienna: United Nations Office on Drugs and Crime.

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designing approaches to youth participation in anti-corruption activities. The practical UNODC guide developed with youth participation is aimed not simply at studying corruption, but at enabling young people to create their own anti-corruption initiatives.[5] Accordingly, the contemporary concept of youth participation may be expressed as the following sequence: "**know about corruption → be able to recognize corruption risks → be able to resist them → participate in corruption prevention → initiate one's own anti-corruption projects**."

The transition to the final two stages appears to be one of the most promising directions of state youth policy.

3. Shortcomings of the traditional model of anti-corruption education.

In practice, anti-corruption education is often limited to lectures, seminars, round tables and information events. These forms undoubtedly retain value; however, when they are used without a practical component, they may lead only to formal assimilation of material.

Several recurring problems can be identified. The first problem is the predominance of a legalistic and regulatory approach. Learners are given detailed explanations of the concept of corruption, the elements of offences and legal liability, while considerably less attention is paid to how a person should act in a specific and ambiguous situation. For example, a young professional may know the definition of a conflict of interest but may be unable to identify one when a close relative is being recruited, a gift is offered, a decision is being made, or official connections are used for private purposes.

The second problem is the insufficient practical orientation of training. If corruption is presented solely as an abstract social evil, learners may fail to connect the issues discussed with their own everyday decisions.

The third problem is that the effectiveness of education is often measured by the number of events held or participants reached, while changes in knowledge, skills and attitudes toward corruption remain without systematic evaluation.

[5] UNODC YouthLED Integrity Advisory Board. Taking Action against Corruption: A Step-by-Step Guide by Youth for Youth. Vienna: UNODC, 2024.

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The OECD explicitly points to the need to establish mechanisms for assessing the impact of education for public integrity, including measurement of learners' knowledge and skills and analysis of the short-, medium- and long-term outcomes of educational programmes.

It is therefore necessary to distinguish between the coverage of anti-corruption education and its effectiveness. A large number of course completers does not, by itself, demonstrate the formation of sustainable anti-corruption behavior.

4. From information provision to the development of anti-corruption competence. It is advisable to build youth education on a competence-based approach. A young person's anti-corruption competence may be defined as a combination of knowledge, value-based attitudes and practical skills that enable the individual to recognize corruption risks, make decisions based on legality and integrity, and participate in corruption prevention. Such competence should include four interrelated components:

1) Cognitive component. This includes knowledge of the nature and forms of corruption; its social, economic and legal consequences; liability for corruption-related offences; conflicts of interest; anti-corruption institutions; and mechanisms of openness and public oversight.

2) Value component. It is not enough to teach a young person to recognize an unlawful act. Education should foster an internal conviction that using public authority, professional status or personal connections to obtain improper advantages is unacceptable. The key concepts here are honesty, fairness, responsibility, impartiality, transparency and public integrity.

3) Behavioral component. Learners should know how to act in practice when faced with a corruption risk: where to seek assistance; how to report suspected misconduct; how to act in a conflict-of-interest situation; how to refuse an unlawful offer; how to use government open data; and how to submit requests for information.

4) Civic component. The highest level presupposes the ability to participate in corruption prevention in the public interest. This component transforms anti-

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corruption education from a process of knowledge transmission into a mechanism of public participation.

5. Practice-oriented methods of youth education. The greatest effect can be achieved by combining traditional teaching with interactive formats.

5.1. Analysis of practical situations. One of the most effective methods is the analysis of specific situations — case studies. For example: a student is offered the opportunity to pay for a higher grade; a young civil servant receives a gift from an organization in relation to a matter on which the civil servant must make a decision; a relative ask for assistance in obtaining employment; an employee gains access to confidential information and intends to use it for personal purposes.

Unlike conventional testing, such tasks require learners to identify the corruption risk independently and choose a lawful course of action.

5.2. Ethical dilemmas. Not all corruption-risk situations are obvious. Training in the resolution of ethical dilemmas is therefore particularly important.

Joint UNODC and UNESCO teaching materials for educational institutions provide for interactive exercises, games, stories and tasks that develop critical thinking and the ability to analyze questions of fairness, legality and ethical choice.

5.3. Learning by doing. The principle of learning by doing is especially important. The OECD recommends involving young people in real public-integrity projects, for example by using access-to-information mechanisms or monitoring the implementation of socially significant projects. Such activities simultaneously develop knowledge and practical civic competences. In Uzbekistan, such assignments may include:assessing the openness of public authorities; examining open data on public procurement; analyzing budget information; identifying corruption risks within an educational institution; developing proposals to improve internal procedures; creating a youth project in the field of integrity.

5.4. The peer-to-peer model. A promising instrument is the peer-to-peer principle, under which trained young participants pass knowledge on to their peers. The advantage of this mechanism is that information is communicated in language

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familiar to young people and within their own social group. A similar approach has been used in Uzbekistan through anti-corruption co-working centers, where students participated in developing start-ups and creative projects and in disseminating anti-corruption initiatives among peers in educational institutions and mahallas.

6. Digital technologies as a means of large-scale anti-corruption education. Contemporary youth policy is virtually impossible without digital technologies. Online learning offers a number of advantages: scalability; geographical accessibility; the ability to choose one's own study time; personalization of content; use of multimedia content; automated testing; the ability to analyze educational outcomes.

From this perspective, the electronic platform "Virtual Academy for Combating Corruption," established in the Republic of Uzbekistan, has significant potential.

Pursuant to the Resolution of the President of the Republic of Uzbekistan of 21 June 2024, a system of continuous improvement of anti-corruption knowledge among the population and civil servants was introduced, with the formation of legal immunity to corruption and the embedding of integrity values in the consciousness of the younger generation identified among its priorities. The platform was launched on 1 January 2025.[6]

Importantly, training on the platform is not limited to civil servants. Its target groups expressly include children, pupils and students of educational institutions.[7]

This makes it possible to use the Virtual Academy not only as a system for delivering distance learning, but also as a national infrastructure for building an anti-corruption culture.

7. From an online course to a digital ecosystem of youth participation. The next stage in the development of distance anti-corruption education should be an expansion of its functions. It appears promising to establish the following model on digital learning platforms: "**learning → practical assignment → youth initiative →**

[6] Resolution of the President of the Republic of Uzbekistan No. PP-228 of 21 June 2024 "On Measures to Introduce a System of Continuous Improvement of Knowledge of the Population and Civil Servants in the Field of Combating Corruption."
[7] Regulation on the Procedure for Organizing Training on the Electronic Platform "Virtual Academy for Combating Corruption," registration No. 3565.

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public participation." After completing the theoretical course, participants could be asked to carry out a practical assignment, for example: analyze open data; identify a potential corruption risk; prepare anti-corruption social advertising; develop a digital solution; prepare a proposal to increase the transparency of a specific procedure; conduct a mini-study of young people's attitudes toward corruption.

The best projects could be selected for further implementation with the participation of public authorities, universities, IT companies and civil-society institutions. Such a mechanism would make it possible to move away from a model in which the sole final result of training is the receipt of a certificate. The main result should be a change in a person's capacity to act.

8. Anti-corruption hackathons as a new form of youth education. Hackathons merit separate attention. Internationally, UNODC implements the Coding4Integrity programme. It creates an environment in which young people simultaneously acquire knowledge about corruption, improve social and technical skills, and develop technological solutions to corruption-related problems. More than 400 young people from 24 countries participated in the first four stages of the initiative. A similar practice is developing in Uzbekistan. In April 2026, the "Anti-Corruption Hackathon — 2026" was organized,[8] with youth teams developing solutions based on open data in such areas as public procurement, health care, sport, construction and education. One of the event's distinct areas focused on involving the public and young people in combating corruption.

The scientific value of this format lies in combining three elements: education + civic participation + innovation.

Participants do not merely learn about a corruption problem; they attempt to create an instrument for solving it.

Hackathons, project schools, start-up competitions and open-data laboratories should therefore be regarded as promising elements of a national system of youth anti-corruption education.

[8] "Anti-Corruption Hackathon 2026" Launched // https://anticorruption.uz/uz/article/aksilkorrupsiya-xakatoni-2026ga-start-berildi (accessed 14.05.08).

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9. Developing skills for working with open data. One underused area is teaching young people how to analyze open information. The digitalization of public administration is generating an ever-growing volume of information on budget expenditures, public procurement, the use of state property, licensing, construction and other areas. However, publishing data does not automatically create public oversight. Citizens must be able to understand, analyze and compare data. A modern anti-corruption course for young people should therefore include basic data literacy.

Young people should be taught how to: find government open data; use public procurement portals; compare information from different sources; visualize information; identify unusual and recurring patterns; formulate questions to public authorities on the basis of the information obtained.

Digital literacy is thus gradually becoming part of anti-corruption competence.

10. The need to differentiate education by age. A single programme cannot be equally effective for school pupils, university students and young civil servants. The content of training should therefore take into account the learner's age, level of education and social status.

For younger age groups, the priorities should be honesty, fairness, responsibility, respect for rules and the unacceptability of obtaining advantages by dishonest means.

For upper-secondary school students, the priorities should include the concept of corruption, the social consequences of corrupt conduct, the foundations of human rights, the role of citizens, public oversight and ethical dilemmas.

For university students, relevant topics include conflicts of interest, academic integrity, corruption risks in professional activity, public procurement, open data, the foundations of compliance control and mechanisms for reporting corruption.

For young civil servants, relevant topics include gifts and hospitality, conflicts of interest, public-service ethics, declarations, procurement procedures, corruption risks and protection of persons who report misconduct.

This would ensure the principle of progressively increasing the complexity of anti-corruption education at each stage of personal socialization.

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11. Scientific debate: information, values, or behavioral change? The scholarly literature reveals at least three competing approaches to explaining the effectiveness of anti-corruption education. The first, the information-cognitive approach, assumes that increasing knowledge about forms of corruption, legal liability and social harm will in itself reduce willingness to participate in corrupt practices. The second, the value-normative approach, links effectiveness primarily to the internalization of honesty, fairness, impartiality and the public interest. The third, the behavioral-institutional approach, holds that knowledge and values can be translated into practice only when individuals possess practical skills, have access to safe channels for action, and operate in an institutional environment in which integrity-based behavior is genuinely feasible. Empirical evidence does not support treating the information model as sufficient. In a randomized study involving approximately 2,000 Russian university students, participants received different brochures and video materials about the negative consequences of corruption. No significant average effect was found across the full sample; however, the authors identified evidence of heterogeneous responses across groups and warned about the possibility of undesirable effects in different directions.[9] An earlier experiment involving 350 students in Khabarovsk and 600 students in Lviv likewise showed that the effects of information materials varied across samples and social groups.[10]

A further argument is provided by the experiment conducted by R. Banerjee and A. Mitra: a four-week ethics module produced only a small immediate effect on the probability of demanding a bribe in a laboratory game, and the effect disappeared four weeks later.[11] These findings do not mean that education is ineffective. On the contrary, they demonstrate the weakness of judging success solely by course completion and support the need for repeated, practice-oriented training with delayed

[9] Denisova-Schmidt E., Huber M., Leontyeva E., Solovyeva A. Combining experimental evidence with machine learning to assess anti-corruption educational campaigns among Russian university students // Empirical Economics. 2021. Vol. 60(4). P. 1661–1684. DOI: 10.1007/s00181-020-01827-1.
[10] Denisova-Schmidt E., Huber M., Leontyeva E. Do Anti-Corruption Educational Campaigns Reach Students? Some Evidence from Russia and Ukraine // Educational Studies Moscow. 2016. No. 1. P. 61–83. DOI: 10.17323/1814-9545-2016-1-61-83.
[11] Banerjee R., Mitra A. On monetary and non-monetary interventions to combat corruption // Journal of Economic Behavior & Organization. 2018. Vol. 149. P. 332–355. DOI: 10.1016/j.jebo.2018.01.004.

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measurement of outcomes. At the same time, research on civic education indicates that higher levels of civic knowledge are associated with lower tolerance of corruption, while open classroom discussion of public issues is directly or indirectly associated with anti-corruption norms. An analysis of ICCS data from Latin American countries explained a substantial share of variation in tolerance of corruption through civic knowledge, authoritarian attitudes and the nature of classroom discussion. [12] An integrative model is therefore more scientifically persuasive: knowledge is necessary but insufficient; sustainable effects arise from the combination of knowledge, value-based reflection, decision-making practice and real experience of participation.

12. What should be measured? International indicator frameworks. No single specialized global index for measuring the effectiveness of youth anti-corruption education currently exists. International practice nevertheless provides several compatible measurement frameworks that can be adapted for this purpose. First, the OECD proposes measuring knowledge and integrity-related skills throughout participation in an educational programme and assessing subsequent behavior; suggested methods explicitly include regression discontinuity, qualitative and participatory methods, and behavioral measures of the propensity for dishonest conduct before and after a programme.[13]

Second, the UNESCO/UIS methodology for Sustainable Development Goal 4.7 divides educational outcomes in global citizenship into cognitive, socio-emotional and behavioral dimensions. Indicator 4.7.4 measures the proportion of students demonstrating an adequate understanding of global citizenship issues; the methodology draws on comparable large-scale assessments, including ICCS, PISA and TIMSS.[14] This three-component architecture is particularly useful for anti-corruption education because it prevents outcomes from being reduced to the reproduction of

[12] Civic knowledge and open classroom discussion: explaining tolerance of corruption among 8th-grade students in Latin America // Educational Psychology. 2020. Vol. 40(2). P. 186–206. DOI: 10.1080/01443410.2019.1699907.
[13] OECD. Education for Public Integrity: Teaching on Anti-Corruption, Values and the Rule of Law. Paris: OECD Publishing, 2018. DOI: 10.1787/133291ea-en.
[14] UNESCO Institute for Statistics. Guidelines for Data Collection to Measure SDG 4.7.4 and 4.7.5. Montreal: UIS, 2021.

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legal definitions. Third, the OECD Survey on Drivers of Trust measures perceptions of integrity, openness, fairness, institutional responsiveness and subjective political agency. For youth anti-corruption education, the "sense of having a say" indicator is especially important: in the 2023 survey across 30 OECD countries, trust in national government was 69% among those who felt they had a say in what the government did, compared with 22% among those who felt they did not.[15] Civic agency — knowing where to turn, confidence in one's ability to act, and experience of participation — should therefore be treated as an independent learning outcome.

Level	**Key indicator**	**Operationalization**	**Instrument**	**Measurement period**
1. Coverage and equity	Share of the target group completing training; coverage gaps by sex, territory and type of education	Completion/registration; accessibility for vulnerable groups	LMS analytics; administrative data	Continuous
2. Cognitive outcome	Growth in knowledge and recognition of corruption risks	Δ in standardized-test score; proportion of cases classified correctly	Parallel test forms; IRT/scaling	T0, T1, T2
3. Normative attitudes	Reduced tolerance of corruption and favoritism	Index of acceptability of bribery, personal connections, gifts and conflicts of interest	Likert scales; vignettes; indirect questions	T0, T1, T2
4. Situational skills	Ability to choose a lawful course of action	Share of correct decisions in ambiguous scenarios	Situational judgment test; case simulation	T0, T1, T2
5.	Readiness to refuse,	Action selected in a	Behavioral	T1, T2

[15] OECD. OECD Survey on Drivers of Trust in Public Institutions – 2024 Results: Building Trust in a Complex Policy Environment. Paris: OECD Publishing, 2024. DOI: 10.1787/9a20554b-en.

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Behavioral readiness	report and request information	simulation; completion of a practical task	task; digital simulation	
6. Civic agency	Self-efficacy and actual participation	Knowledge of reporting channels; number of verifiable initiatives/appeals/projects	Survey + verified activities	T1, T2/T3
7. Transfer and sustainability	Retention of effect outside the learning setting	Share of the effect retained after 3–12 months	Repeat test; panel observation	T2 = 3 months; T3 = 12 months
8. Institutional effect	Change in the educational institution's environment	Trends in academic dishonesty, perceived fairness of procedures and use of reporting channels	Anonymous climate survey; administrative indicators	Annually

Note: *T0 — before training; T1 — immediately after training; T2 — delayed measurement approximately 3 months later; T3 — long-term measurement approximately 12 months later. The specific intervals should be determined by the programme design and the feasibility of tracking participants.*

Table 1. Proposed System of Indicators for Evaluating the Effectiveness of Youth Anti-Corruption Education

13. What international youth surveys show and why it matters for educational design. The findings of international studies confirm the need to combine education with real experience of action. In the 2017 Global Corruption Barometer, covering 119 countries, territories and regions and 162,136 adults, 58% of respondents under the age of 24 believed that ordinary citizens could make a difference in the fight against corruption; among respondents aged 55 and over, the corresponding share was 50%.[16] This indicator should not be interpreted as proof of

[16] Transparency International. Global Corruption Barometer 2017. Berlin: Transparency International, 2017.

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the effectiveness of a particular educational programme, but as an empirical basis for developing and measuring youth anti-corruption agency.

At the same time, young people may be more vulnerable to corrupt practices. In the 2020 Global Corruption Barometer — Asia, being aged 18–34 was associated with a higher likelihood of paying a bribe or using personal connections to obtain public services; in a comparison published by Transparency International, 22% of respondents aged 18–34 reported paying a bribe, compared with 13% of respondents over the age of 55.[17] Course content should therefore include not only general norms but also scenarios involving everyday interactions with education, health care, licensing, employment and the police.

A U-Report survey conducted in 2018 for the African Union among approximately 34,000 children and young people in three countries found that 63% of respondents had experienced corruption either personally or through family members; 94% believed that corruption negatively affected their lives, and around half identified education as the main area of concern.[18] These findings indicate that anti-corruption education should begin with learners' lived experience and include safe discussion of real dilemmas rather than being built solely around abstract definitions.

Afrobarometer data from 39 African countries likewise reveal a combination of critical perceptions of institutions and relatively low youth engagement: 64% of young respondents aged 18–35 preferred democracy, 60% were dissatisfied with the way it functioned, and 40% believed that most or all officials in the office of the president were corrupt; at the same time, young people participated less often than older groups in voting and several forms of civic activity.[19] For educational policy, this means that increasing critical awareness without developing constructive channels for participation may fail to produce socially beneficial action.

Finally, UNESCO monitoring of SDG 4.7 shows that across 23 countries the proportion of students demonstrating sufficient understanding of global citizenship

[17] Transparency International. Global Corruption Barometer — Asia 2020. Berlin: Transparency International, 2020.
[18] African Union / U-Report. Stolen Futures: The Impact of Corruption on Children in Africa. 2018.
[19] Afrobarometer. African Insights 2024: Democracy at Risk — The People's Perspective; Round 9 materials on youth. 2024.

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issues under the relevant methodology ranged from approximately 40% to almost 70%. In PISA 2018 data, broader participation in relevant learning activities was associated with higher levels of awareness, agency and self-efficacy even after controlling for socio-economic factors, although the effect sizes remained small.[20] Methodologically, this means that educational opportunity and educational outcome should be measured separately.

14. Author-developed model: youth anti-corruption education effectiveness index (YACEEI). For pilot evaluation, this article proposes an integrated Youth Anti-Corruption Education Effectiveness Index (YACEEI). Its purpose is not to rank young people by their "integrity," but to provide researchers and programme administrators with a reproducible indicator of educational change. The index should be calculated at the aggregate level of a course, educational institution, age group or region and should be accompanied by confidence intervals.

In a pilot version, YACEEI may comprise five sub-indices: K — knowledge and recognition of risks; V — value and normative attitudes; S — situational decision-making skills; A — civic agency and practical readiness to act; and R — retention and transfer of outcomes over time. Equal weighting of the components (20% each) may be used for initial testing, but after sufficient data have been accumulated, the weights should preferably be determined empirically through confirmatory factor analysis, scale reliability analysis and tests of predictive validity against behavioral tasks.

Formally, the pilot index may be expressed as: YACEEI = 0.20K + 0.20V + 0.20S + 0.20A + 0.20R, where each component is normalized on a 0–100 scale. It is scientifically essential that component R should not simply repeat the same questions at a later date. It should reflect the proportion of the effect retained and the ability to apply knowledge in new situations. For example, if the immediate post-course gain is 20 points but only 8 points remain after three months, the effect-retention coefficient is 0.40. To improve validity, reliance on a single self-report measure should be avoided. Socially desirable responses are especially likely when participants are

[20] UNESCO Global Education Monitoring Report. Monitoring SDG 4: Global Citizenship Education. UNESCO, current online version.

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asked direct questions such as “Would you be willing to pay a bribe?” The questionnaire should therefore combine: (a) neutrally worded vignettes; (b) situational tasks with several plausible options; (c) indirect techniques for sensitive questions; (d) digital behavioral simulations; and (e) information on tasks actually completed. Where ethically and legally permissible, randomized information interventions, stepped-wedge designs, regression discontinuity or difference-in-differences methods may also be incorporated into the research design.

15. Design of a national evaluation system for Uzbekistan. Resolution of the President of the Republic of Uzbekistan No. PP-228 of 21 June 2024 provides for the introduction, from 1 January 2025, of the electronic platform “Virtual Academy for Combating Corruption,” and expressly identifies among its priorities the formation of legal immunity to corruption, the inculcation of integrity values in the younger generation, knowledge assessment and scientific research.[21] The existence of a unified digital infrastructure creates a rare opportunity to move from episodic surveys to a longitudinal evaluation system. It is proposed that the platform implement four interconnected components. The first is diagnostic: a short entrance test and a set of validated vignettes before training. The second is instructional: adaptive content, cases and simulations that record not only whether an answer is correct but also the path by which the decision was reached. The third is delayed: an automated repeat module after three months and a selective panel study after twelve months. The fourth is research-oriented: an anonymized dataset for analyzing the effectiveness of different formats, age groups and topics.

The sample for in-depth research should be stratified by age, sex, territory, type of educational institution and socio-professional status. To ensure comparability over time, anchor items should be retained while cases are rotated to minimize memorization effects. With a sufficiently large dataset, Item Response Theory should be used to calibrate item difficulty, and measurement invariance across groups should

[21] Resolution of the President of the Republic of Uzbekistan No. PP-228 of 21 June 2024 “On Measures to Introduce a System of Continuous Improvement of Knowledge of the Population and Civil Servants in the Field of Combating Corruption.”

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be tested so that differences in scores reflect differences in competence rather than differences in wording. Not only the average effect but also its heterogeneity should be assessed. Experimental studies show that the same anti-corruption material may affect different groups of learners in different ways. Subgroup analysis and checks for adverse effects should therefore be mandatory. For example, researchers should examine whether excessive emphasis on the prevalence of corruption reinforces the belief that "everyone does it," unintentionally normalizing the practice. This risk makes messages that emphasize concrete integrity norms, personal efficacy and functioning protection mechanisms preferable to messages focused solely on the scale of the problem.

16. Scientifically grounded proposals for improving youth anti-corruption education. Conceptual and methodological documents should clearly distinguish among "training coverage," "immediate educational outcome" and "sustainable preventive effect." The number of participants and certificates should be used only as indicators of access, not as evidence of effectiveness.

A national bank of standardized anti-corruption tasks for young people should be developed, covering legal issues, ethical dilemmas, conflicts of interest, academic integrity, favoritism, gifts, procurement, open data and reporting of misconduct. Separate calibrated forms should be used for different age groups.

A mandatory three-point T0–T1–T2 assessment should be introduced, with T3 after twelve months for a research subsample. The principal indicator should include not only the immediate post-course gain but also the effect-retention coefficient.

YACEEI should be developed and piloted on a representative sample. Before any regulatory use, its internal consistency, factor structure, criterion and predictive validity, resistance to socially desirable responding, and measurement equivalence across groups should be tested.

Public rankings of individual learners by "integrity" should not be used. The index should be applied to programmes and groups in anonymized form; individual results should be used only for educational feedback.

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The emphasis should shift from communicating the prevalence of corruption to teaching specific actions: recognize a risk, refuse participation, document the situation, use a safe reporting channel, request open information, examine procurement data and propose a procedural change.

Every youth course should include a compulsory learning-by-doing module: open-data analysis, a mini-audit of transparency, a corruption-risk-reduction project, a social initiative, or a simulation of public oversight.

The peer-to-peer principle should be used, but its effectiveness should be evaluated not by the number of meetings held, but by changes in indicators among the second wave of participants and by the quality of initiatives created.

A research track should be established within the Virtual Academy for A/B testing of learning formats, subject to ethical requirements. It should compare case-based learning, video materials, interactive simulations, peer-to-peer approaches and project-based activities. An aggregated annual scientific and analytical report entitled “Youth Anti-Corruption Competence” should be published, reflecting trends in knowledge, attitudes, skills, agency and sustainability of effects, together with methodological limitations and confidence intervals.

CONCLUSION. Youth anti-corruption education should be understood not as a communication campaign or a collection of lectures, but as a testable preventive intervention. Contemporary scientific debate shows that the transmission of information alone does not guarantee sustainable changes in attitudes and behavior. Short-term effects may be weak, heterogeneous or disappear over time; a scientifically sound model should therefore incorporate practical application, the development of civic agency and delayed measurement.

International indicator frameworks developed by UNESCO/UIS and the OECD provide a methodological foundation for such evaluation: educational opportunities, knowledge, socio-normative attitudes, behavioral readiness and participation should be measured separately. International youth surveys, in turn, point to the dual position of young people: they often experience corruption risks particularly strongly while at

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the same time demonstrating substantial potential for public participation. The task of education, therefore, is not only to develop intolerance of corruption, but also to transform that intolerance into competent, safe and lawful action.

For Uzbekistan, the Virtual Academy can become not only a channel for large-scale learning, but also a national infrastructure for measuring educational impact. The proposed YACEEI should be regarded as a research hypothesis and a piloting instrument rather than a ready-made administrative ranking. Its scientific value will depend on the quality of validation, longitudinal data and its ability to explain real changes in young people's decisions and forms of civic participation. The prospective paradigm may therefore be formulated as follows: from awareness to competence; from competence to action; from isolated action to a sustainable culture of integrity.

REFERENCES

1. United Nations. United Nations Convention against Corruption. New York: United Nations, 2003.

2. OECD. Education for Public Integrity: Teaching on Anti-Corruption, Values and the Rule of Law. Paris: OECD Publishing, 2018. DOI: 10.1787/133291ea-en.

3. OECD. OECD Public Integrity Handbook. Paris: OECD Publishing, 2020.

4. OECD. OECD Survey on Drivers of Trust in Public Institutions – 2024 Results: Building Trust in a Complex Policy Environment. Paris: OECD Publishing, 2024. DOI: 10.1787/9a20554b-en.

5. UNESCO Institute for Statistics. Guidelines for Data Collection to Measure SDG 4.7.4 and 4.7.5. Montreal: UIS, 2021.

6. UNESCO Global Education Monitoring Report. Monitoring SDG 4: Global Citizenship Education. UNESCO, current online version.

7. UNODC. Global Resource for Anti-Corruption Education and Youth Empowerment (GRACE Initiative). Vienna: United Nations Office on Drugs and Crime.

8. UNODC YouthLED Integrity Advisory Board. Taking Action against Corruption: A Step-by-Step Guide by Youth for Youth. Vienna: UNODC, 2024.

9. Transparency International. Global Corruption Barometer 2017. Berlin:

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 23.10.2026
PUBLISHED: 23.10.2026

Transparency International, 2017.

10. Transparency International. Global Corruption Barometer — Asia 2020. Berlin: Transparency International, 2020.

11. African Union / U-Report. Stolen Futures: The Impact of Corruption on Children in Africa. 2018.

12. Afrobarometer. African Insights 2024: Democracy at Risk — The People's Perspective; Round 9 materials on youth. 2024.

13. Denisova-Schmidt E., Huber M., Leontyeva E., Solovyeva A. Combining experimental evidence with machine learning to assess anti-corruption educational campaigns among Russian university students // Empirical Economics. 2021. Vol. 60(4). P. 1661–1684. DOI: 10.1007/s00181-020-01827-1.

14. Denisova-Schmidt E., Huber M., Leontyeva E. Do Anti-Corruption Educational Campaigns Reach Students? Some Evidence from Russia and Ukraine // Educational Studies Moscow. 2016. No. 1. P. 61–83. DOI: 10.17323/1814-9545-2016-1-61-83.

15. Banerjee R., Mitra A. On monetary and non-monetary interventions to combat corruption // Journal of Economic Behavior & Organization. 2018. Vol. 149. P. 332–355. DOI: 10.1016/j.jebo.2018.01.004.

16. Civic knowledge and open classroom discussion: explaining tolerance of corruption among 8th-grade students in Latin America // Educational Psychology. 2020. Vol. 40(2). P. 186–206. DOI: 10.1080/01443410.2019.1699907.

17. OECD. Integrity of Education Systems: A Methodology for Sector Assessment. Paris: OECD Publishing, 2018.

18. Resolution of the President of the Republic of Uzbekistan No. PP-228 of 21 June 2024 "On Measures to Introduce a System of Continuous Improvement of Knowledge of the Population and Civil Servants in the Field of Combating Corruption."

19. Regulation on the Procedure for Organizing Training on the Electronic Platform "Virtual Academy for Combating Corruption," registration No. 3565.

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MECHANISMS FOR IMPROVING SCHOOL PRINCIPALS' MANAGERIAL COMPETENCE BASED ON THE PRINCIPLES OF A SYSTEMATIC APPROACH

Rustamova Salomat Erkamovna

Methodologist, Department of International Education Program Coordination and Educational and Methodological Support, Nizami Ganjavi National Pedagogical University of Uzbekistan

Abstract

This article theoretically examines mechanisms for improving school principals' managerial competence based on the principles of a systems approach. It discusses the importance of strategic thinking, organizational skills, communication, teamwork, and decision-making in effective school management. The principles of integrity, interdependence, consistency, feedback, and continuous development are considered in relation to educational leadership. Based on theoretical analysis and conceptual modeling, the article proposes target-oriented, organizational, practical, and reflective mechanisms for developing principals' managerial competence. No empirical results are claimed. The proposed framework is presented as a conceptual approach that may be examined through further practical research in educational institutions.

Keywords

school principal, managerial competence, systems approach, educational management, strategic planning, managerial decision-making, teaching staff, professional development, monitoring, feedback.

MAKTAB DIREKTORLARINING BOSHQARUV KOMPETENTLIGINI TIZIMLI YONDASHUV TAMOYILLARI ASOSIDA TAKOMILLASHTIRISH MEXANIZMLARI

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Mazkur maqolada maktab direktorlarining boshqaruv kompetentligini tizimli yondashuv tamoyillari asosida takomillashtirish mexanizmlari nazariy jihatdan tahlil qilinadi. Ta’lim muassasasini samarali boshqarishda rahbarning strategik fikrlashi, tashkiliy qobiliyati, pedagogik jamoa bilan ishlash mahorati, kommunikativ kompetentligi va qaror qabul qilish ko‘nikmalarining o‘rni yoritiladi. Tizimli yondashuvning yaxlitlik, o‘zaro bog‘liqlik, izchillik, qayta aloqa va rivojlanishga yo‘naltirilganlik tamoyillari maktab boshqaruvi nuqtayi nazaridan izohlanadi. Nazariy tahlil va konseptual modellashtirish asosida direktorlarning boshqaruv kompetentligini takomillashtirishga xizmat qiluvchi maqsadli, tashkiliy, amaliy va refleksiv mexanizmlar taklif etiladi. Maqolada empirik tajriba natijalari keltirilmaydi; ishlab chiqilgan takliflar ta’lim muassasalarida keyingi amaliy tadqiqotlar orqali tekshirilishi mumkin bo‘lgan nazariy yondashuv sifatida taqdim etiladi.

Kalit so‘zlar: maktab direktori, boshqaruv kompetentligi, tizimli yondashuv, ta’lim menejmenti, strategik rejalashtirish, boshqaruv qarorlari, pedagogik jamoa, kasbiy rivojlanish, monitoring, qayta aloqa.

1. Kirish

Bugungi kunda ta’lim tizimini rivojlantirish, ta’lim sifatini oshirish va maktab faoliyatini zamonaviy talablar asosida tashkil etishda rahbarlarning kasbiy salohiyati muhim ahamiyat kasb etadi. Maktab direktori nafaqat ta’lim muassasasining kundalik faoliyatini boshqaruvchi shaxs, balki uning rivojlanish strategiyasini belgilovchi, pedagogik jamoani birlashtiruvchi, mavjud resurslardan oqilona foydalanishni tashkil etuvchi va ta’lim natijalarini yaxshilashga mas’ul rahbar hisoblanadi.

Ta’lim muassasasidagi boshqaruv jarayoni ko‘plab o‘zaro bog‘liq tarkibiy qismlardan tashkil topadi. Ular qatoriga o‘quv-tarbiya jarayonini tashkil etish, pedagog kadrlar faoliyatini muvofiqlashtirish, moddiy-texnik resurslarni boshqarish, ota-onalar va jamoatchilik bilan hamkorlik qilish, ichki nazoratni amalga oshirish hamda rivojlanish rejalarini ishlab chiqish kiradi. Ushbu vazifalarni alohida-alohida amalga oshirish maktab faoliyatining umumiy natijalarini har doim ham

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ta’minlamaydi. Shu sababli boshqaruv jarayonlarini yaxlit tizim sifatida ko‘rib chiqish zarur.

Tizimli yondashuv tashkilotni o‘zaro bog‘liq elementlar, munosabatlar va jarayonlardan iborat yaxlit tuzilma sifatida o‘rganishga asoslanadi. Ta’lim menejmentida mazkur yondashuv maktabning maqsadlari, boshqaruv faoliyati, pedagogik jamoa, resurslar va natijalar o‘rtasidagi aloqalarni hisobga olish imkonini beradi. OECD tomonidan ta’lim rahbarligi bo‘yicha olib borilgan tahlillarda ham maktab rahbarlarining faoliyati ta’lim muassasasining rivojlanishi, pedagoglarning kasbiy faoliyati va o‘quv jarayonini tashkil etish bilan uzviy bog‘liqligi ta’kidlanadi [1].

K. Leithwood va hammualliflarining tadqiqotlarida ta’lim rahbarligining o‘quvchilarning ta’lim olishi bilan bog‘liq jarayonlarga ta’siri bevosita va bilvosita mexanizmlar orqali izohlangan [2]. T. Bush esa ta’lim tashkilotlarini boshqarishda turli nazariy yondashuvlarning ahamiyatini yoritib, boshqaruv faoliyatini tashkilotning maqsadlari va ichki xususiyatlari bilan bog‘liq holda tushunish zarurligini ko‘rsatadi [3].

Shu nuqtayi nazardan, maktab direktorining boshqaruv kompetentligini rivojlantirish faqat alohida bilim va ko‘nikmalarni shakllantirish bilan cheklanmasligi lozim. Bu jarayon rahbarning kasbiy bilimlari, amaliy faoliyati, shaxsiy fazilatlari, boshqaruv qarorlarini qabul qilish usullari va o‘z faoliyatini tahlil qilish qobiliyatini o‘zaro uyg‘unlashtirishni talab qiladi.

Maqolaning maqsadi — maktab direktorlarining boshqaruv kompetentligini tizimli yondashuv tamoyillari asosida takomillashtirish mexanizmlarini nazariy jihatdan asoslash va ularni o‘zaro bog‘langan konseptual model ko‘rinishida tavsiflash.

2. Metodologiya va tadqiqot usullari

Maqolani tayyorlashda nazariy tahlil, ilmiy manbalarni o‘rganish, taqqoslash, umumlashtirish va konseptual modellashtirish usullaridan foydalanildi. Ushbu usullar

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ta’lim menejmenti, maktab rahbarligi va boshqaruv kompetentligiga oid nazariy qarashlarni tizimlashtirishga xizmat qiladi.

Tizimli yondashuv tadqiqotning metodologik asosini tashkil etadi. Mazkur yondashuv doirasida maktab direktori kompetentligi bir-biridan ajralgan ko‘nikmalar majmui sifatida emas, balki o‘zaro aloqador kasbiy sifatlar va amaliy qobiliyatlar tizimi sifatida qaraladi.

Tadqiqotning nazariy doirasida uchta asosiy masala ko‘rib chiqildi. Birinchidan, boshqaruv kompetentligining mazmuni va tarkibiy qismlari aniqlashtirildi. Ikkinchidan, tizimli yondashuv tamoyillarining maktab boshqaruvidagi o‘rni izohlandi. Uchinchidan, direktor kompetentligini rivojlantirishga xizmat qiladigan tashkiliy va amaliy mexanizmlar birlashtirildi.

Maqola nazariy-konseptual xarakterga ega. Unda maktablarda tajriba-sinov ishlari o‘tkazilgani, respondentlar so‘rovi amalga oshirilgani yoki statistik ko‘rsatkichlar hisoblangani haqida da’vo qilinmaydi. Shu sababli natijalar amaliy tajriba bilan tasdiqlangan xulosalar emas, balki ilmiy manbalar tahlili asosida shakllantirilgan nazariy takliflar hisoblanadi.

3. Natijalar

3.1. Maktab direktorining boshqaruv kompetentligi mazmuni

Boshqaruv kompetentligi — rahbarning ta’lim muassasasi oldiga qo‘yilgan maqsadlarga erishish uchun zarur bilim, ko‘nikma, tajriba va shaxsiy sifatlarni amaliy faoliyatda samarali qo‘llash qobiliyatidir. U faqat boshqaruvga oid nazariy bilimlarni bilish bilan belgilanmaydi. Rahbarning mavjud vaziyatni tahlil qilishi, muammolarni aniqlashi, muqobil yechimlarni baholashi, jamoa bilan muloqot qilishi va qabul qilingan qarorlar natijasini kuzatishi ham ushbu kompetentlikning muhim tarkibiy qismlaridir.

Maktab direktorining boshqaruv kompetentligini quyidagi tarkibiy yo‘nalishlar orqali tavsiflash mumkin.

Strategik kompetentlik. Ta’lim muassasasining rivojlanish maqsadlarini belgilash, uzoq muddatli rejalashtirish, ustuvor vazifalarni aniqlash va mavjud

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imkoniyatlarni hisobga olgan holda rivojlanish yo‘nalishlarini tanlash qobiliyatini anglatadi.

Tashkiliy kompetentlik. Vazifalarni taqsimlash, xodimlar faoliyatini muvofiqlashtirish, ish jarayonlarini rejalashtirish, vaqt va resurslardan samarali foydalanish bilan bog‘liq qobiliyatlarni qamrab oladi.

Kommunikativ kompetentlik. Pedagoglar, o‘quvchilar, ota-onalar va boshqa manfaatdor tomonlar bilan samarali muloqot qilish, nizolarni konstruktiv hal etish hamda jamoada hamkorlik muhitini shakllantirishni o‘z ichiga oladi.

Tahliliy kompetentlik. Maktab faoliyatiga oid ma’lumotlarni tahlil qilish, muammolarning sabablarini aniqlash, mavjud holatni baholash va qarorlarni dalillar asosida qabul qilish qobiliyatidir.

Innovatsion kompetentlik. Ta’lim va boshqaruv jarayonlaridagi yangiliklarni baholash, maqsadga muvofiq texnologiyalarni joriy etish va o‘zgarishlarni tashkil qilish bilan bog‘liq.

Refleksiv kompetentlik. Rahbarning o‘z faoliyatini tanqidiy tahlil qilishi, qabul qilgan qarorlarining natijalarini baholashi, kamchiliklarini aniqlashi va kasbiy rivojlanish ehtiyojlarini belgilash qobiliyatidir.

Ushbu tarkibiy qismlar bir-birini to‘ldiradi. Masalan, strategik reja samarali amalga oshishi uchun direktor tashkiliy kompetentlikka, pedagogik jamoa bilan ishlash uchun kommunikativ kompetentlikka, natijalarni baholash uchun esa tahliliy va refleksiv kompetentlikka ega bo‘lishi lozim. Demak, kompetentlikni rivojlantirishda alohida ko‘nikmalarni o‘rgatish bilan birga, ularning o‘zaro uyg‘unligini ta’minlash ham muhimdir.

3.2. Tizimli yondashuvning asosiy tamoyillari

Maktab direktorlarining boshqaruv kompetentligini takomillashtirishda tizimli yondashuv bir nechta o‘zaro bog‘liq tamoyillarga tayanadi.

Yaxlitlik tamoyili. Maktab boshqaruvi yagona jarayon sifatida qaraladi. Strategik rejalashtirish, pedagoglar faoliyatini tashkil etish, ichki nazorat va

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natijalarni baholash bir-biridan uzilgan holda emas, o‘zaro bog‘liqlikda amalga oshiriladi.

O‘zaro bog‘liqlik tamoyili. Boshqaruv tizimining har bir elementi boshqa elementlarga ta’sir ko‘rsatadi. Masalan, pedagoglar malakasini oshirishga oid qarorlar o‘quv jarayonini tashkil etish, dars sifatini tahlil qilish va maktabning rivojlanish rejalari bilan muvofiqlashtirilishi zarur.

Maqsadga yo‘naltirilganlik tamoyili. Boshqaruv faoliyatining barcha yo‘nalishlari ta’lim muassasasining belgilangan maqsadlariga xizmat qilishi lozim. Maqsadlarning aniq belgilanishi vazifalarni taqsimlash va natijalarni baholashni osonlashtiradi.

Izchillik tamoyili. Boshqaruv qarorlari ketma-ketlik va mantiqiy bog‘liqlik asosida amalga oshiriladi. Avval muammo aniqlanadi, keyin uning sabablari tahlil qilinadi, muqobil yechimlar tanlanadi, ijro tashkil etiladi va natijalar baholanadi.

Qayta aloqa tamoyili. Boshqaruv faoliyatining natijalari muntazam tahlil qilinib, keyingi qarorlarda hisobga olinadi. Pedagoglarning fikrlari, monitoring natijalari va mavjud muammolar rahbarga boshqaruv usullarini o‘zgartirish imkonini beradi.

Moslashuvchanlik va uzluksiz rivojlanish tamoyili. Maktab faoliyati o‘zgarib boruvchi sharoitlarda amalga oshiriladi. Shu sababli direktor yangi vaziyatlarga moslashishi, o‘z bilimlarini yangilashi va boshqaruv amaliyotini takomillashtirib borishi kerak.

Mazkur tamoyillar maktab direktorining kompetentligini rivojlantirish jarayonini yagona tizimga birlashtirishga xizmat qiladi. Ularning amaliy ahamiyati har bir tamoyilning boshqaruv faoliyatida qanday qo‘llanishi va boshqa tamoyillar bilan qay darajada uyg‘unlashishiga bog‘liq.

3.3. Boshqaruv kompetentligini takomillashtirish mexanizmlari

Maktab direktorining boshqaruv kompetentligini tizimli yondashuv asosida takomillashtirish uchun bir-birini to‘ldiruvchi to‘rtta mexanizmni taklif etish mumkin.

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Birinchi mexanizm — maqsadli-diagnostik mexanizm.

Ushbu mexanizm direktorning mavjud kompetentlik darajasini aniqlash va rivojlanish ehtiyojlarini belgilashga qaratiladi. Bunda o‘zini o‘zi baholash, kasbiy faoliyatni tahlil qilish, pedagogik jamoaning fikrlarini o‘rganish va boshqaruv jarayonlari natijalarini ko‘rib chiqish kabi usullardan foydalanish mumkin.

Diagnostika natijasida direktor uchun individual rivojlanish yo‘nalishlari belgilanadi. Masalan, strategik rejalashtirish, nizolarni boshqarish, ma’lumotlarni tahlil qilish yoki jamoa bilan samarali muloqot qilish ko‘nikmalarini rivojlantirish ustuvor vazifa sifatida tanlanishi mumkin.

Ikkinchi mexanizm — tashkiliy-muvofiqlashtiruvchi mexanizm.

Bu mexanizm boshqaruv faoliyatining tarkibiy qismlari o‘rtasidagi muvofiqlikni ta’minlashga xizmat qiladi. Maktabning rivojlanish rejasi, yillik ish rejasi, pedagoglar faoliyati, resurslar taqsimoti va monitoring jarayonlari yagona maqsadlar bilan bog‘lanishi lozim.

Direktor vazifalarni xodimlarning kasbiy imkoniyatlarini hisobga olgan holda taqsimlashi, mas’uliyat chegaralarini belgilashi va jamoaviy hamkorlikni rivojlantirishi zarur. Bu boshqaruv qarorlarining ijrosini yaxshiroq muvofiqlashtirishga yordam beradi.

Uchinchi mexanizm — amaliy-kasbiy rivojlantirish mexanizmi.

Mazkur mexanizm direktorning boshqaruv ko‘nikmalarini real yoki modellashtirilgan vaziyatlarda rivojlantirishga yo‘naltiriladi. Uning tarkibiga malaka oshirish, seminarlar, amaliy mashg‘ulotlar, muammoli vaziyatlarni tahlil qilish, tajriba almashish, mentorlik va kasbiy hamkorlik shakllari kiritilishi mumkin.

Bunda faqat nazariy ma’lumotlarni o‘zlashtirish bilan cheklanmasdan, amaliy vazifalarni bajarish muhimdir. Masalan, maktabning rivojlanish strategiyasini ishlab chiqish, pedagogik jamoa bilan muammoni muhokama qilish yoki cheklangan resurslar sharoitida ustuvor vazifalarni belgilash bo‘yicha mashqlar direktorning amaliy tayyorgarligini rivojlantirishga xizmat qiladi.

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To‘rtinchi mexanizm — monitoring va refleksiv-rivojlantiruvchi mexanizm.

Ushbu mexanizm amalga oshirilgan faoliyatni baholash, natijalarni rejalashtirilgan maqsadlar bilan taqqoslash va keyingi rivojlanish yo‘nalishlarini belgilashni nazarda tutadi. Monitoring jarayonida faqat bajarilgan ishlar soni emas, balki ularning maqsadga muvofiqligi, jamoaviy hamkorlikka ta’siri va aniqlangan muammolarning bartaraf etilishi ham hisobga olinishi kerak.

Refleksiya orqali direktor qabul qilgan qarorlarining kuchli va zaif tomonlarini aniqlaydi, muvaffaqiyatsizliklarning sabablarini tahlil qiladi hamda keyingi faoliyatiga tegishli o‘zgartirishlar kiritadi. Natijada kompetentlikni rivojlantirish bir martalik tadbir emas, uzluksiz jarayonga aylanadi.

Taklif etilgan mexanizmlarning o‘zaro aloqasi quyidagicha ifodalanadi: diagnostika rivojlanish ehtiyojlarini aniqlaydi; tashkiliy mexanizm faoliyatni muvofiqlashtiradi; amaliy-kasbiy mexanizm zarur ko‘nikmalarni rivojlantiradi; monitoring va refleksiya esa natijalarni baholash hamda keyingi rivojlanish vazifalarini belgilash imkonini beradi.

3.4. Takomillashtirish modelining tarkibiy tuzilishi

Tizimli yondashuv asosida boshqaruv kompetentligini takomillashtirish modelini quyidagi ketma-ket bosqichlarda tasvirlash mumkin:

1. **Maqsadni belgilash:** maktab rivojlanishining ustuvor yo‘nalishlari va direktor kompetentligiga qo‘yiladigan talablarni aniqlash.
2. **Diagnostika:** mavjud bilim, ko‘nikma va boshqaruv tajribasini tahlil qilish.
3. **Rejalashtirish:** individual rivojlanish dasturi va amalga oshiriladigan chora-tadbirlarni ishlab chiqish.
4. **Amaliy amalga oshirish:** trening, mentorlik, tajriba almashish va boshqaruv vazifalarini bajarish orqali kompetentlikni rivojlantirish.
5. **Monitoring:** amalga oshirilgan ishlar va ularning natijalarini belgilangan mezonlar asosida kuzatish.

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6. **Refleksiya va tuzatish:** natijalarni tahlil qilish, aniqlangan kamchiliklarni bartaraf etish va yangi rivojlanish vazifalarini belgilash.

Modelning muhim xususiyati shundaki, u qat’iy bir yo‘nalishda tugaydigan jarayon emas. Monitoring va refleksiya natijasida yangi ehtiyojlar aniqlanishi mumkin. Bunday vaziyatda jarayon qayta diagnostika va rejalashtirish bosqichiga qaytadi.

Taklif etilgan modelning samaradorligini kelgusidagi amaliy tadqiqotlarda direktorning strategik rejalashtirish qobiliyati, qaror qabul qilish sifati, jamoaviy hamkorlik, vazifalar ijrosini muvofiqlashtirish va o‘z faoliyatini tahlil qilish ko‘nikmalari kabi mezonlar orqali o‘rganish mumkin. Biroq ushbu mezonlarning aniq indikatorlari va baholash usullari tadqiqot sharoiti hamda ta’lim muassasasining xususiyatlariga qarab ishlab chiqilishi kerak.

4. Muhokama

Tizimli yondashuv maktab direktorining boshqaruv kompetentligini alohida ko‘nikmalar yig‘indisi sifatida emas, o‘zaro bog‘liq kasbiy qobiliyatlar tizimi sifatida ko‘rib chiqish imkonini beradi. Bu yondashuvning asosiy afzalligi shundaki, rahbarning kasbiy rivojlanishi ta’lim muassasasining real ehtiyojlari va rivojlanish maqsadlari bilan bog‘lanadi.

Leithwood va hammualliflarining ta’lim rahbarligi bo‘yicha tahlillari rahbarlikning ta’lim jarayoniga ta’sirini tushunishda maktab ichidagi jarayonlar va pedagoglar faoliyatini hisobga olish muhimligini ko‘rsatadi [2]. Ushbu qarash maqolada taklif etilgan tashkiliy-muvofiqlashtiruvchi mexanizmning nazariy ahamiyatini izohlaydi. Ya’ni direktorning kasbiy rivojlanishi faqat uning shaxsiy bilimlarini oshirish bilan cheklanmasdan, maktabdagi boshqaruv jarayonlari bilan uyg‘unlashtirilishi kerak.

Bush tomonidan yoritilgan ta’lim rahbarligi va menejment nazariyalari esa boshqaruv faoliyatini tashkilotning maqsadlari, tuzilishi va faoliyat sharoitlari bilan bog‘liq holda tahlil qilish zarurligini ko‘rsatadi [3]. Shu sababli barcha maktablar uchun mutlaqo bir xil rivojlanish dasturini qo‘llash o‘rniga, umumiy tamoyillarni

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saqlagan holda direktorlarning individual ehtiyojlari va maktablarning o‘ziga xos jihatlarini hisobga olish maqsadga muvofiq.

M. Fullan ta’lim sohasidagi o‘zgarishlarni amalga oshirishda rahbarning yetakchiligi va tashkilotning rivojlanish jarayonlariga e’tibor qaratadi [4]. Bu qarash boshqaruv kompetentligini rivojlantirishda innovatsion va refleksiv mexanizmlarning o‘rnini asoslashga yordam beradi. Yangi boshqaruv usullarini joriy etishning o‘zi yetarli emas; ularning amaliy natijalarini tahlil qilish va zarur o‘zgartirishlarni kiritish ham talab etiladi.

Shu bilan birga, taklif etilgan modelni amaliyotga tatbiq etishda ayrim shartlarga e’tibor berish lozim. Birinchidan, direktorning kasbiy rivojlanishiga ajratiladigan vaqt va resurslar aniq rejalashtirilishi kerak. Ikkinchidan, monitoring nazorat va jazolash vositasiga aylanib qolmasdan, rivojlanishga yordam beradigan mexanizm sifatida tashkil etilishi lozim. Uchinchidan, pedagogik jamoaning fikrlari xolis va konstruktiv tarzda o‘rganilishi kerak. To‘rtinchidan, direktor kompetentligini baholash mezonlari tushunarli, amaliy va kuzatiladigan bo‘lishi zarur.

Mazkur maqolaning cheklovi shundaki, unda taklif etilgan model maktablarda empirik sinovdan o‘tkazilmagan. Shu sababli uni barcha ta’lim muassasalari uchun samaradorligi to‘liq isbotlangan yechim sifatida baholash mumkin emas. Keyingi tadqiqotlarda modelning turli maktab sharoitlarida qo‘llanishi, direktorlarning kasbiy rivojlanish dinamikasi va boshqaruv natijalariga ta’siri o‘rganilishi lozim.

5. Xulosa

Maktab direktorlarining boshqaruv kompetentligini tizimli yondashuv tamoyillari asosida takomillashtirish ta’lim muassasasining faoliyatini yaxlit tashkil etish va rahbarning kasbiy salohiyatini izchil rivojlantirish uchun muhim nazariy yo‘nalish hisoblanadi.

Nazariy tahlil asosida boshqaruv kompetentligining strategik, tashkiliy, kommunikativ, tahliliy, innovatsion va refleksiv tarkibiy qismlari ajratib ko‘rsatildi. Ushbu tarkibiy qismlarning o‘zaro bog‘liqligi direktorning kasbiy rivojlanishini kompleks tarzda tashkil etish zarurligini ko‘rsatadi.

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Maqolada maqsadli-diagnostik, tashkiliy-muvofiqlashtiruvchi, amaliy-kasbiy rivojlantirish hamda monitoring va refleksiv-rivojlantiruvchi mexanizmlardan iborat konseptual model taklif etildi. Ushbu mexanizmlar rivojlanish ehtiyojlarini aniqlash, boshqaruv jarayonlarini muvofiqlashtirish, amaliy ko‘nikmalarni shakllantirish va natijalarni muntazam baholashni yagona tizimga birlashtiradi.

Modelni amaliyotga joriy etishda maktabning o‘ziga xos xususiyatlari, direktorning kasbiy ehtiyojlari, pedagogik jamoaning imkoniyatlari va mavjud resurslar hisobga olinishi lozim. Kelgusidagi empirik tadqiqotlar taklif etilgan modelning amaliy qo‘llanish imkoniyatlarini, uning samaradorligini baholash mezonlarini va rivojlantirish yo‘nalishlarini aniqlashga xizmat qilishi mumkin.

Foydalanilgan adabiyotlar

1. OECD. (2008). *Improving School Leadership, Volume 1: Policy and Practice*. OECD Publishing. https://doi.org/10.1787/9789264044715-en

2. Leithwood, K., Louis, K. S., Anderson, S., & Wahlstrom, K. (2004). *How Leadership Influences Student Learning*. The Wallace Foundation.

3. Bush, T. (2011). *Theories of Educational Leadership and Management* (4th ed.). SAGE Publications.

4. Fullan, M. (2014). *The Principal: Three Keys to Maximizing Impact*. Jossey-Bass.

5. Lidstone, J., & Seashore Louis, K. (Eds.). (1999). *Organizing for Learning: An International Perspective on the New School Improvement*. RoutledgeFalmer.

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THE EVIDENTIARY SIGNIFICANCE OF ELECTRONIC DOCUMENT METADATA IN COURT AND THE RISK OF ITS MANIPULATION

Sunnat Nurulla o‘g‘li Abdullayev

Sarbon University Second-Year Undergraduate Student Field of Study: Jurisprudence

Javoxir Zarfulla o‘g‘li Mehrojev

Sarbon University Second-Year Undergraduate Student Field of Study: Jurisprudence

Abstract

This article examines the evidentiary significance of electronic document metadata in judicial proceedings, the criteria for establishing its authenticity, and the risks associated with its manipulation. Metadata may provide information about a document’s creation and modification dates, authorship, source, revision history, and technical characteristics. However, such information may be altered, misinterpreted, or insufficient on its own to establish a document’s authenticity. Drawing on national legislation and international standards, the article examines the legal and technical aspects of evaluating electronic documents in court. As its principal scientific contribution, the article proposes the **“METAD” five-criteria assessment model for** evaluating the evidentiary reliability of metadata. The model is based on the combined examination of source reliability, data integrity, chronological consistency, verification of authorship, and consistency with other evidence.

Keywords

electronic document, metadata, digital evidence, forensic examination, electronic digital signature, data integrity, digital forensics, document forgery.

ELEKTRON HUJJAT METAMA’LUMOTLARINING SUDDA DALİLIY AHAMIYATI VA ULARNI SOXTALASHTIRISH XAVFI

Abdullayev Sunnat Nurulla o‘g‘li

Sarbon universiteti, “Yurisprudensiya” ta’lim yo‘nalishi, 2-bosqich talabasi

Mehrojev Javoxir Zarfulla o‘g‘li

Sarbon universiteti, “Yurisprudensiya” ta’lim yo‘nalishi, 2-bosqich talabasi

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Annotatsiya: Mazkur maqolada elektron hujjat metama'lumotlarining sud ishlarini ko'rish jarayonidagi daliliy ahamiyati, ularning haqiqiyligini aniqlash mezonlari va soxtalashtirish bilan bog'liq xavflar tahlil qilinadi. Metama'lumotlar hujjatning yaratilish va o'zgartirilish vaqti, muallifi, manbasi, tahrirlar tarixi hamda texnik xususiyatlari haqida axborot berishi mumkin. Biroq bunday ma'lumotlar o'zgartirilishi, noto'g'ri talqin qilinishi yoki hujjatning haqiqiyligini tasdiqlash uchun yetarli bo'lmasligi ehtimoli mavjud. Milliy qonunchilik va xalqaro standartlar asosida elektron hujjatlarni sudda baholashning huquqiy va texnik jihatlari o'rganiladi. Maqolaning ilmiy yangiligi sifatida metama'lumotlarning daliliy ishonchliligini tekshirishga qaratilgan "METAD" besh mezonli baholash modeli taklif etiladi. Ushbu model manbaning ishonchliligi, ma'lumotlar yaxlitligi, vaqt izchilligi, mualliflikning tasdiqlanishi va boshqa dalillar bilan muvofiqlikni birgalikda tekshirishga asoslanadi.

Kalit so'zlar: elektron hujjat, metama'lumotlar, raqamli dalillar, sud ekspertizasi, elektron raqamli imzo, axborot yaxlitligi, raqamli forensika, hujjatlarni soxtalashtirish.

Аннотация: В данной статье анализируется доказательственное значение метаданных электронных документов в судебном процессе, критерии установления их подлинности и риски, связанные с их фальсификацией. Метаданные могут содержать информацию о времени создания и изменения документа, его авторе, источнике происхождения, истории редактирования и технических характеристиках. Однако такие сведения могут быть изменены, неверно истолкованы или оказаться недостаточными для подтверждения подлинности документа. На основе анализа национального законодательства и международных стандартов рассматриваются правовые и технические аспекты оценки электронных документов в суде. В качестве научной новизны статьи предлагается пятифакторная модель оценки «METAD», направленная на проверку доказательственной достоверности метаданных. Данная модель основана на комплексной проверке надежности источника, целостности данных, хронологической согласованности, подтверждения авторства и соответствия другим доказательствам.

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Ключевые слова: электронный документ, метаданные, цифровые доказательства, судебная экспертиза, электронная цифровая подпись, целостность данных, цифровая криминалистика, фальсификация документов.

Kirish. Raqamli texnologiyalarning rivojlanishi natijasida shartnomalar, yozishmalar, moliyaviy hujjatlar, elektron arizalar va boshqa huquqiy ahamiyatga ega ma’lumotlarning katta qismi elektron shaklda yaratilmoqda va saqlanmoqda. Bu jarayon hujjatlarni tayyorlash, uzatish hamda qayta ishlashni tezlashtirgan bo‘lsa-da, ularning haqiqiyligini aniqlash va sudda ishonchli dalil sifatida baholash masalasini murakkablashtirmoqda. An’anaviy qog‘oz hujjatlarda imzo, muhr, qog‘ozning xususiyatlari va boshqa tashqi belgilar tekshirilishi mumkin. Elektron hujjatlarda esa uning ekranda ko‘rinadigan mazmunidan tashqari, yaratilish tarixi, texnik xususiyatlari va qayta ishlanish jarayoni haqidagi ma’lumotlar ham muhim ahamiyat kasb etadi. Bunday ma’lumotlar metama’lumotla**r** deb ataladi. Metama’lumotlar elektron hujjatning qachon yaratilgani, qaysi dasturda qayta ishlangani, muallif maydonida qanday ma’lumot ko‘rsatilgani yoki faylning qachon o‘zgartirilgani haqida ma’lumot berishi mumkin. Shu bilan birga, ushbu maydonlardagi ma’lumotlar foydalanuvchi tomonidan o‘zgartirilishi yoki turli dasturlar yordamida qayta yozilishi mumkin. Shuning uchun faylda ko‘rsatilgan sana yoki muallif nomini o‘z-o‘zidan hujjatning haqiqiyligi isboti sifatida qabul qilish to‘g‘ri emas. O‘zbekiston Respublikasi Jinoyat-protsessual kodeksiga 2024-yilda kiritilgan o‘zgartirishlar bilan elektron ma’lumotlar va raqamli dalillarga oid normalarning belgilanishi ushbu masalaning amaliy ahamiyatini yanada oshirdi [1]. Mazkur sharoitda elektron hujjatning faqat mazmunini emas, balki uning kelib chiqishi, yaxlitligi va o‘zgartirilish ehtimolini ham tekshirish zarur.

Tadqiqotning maqsadi — elektron hujjat metama’lumotlarining suddagi daliliy ahamiyatini aniqlash, ularni soxtalashtirish xavflarini tasniflash hamda elektron hujjatlarning ishonchliligini baholash bo‘yicha takomillashtirilgan mezonlarni ishlab chiqish. Tadqiqotning asosiy vazifalari elektron hujjat metama’lumotlarining mohiyatini ochib berish, ularni soxtalashtirish usullari bilan bog‘liq xavflarni

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aniqlash, milliy qonunchilik va xalqaro standartlarni tahlil qilish hamda metama'lumotlarni baholashning amaliy modelini taklif etishdan iborat.

Adabiyotlar tahlili. Elektron hujjatlarning daliliy ahamiyatini o‘rganishda, avvalo, milliy protsessual qonunchilik muhim o‘rin tutadi. O‘zbekiston Respublikasi Jinoyat-protsessual kodeksida elektron ma'lumotlar va raqamli dalillarga oid qoidalar belgilangan bo‘lib, raqamli dalil nusxasini olishda uning yaxlitligi va asl manba bilan aynanligini saqlash masalasiga e'tibor qaratiladi [1]. “Elektron hujjat aylanishi to‘g‘risida”gi Qonun elektron hujjatlarni yaratish, yuborish, qabul qilish va saqlashning huquqiy asoslarini belgilaydi [2]. “Elektron raqamli imzo to‘g‘risida”gi Qonun esa elektron imzoning huquqiy ahamiyati va undan foydalanish shartlarini tartibga soladi [3]. Fuqarolik va iqtisodiy protsessual qonunchilik sud ishlarida dalillarni taqdim etish hamda baholashning umumiy protsessual asoslarini belgilaydi [4; 5]. “Shaxsga doir ma'lumotlar to‘g‘risida”gi Qonun metama'lumotlarda shaxsni aniqlash imkonini beruvchi axborot mavjud bo‘lgan holatlarda ma'lumotlarni qonuniy qayta ishlash va himoya qilish masalasini ham dolzarb qiladi [6]. Xalqaro miqyosda BMTning Xalqaro savdo huquqi bo‘yicha komissiyasi tomonidan qabul qilingan Elektron tijorat to‘g‘risidagi namunaviy qonun elektron axborotga faqat elektron shaklda ekanligi sababli huquqiy kuch berishni rad etmaslik tamoyilini ilgari suradi [7]. Elektron imzolar to‘g‘risidagi namunaviy qonun esa elektron imzoning ishonchliligini aniqlashga doir mezonlarni yoritadi [8]. ISO 15489-1:2016 standarti hujjatlarni boshqarish, metama'lumotlar va hujjatlarning hayotiy siklini nazorat qilish tamoyillarini belgilaydi [9]. AQSh Milliy standartlar va texnologiyalar instituti tomonidan tayyorlangan NISTIR 8354 hisoboti raqamli ekspertiza usullarining ilmiy asoslari va cheklovlarini tahlil qiladi [10]. BMTning 2005-yildagi xalqaro shartnomalarda elektron kommunikatsiyalardan foydalanish to‘g‘risidagi konvensiyasi elektron xabarlarning huquqiy ahamiyati va ularni yuborish-qabul qilish bilan bog‘liq masalalarni tartibga solishga qaratilgan [11]. O‘zbekiston Respublikasi Konstitutsiyasi esa inson huquqlari, shaxsiy hayot daxlsizligi va huquqiy himoya uchun umumiy konstitutsiyaviy asos yaratadi [12]. Mavjud manbalar elektron

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hujjatlarning huquqiy maqomi, ularni boshqarish va raqamli ekspertiza masalalarini turli jihatlardan yoritadi. Biroq sudda metama'lumotlarning daliliy ishonchliligini bir nechta mezon asosida birgalikda tekshirishga ehtiyoj mavjud. Ushbu maqola aynan shu masalaga e'tibor qaratib, huquqiy va texnik tekshiruvlarni yagona baholash modeli doirasida birlashtirishni taklif qiladi.

Metodologiya. Tadqiqotda normativ-huquqiy tahlil, qiyosiy-huquqiy tahlil, tizimli yondashuv va mantiqiy umumlashtirish usullaridan foydalanildi. Normativ-huquqiy tahlil orqali O‘zbekiston qonunchiligidagi elektron hujjatlar va raqamli dalillarga tegishli qoidalar o‘rganildi. Qiyosiy-huquqiy tahlil milliy yondashuvlarni xalqaro hujjatlar va standartlar bilan solishtirishga xizmat qildi. Tizimli yondashuv elektron hujjat, uning metama'lumotlari, saqlash muhiti, elektron imzo va ekspertiza natijalari o‘rtasidagi aloqalarni o‘rganish imkonini berdi. Mantiqiy umumlashtirish asosida esa metama'lumotlarning ishonchliligini tekshirish uchun besh mezonli “METAD” modeli ishlab chiqildi. Mazkur tadqiqot normativ-huquqiy va nazariy tahlilga asoslangan. Shu sababli taklif etilayotgan model amaliy sud ishlarida statistik sinovdan o‘tkazilgan yoki samaradorligi empirik ravishda tasdiqlangan usul sifatida emas, balki keyingi amaliy tadqiqotlarda tekshirilishi lozim bo‘lgan ilmiy-amaliy taklif sifatida qaraladi.

Tahlil va natijalar. Metama'lumotlar — elektron hujjatning mazmuni, kelib chiqishi, tuzilishi, yaratilishi, o‘zgartirilishi yoki saqlanishi haqida qo‘shimcha axborot beruvchi ma'lumotlardir. Ular hujjatning mazmunidan farq qiladi, biroq mazkur mazmunning qanday sharoitda yaratilganini tushunishga yordam beradi.

Metama'lumotlarni shartli ravishda quyidagi guruhlarga ajratish mumkin:

1. **Tavsiflovchi metama'lumotlar** — hujjat nomi, muallif maydoni, mavzusi va boshqa identifikatsion ma'lumotlar.
2. **Vaqtga oid metama'lumotlar** — fayl yaratilgan, o‘zgartirilgan yoki tizimda qayd etilgan vaqt haqidagi ko‘rsatkichlar.
3. **Texnik metama'lumotlar** — fayl formati, hajmi, dasturiy muhit va boshqa texnik xususiyatlar.

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4. **Jarayon va kelib chiqishga oid metama'lumotlar** — hujjatning uzatilishi, saqlanishi, versiyalari va qayta ishlanishi haqida qaydlar.

5. **Yaxlitlikni tekshirishga xizmat qiluvchi ma'lumotlar** — xesh qiymatlari, elektron imzo va tekshiruv natijalari bilan bog‘liq axborot.

Ushbu ma'lumotlar sud uchun bir nechta savolga javob topishda yordam berishi mumkin: hujjat qayerdan kelib chiqqan, uning mazmuni qachon shakllangan, fayl keyinchalik o‘zgartirilganmi va taqdim etilgan nusxa dastlabki elektron manbaga mos keladimi? Biroq metama'lumotlar bilan hujjatning haqiqiyligi o‘rtasida mutlaq teng-lik mavjud emas. Masalan, Microsoft Word faylining muallif maydonida muayyan shaxsning ismi ko‘rsatilgani faylni aynan shu shaxs yaratganini uzil-kesil isbotlamay-di. Muallif maydoni avvaldan sozlangan bo‘lishi, boshqa foydalanuvchi tomonidan o‘zgartirilishi yoki hujjat shablonidan meros bo‘lib qolishi mumkin. Xuddi shuning-dek, faylning “oxirgi o‘zgartirilgan” sanasi uning mazmuni aynan shu vaqtda huquqiy jihatdan o‘zgartirilganini har doim ham anglatmaydi. Faylni boshqa qurilmaga ko‘chirish, qayta saqlash yoki formatini almashtirish ayrim vaqt ko‘rsatkichlariga ta'sir qilishi mumkin. Demak, metama'lumotlarning daliliy ahamiyati ularning mavjudligigagina emas, balki qanday usulda olingani, saqlangani, tekshirilgani va boshqa dalillar bilan qanchalik mos kelishiga bog‘liq. Sud uchun asosiy vazifa metama'lumotni shunchaki o‘qish emas, balki uning ishonchliligini aniqlashdir.

Elektron hujjatlarning o‘ziga xos xususiyati shundaki, ularning ayrim texnik atributlari maxsus dasturlar yoki oddiy fayl tahrirlash vositalari orqali o‘zgartirilishi mumkin. Shu sababli elektron hujjatning tashqi ko‘rinishi asl nusxaga o‘xshash bo‘lishi uning texnik jihatdan o‘zgartirilmaganini kafolatlamaydi.

Metama'lumotlarni soxtalashtirish yoki noto‘g‘ri talqin qilish xavfini quyidagi asosiy ko‘rinishlarda ifodalash mumkin.

Birinchidan, vaqt ko‘rsatkichlarini o‘zgartirish. Faylning yaratilgan yoki tahrirlangan sanasi o‘zgartirilib, hujjat muayyan voqeadan oldin tayyorlangan degan noto‘g‘ri tasavvur yuzaga keltirilishi mumkin. Bunday holat shartnoma, topshiriq, hisobot yoki yozishmaning qachon mavjud bo‘lganini aniqlashga ta'sir ko‘rsatadi.

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Ikkinchidan, mualliflik ma’lumotlarini soxtalashtirish**.** Elektron hujjatning muallif maydoniga boshqa shaxsning ismini kiritish yoki mavjud ma’lumotlarni o‘chirish orqali hujjatning kelib chiqishi noto‘g‘ri ko‘rsatilishi mumkin. Bunda muallif maydoni shaxsning haqiqiy harakatini tasdiqlovchi mustaqil dalil sifatida qabul qilinmasligi kerak.

Uchinchidan, hujjat mazmunini o‘zgartirib, tashqi belgilarni saqlab qolish. Hujjat matniga o‘zgartirish kiritilib, fayl nomi, ko‘rinishi yoki ayrim metama’lumotlari saqlab qolinishi mumkin. Agar faqat hujjatning ekrandagi ko‘rinishi tekshirilsa, bunday o‘zgarishlar aniqlanmasligi ehtimoli bor.

To‘rtinchidan, metama’lumotlarning yo‘qolishi yoki buzilishi. Faylni boshqa formatga o‘tkazish, elektron pochta orqali yuborish yoki turli dasturlarda qayta saqlash natijasida ayrim metama’lumotlar yo‘qolishi yoki yangilanishi mumkin. Bunday holat har doim ham qasddan soxtalashtirishni anglatmaydi. Shu bois ekspert texnik o‘zgarish bilan ataylab amalga oshirilgan manipulyatsiyani farqlashi lozim.

Beshinchidan, dalil nusxasining ishonchliligini buzish. Sudga taqdim etilgan faylning qayerdan olingani, kim tomonidan ko‘chirilgani va tekshiruvgacha qanday saqlangani hujjatlashtirilmasa, keyinchalik uning asl nusxaga mosligini aniqlash qiyinlashadi. Ushbu xavflar sud jarayonida uchta asosiy muammoni keltirib chiqarishi mumkin: dalilning kelib chiqishiga shubha tug‘ilishi, hujjat mazmunining ishonchliligi pasayishi va ish uchun muhim bo‘lgan vaqt ketma-ketligi noto‘g‘ri talqin qilinishi. Shu bilan birga, metama’lumotlarning yo‘qligi yoki ular orasidagi nomuvofiqlik hujjat soxtalashtirilganini avtomatik ravishda isbotlamaydi. Buning sababi texnik jarayon, noto‘g‘ri sozlama yoki ma’lumotlarni ko‘chirish bo‘lishi mumkin. Huquqiy xulosa chiqarish uchun boshqa dalillar va zarur hollarda mutaxassis yoki ekspert tekshiruvi talab etiladi.

Elektron hujjatlarning suddagi maqomi faqat texnik tekshiruv bilan belgilanmaydi. Ularning tegishli protsessual tartibda taqdim etilishi, olinishi, tekshirilishi va baholanishi ham muhimdir. O‘zbekiston Respublikasi Jinoyat-protsessual kodeksida elektron ma’lumotlar va raqamli dalillarga doir qoidalar

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nazarda tutilgan. Xususan, raqamli dalil nusxasini olishda uning yaxlitligi va asl manba bilan aynanligini saqlash talabi metama'lumotlarni tekshirish uchun ham muhim protsessual ahamiyatga ega [1]. Ushbu qoida raqamli dalil bilan ishlashda faqat faylning mazmunini emas, balki uning dastlabki manbasini va nusxa olish jarayonini ham hujjatlashtirish zarurligini ko‘rsatadi. “Elektron hujjat aylanishi to‘g‘risida”gi Qonun elektron hujjatlarning muomaladagi huquqiy asoslarini belgilaydi [2]. “Elektron raqamli imzo to‘g‘risida”gi Qonun esa elektron imzoning haqiqiyligini tasdiqlash va undan foydalanish shartlarini tartibga soladi [3]. Bunda muhim jihat shuki, elektron raqamli imzo hujjatning muayyan imzo kaliti bilan bog‘liqligini va belgilangan tekshiruv shartlarida uning yaxlitligini aniqlashga yordam beradi. Biroq u hujjatdagi har bir faktning haqiqatga mosligini o‘z-o‘zidan kafolatlamaydi. Fuqarolik protsessual qonunchilik va iqtisodiy protsessual qonunchilik doirasida ham hujjatlarni taqdim etish, tekshirish va dalillarga huquqiy baho berish masalalari ahamiyatlidir [4; 5]. Shu sababli metama'lumotlarni texnik jihatdan tahlil qilish natijasi protsessual talablardan ajratilgan holda baholanmasligi kerak. Shaxsga doir ma'lumotlarni o‘z ichiga olgan metama'lumotlarni yig‘ish va tekshirishda esa tegishli qonunchilik talablariga rioya etish zarur [6]. Masalan, elektron hujjatning muallifi, foydalanuvchi identifikatori yoki tizimdagi harakatlar tarixi shaxsni aniqlash imkonini berishi mumkin. Bunday ma'lumotlarni olish va ulardan foydalanish qonuniy asosga ega bo‘lishi lozim. Xalqaro huquqiy yondashuvlarda elektron shakldagi ma'lumotlarning huquqiy ahamiyati ularning faqat elektron shaklda ekanligi sababli inkor etilmasligi tamoyili qo‘llab-quvvatlanadi [7]. Biroq elektron shaklni tan olish bilan dalilning ishonchliligini tasdiqlash bir xil masala emas. Birinchisi hujjatning elektron shaklda mavjud bo‘lishiga huquqiy munosabatni, ikkinchisi esa aynan taqdim etilgan hujjatning kelib chiqishi va yaxlitligini tekshirishni anglatadi. Elektron imzolar to‘g‘risidagi xalqaro namunaviy qonun ham elektron imzoning ishonchliligini baholashda muayyan shartlar va usullarning ahamiyatini ko‘rsatadi [8]. ISO 15489-1:2016 standarti hujjatlarni yaratish, qayd etish, boshqarish va saqlash jarayonlarida metama'lumotlar hamda

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nazorat mexanizmlarining o‘rnini yoritadi [9]. NISTIR 8354 hisoboti esa raqamli ekspertiza usullari ilmiy asoslangan bo‘lishi kerakligini, shu bilan birga, texnologiyalar va dasturiy muhit o‘zgarishi raqamli izlarning talqiniga ta’sir qilishi mumkinligini ta’kidlaydi [10]. Demak, samarali huquqiy yondashuv uchta tarkibiy qismni birlashtirishi kerak: protsessual qonuniylik, texnik ishonchlilik va dalillarni o‘zaro solishtirish. Ushbu qismlardan biri yetarli bo‘lmasa, metama’lumotlarga asoslangan xulosaning ishonchliligi pasayishi mumkin.

Tadqiqotning asosiy ilmiy yangiligi elektron hujjat metama’lumotlarining suddagi ishonchliligini alohida texnik belgilar asosida emas, balki o‘zaro bog‘langan besh mezon orqali tekshirishga qaratilgan “METAD” modelini taklif etishdan iborat. **Modelning nomi elektron hujjat metama’lumotlarini tekshirishda muhim bo‘lgan besh mezonning mazmunini ifodalaydi:**

M—Manbaning ishonchliligi. Hujjat qaysi qurilma, tizim yoki axborot manbasidan olingani aniqlanadi. Faylni kim taqdim etgani, u dastlab qayerda saqlangani va uning kelib chiqishini tasdiqlovchi qaydlar mavjudligi tekshiriladi. Manba noma’lum bo‘lsa, hujjatning kelib chiqishi haqida qat’iy xulosa chiqarish qiyinlashadi.

E — Elektron ma’lumotlar yaxlitligi. Hujjatning asl nusxasi va tekshiruv uchun olingan nusxasi o‘rtasidagi muvofiqlik baholanadi. Bunda xesh qiymatlaridan foydalanish mumkin. Xesh qiymatlari fayl mazmunidagi o‘zgarishlarni aniqlashga yordam beradi, biroq faqat xesh qiymatining mavjudligi hujjat dastlabdan haqiqiy bo‘lganini isbotlamaydi. Uning ishonchliligi qiymat qachon, qayerda va qanday sharoitda hisoblanganiga ham bog‘liq.

T — Vaqt izchilligi. Fayldagi vaqt ko‘rsatkichlari boshqa mustaqil manbalar bilan solishtiriladi. Masalan, elektron pochta serveri qaydlari, hujjat aylanishi tizimidagi ro‘yxatga olish vaqti, elektron imzoni tekshirish ma’lumotlari yoki boshqa tegishli qaydlar bilan muvofiqlik o‘rganiladi. Bunda qurilma soati noto‘g‘ri sozlangan bo‘lishi yoki vaqt zonasi farqi yuzaga kelishi mumkinligi ham hisobga olinadi.

A — Avtorlik va autentiklikni tasdiqlash. Hujjatning mualliflik maydoni, elektron raqamli imzo, foydalanuvchi identifikatsiyasi va boshqa mavjud ma’lumotlar

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tekshiriladi. Muallif maydonidagi ismning o‘zi yetarli bo‘lmaydi; imkon qadar hujjatning yaratilishi yoki yuborilishini tasdiqlovchi mustaqil belgilar talab etiladi.

D — Dalillar bilan muvofiqlik. Metama’lumotlar boshqa dalillar bilan solishtiriladi. Masalan, hujjatda ko‘rsatilgan sana elektron yozishmalar, shartnoma ro‘yxatga olingan vaqt yoki tizim qaydlari bilan mos keladimi, degan savol tekshiriladi. Nomuvofiqlik aniqlansa, uning texnik sababi va huquqiy ahamiyati alohida o‘rganiladi.

“METAD” modelining mohiyati barcha besh mezonning mavjudligini mexanik tarzda sanashdan iborat emas. Asosiy maqsad — metama’lumotlarning ishonchliligini yagona belgi asosida baholashdan voz kechib, ularning kelib chiqishi, yaxlitligi, vaqti, muallifligi va boshqa dalillar bilan aloqasini birgalikda tekshirishdir.

Modelni qo‘llash jarayonini quyidagi ketma-ketlikda tashkil etish taklif qilinadi:

1. Elektron hujjat va uning dastlabki manbasini aniqlash.
2. Asl faylni saqlab qolish va tekshiruv nusxasini hujjatlashtirilgan tartibda olish.
3. Metama’lumotlarni qayd etish va yaxlitlikni tekshirish.
4. Vaqt hamda mualliflik ko‘rsatkichlarini mustaqil manbalar bilan solishtirish.
5. Olingan natijalarni boshqa dalillar bilan taqqoslab, aniqlangan cheklovlarni qayd etish.

Ushbu yondashuv elektron hujjatning texnik xususiyatlarini uning protsessual maqomidan ajratib yubormaslikka yordam beradi. Masalan, barcha metama’lumotlari saqlangan fayl ham noqonuniy yo‘l bilan olingan bo‘lishi mumkin. Aksincha, ayrim metama’lumotlari yo‘qolgan fayl boshqa ishonchli dalillar bilan tasdiqlanishi ehtimoldan xoli emas. Shuning uchun model avtomatik ravishda “haqiqiy” yoki “soxta” degan xulosa bermaydi, balki tekshiruvning izchil yo‘nalishini belgilaydi. Modelning ilmiy-amaliy ahamiyati elektron hujjatlarni tekshirishda texnik, protsessual va dalillararo muvofiqlik mezonlarini birlashtirishidadir. Uning amaliy samaradorligini aniqlash uchun kelgusida turli formatdagi elektron hujjatlar, ekspertiza xulosalari va sud amaliyoti misolida empirik sinovlar o‘tkazish lozim. “METAD” modelining amaliyotga tatbiq etilishi faqat ekspertning texnik

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imkoniyatlariga emas, balki elektron dalillar bilan ishlashning tashkiliy va protsessual tartiblariga ham bog‘liq. Shu sababli quyidagi takliflarni ilgari surish mumkin.

Birinchidan, elektron dalillarni qabul qilish va ko‘chirish tartibini hujjatlashtirish zarur. Dalilning qayerdan olingani, uni kim ko‘chirganligi, qaysi vositalardan foydalanilgani va qanday saqlangani qayd etilishi kerak. Bu ma’lumotlar keyinchalik dalilning yaxlitligi va kelib chiqishini tekshirishga yordam beradi.

Ikkinchidan, asl elektron manbani saqlashga ustuvor ahamiyat berish lozim. Imkon qadar tekshiruv asl fayl yoki tegishli elektron tashuvchi asosida amalga oshirilishi, tahlil uchun esa alohida nusxa yaratilishi kerak. Nusxa olish jarayonida xesh qiymatlarini qayd etish va ularni keyingi tekshiruvlarda solishtirish maqsadga muvofiq.

Uchinchidan, metama’lumotlarni baholashda mutaxassis ishtirokini ta’minlash kerak. Sud ishining xususiyatiga qarab, axborot texnologiyalari yoki raqamli ekspertiza bo‘yicha bilimga ega mutaxassis jalb etilishi mumkin. Ekspert texnik aniqlangan holatlarni bayon qilishi, ularning chegaralarini ko‘rsatishi va huquqiy masalalarni hal qilish sud vakolatiga tegishli ekanini hisobga olishi lozim.

To‘rtinchidan, elektron hujjatning vaqt va mualliflik belgilarini mustaqil manbalar bilan solishtirish amaliyotini kuchaytirish zarur. Hujjatdagi sana yoki ismni yakka holda qabul qilish o‘rniga, elektron imzo ma’lumotlari, tizim jurnallari, server qaydlari va boshqa tegishli dalillar bilan taqqoslash kerak.

Beshinchidan, sudlar va huquqni muhofaza qiluvchi organlar uchun uslubiy tavsiyalar ishlab chiqish lozim. Tavsiyalarda metama’lumotlarni olish, saqlash, tekshirish va ekspert xulosasini talqin qilish bosqichlari izchil bayon etilishi mumkin. Bunday hujjatlar turli mutaxassislar tomonidan o‘tkaziladigan tekshiruvlar o‘rtasidagi yondashuv farqlarini kamaytirishga xizmat qiladi. Mazkur takliflarning umumiy maqsadi elektron hujjatni faqat ko‘rinadigan mazmuni asosida emas, balki uning kelib chiqishi va saqlanish tarixi bilan birgalikda baholashdir. Bunda texnik vositalar sudning mustaqil baholash vakolatini almashtirmaydi, balki dalillarni chuqurroq va asosliroq o‘rganishga yordam beradi.

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Xulosa. Elektron hujjat metama'lumotlari raqamli dalillarning kelib chiqishi, yaratilish vaqti, mualliflik xususiyatlari va o‘zgarish tarixini aniqlashda muhim axborot manbai hisoblanadi. Biroq ularning daliliy ahamiyati avtomatik ravishda yuzaga kelmaydi. Metama'lumotlar o‘zgartirilishi, texnik jarayonlar sababli yo‘qolishi yoki noto‘g‘ri talqin qilinishi mumkin. Shu sababli ularni boshqa dalillardan ajratilgan holda baholash huquqiy xatolarga olib kelishi ehtimoli mavjud.

Tadqiqot natijasida quyidagi xulosalarga kelindi:

Birinchidan, elektron hujjatning ekrandagi ko‘rinishi yoki alohida metama'-lumot maydoni uning haqiqiyligini to‘liq tasdiqlamaydi. Ishonchli xulosa chiqarish uchun hujjatning kelib chiqishi, yaxlitligi va o‘zgartirilish tarixi tekshirilishi zarur.

Ikkinchidan, metama'lumotlarni soxtalashtirish xavfi faqat ataylab qilingan o‘zgartirishlar bilan cheklanmaydi. Fayllarni ko‘chirish, formatini almashtirish, dasturiy vositalarda qayta saqlash yoki noto‘g‘ri vaqt sozlamalari ham ayrim ko‘rsatkichlarning o‘zgarishiga sabab bo‘lishi mumkin. Shu bois texnik nomuvofiqlikni qasddan soxtalashtirish bilan tenglashtirish mumkin emas.

Uchinchidan, milliy qonunchilik, xalqaro huquqiy hujjatlar va raqamli ekspertiza standartlari elektron hujjatlarni baholashda huquqiy hamda texnik yondashuvlarni uyg‘unlashtirish zarurligini ko‘rsatadi. Elektron imzo, xesh qiymati yoki tizim qaydlaridan foydalanish foydali bo‘lsa-da, ularning har biri tegishli sharoitda va boshqa dalillar bilan birgalikda baholanishi kerak.

To‘rtinchidan, maqolada taklif etilgan “METAD” modeli elektron hujjat meta-ma'lumotlarining ishonchliligini manba, yaxlitlik, vaqt izchilligi, autentiklik va bosh-qa dalillar bilan muvofiqlik mezonlari asosida tizimli tekshirishni nazarda tutadi. Mo-delning yangiligi ushbu mezonlarni yagona amaliy yondashuv doirasida birlashtirish taklifida namoyon bo‘ladi. Shu bilan birga, modelning samaradorligi keyingi empirik va amaliy tadqiqotlar orqali tekshirilishi lozim. Umuman olganda, elektron hujjatning suddagi ishonchliligi uning tashqi ko‘rinishi bilan emas, balki kelib chiqishi, yaxlitli-gi, texnik xususiyatlari va boshqa dalillar bilan tasdiqlanish darajasi bilan belgilanadi. Metama'lumotlarni tizimli tekshirish raqamli dalillarni baholash sifatini oshirish va

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sud qarorlarining daliliy asoslanganligini mustahkamlashga xizmat qilishi mumkin.

FOYDALANILGAN ADABIYOTLAR RO‘YXATI

1. O‘zbekiston Respublikasi. Jinoyat-protsessual kodeksi. 1994-yil 22-sentabr. Elektron ma’lumotlar va raqamli dalillarga oid 204¹ va 204²-moddalar 2024-yil 21-noyabrdagi O‘RQ-1003-son Qonun bilan kiritilgan.

2. O‘zbekiston Respublikasi. “Elektron hujjat aylanishi to‘g‘risida”gi Qonun. 2004-yil 29-aprel, 611-II-son.

3. O‘zbekiston Respublikasi. “Elektron raqamli imzo to‘g‘risida”gi Qonun. 2022-yil 12-oktabr, O‘RQ-793-son.

4. O‘zbekiston Respublikasi. Fuqarolik protsessual kodeksi. 2018-yil 22-yanvar, O‘RQ-460-son.

5. O‘zbekiston Respublikasi. Iqtisodiy protsessual kodeksi. 2018-yil 24-yanvar, O‘RQ-461-son.

6. O‘zbekiston Respublikasi. “Shaxsga doir ma’lumotlar to‘g‘risida”gi Qonun. 2019-yil 2-iyul, O‘RQ-547-son.

7. United Nations Commission on International Trade Law (UNCITRAL). Model Law on Electronic Commerce. United Nations, 1996.

8. United Nations Commission on International Trade Law (UNCITRAL). Model Law on Electronic Signatures. United Nations, 2001.

9. International Organization for Standardization (ISO). ISO 15489-1:2016: Information and Documentation — Records Management — Part 1: Concepts and Principles. Geneva: ISO, 2016.

10. Lyle, J., Guttman, B., Butler, J., Sauerwein, K., Reed, C., & Lloyd, C. Digital Investigation Techniques: A NIST Scientific Foundation Review. NISTIR 8354. National Institute of Standards and Technology, 2022.

11. United Nations. United Nations Convention on the Use of Electronic Communications in International Contracts. New York, 2005.

12. O‘zbekiston Respublikasi. Konstitutsiyasi. Yangi tahrir. 2023-yil 30-aprel kuni referendum orqali qabul qilingan.

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EFFECT OF THE DRYING PROCESS ON BIOLOGICALLY ACTIVE SUBSTANCES IN STRAWBERRY COMPOSITION

TURGUNOV AZIZBEK NORMAT UGLI

Tashkent State Agrarian University, doctoral student

https://orcid.org/0009-0001-9979-8205

turgunovazizbek@tdau.uz

UMIDOV SHAVKAT ERGASHEVICH

Tashkent State Agrarian University, Associate Professor

https://orcid.org/0009-0008-5344-0014

umidov_shavkat@mail.ru

Abstract

This article analyses, on the basis of international research, the effect of drying on the vitamin C, anthocyanin and phenolic compound content and the antioxidant activity of strawberry (Fragaria × ananassa) fruits. Hot-air, vacuum-microwave and freeze-drying were compared in terms of the retention of bioactive compounds, the effect of temperature and drying time, and first-order degradation kinetics. The analysis showed that freeze-drying retains vitamin C, anthocyanins and phenolics best, whereas hot-air drying showed the lowest retention for most indicators. In one study, conventional convective and vacuum-microwave drying reduced vitamin C to about 40% of its initial value, while improved process conditions raised its retention to about 65%. Drying strawberries at temperatures below 65 °C and using microwave-assisted or combined methods is recommended.

Keywords

strawberry, drying, bioactive compounds, vitamin C, anthocyanins, phenolic compounds, antioxidant activity, freeze-drying, vacuum-microwave drying.

QURITISH JARAYONINING QULUPNAY TARKIBIDAGI BIOLOGIK FAOL MODDALARGA TA’SIRI

TURG‘UNOV AZIZBEK NORMAT O‘G‘LI

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https://orcid.org/0009-0001-9979-8205

turgunovazizbek@tdau.uz

UMIDOV SHAVKAT ERGASHEVICH

Toshkent davlat agrar universiteti dotsenti

https://orcid.org/0009-0008-5344-0014

umidov_shavkat@mail.ru

Annotatsiya. Maqolada qulupnay (Fragaria × ananassa) mevalarini quritish jarayonining C vitamini, antotsianlar, fenol birikmalari va antioksidant faollikka ta’siri xalqaro ilmiy tadqiqotlar asosida tahlil qilingan. Issiq havo bilan, vakuum-mikroto‘lqinli va muzlatib quritish usullarining bioaktiv moddalarni saqlab qolish darajasi, harorat va quritish davomiyligining ta’siri hamda birinchi tartibli parchalanish kinetikasi taqqoslandi. Tahlil natijalariga ko‘ra, muzlatib quritish C vitamini, antotsianlar va fenollarni eng yaxshi saqlaydi, issiq havo bilan quritishda esa saqlanish ko‘pchilik ko‘rsatkichlar bo‘yicha eng past bo‘ladi. Bir tadqiqotda an’anaviy konvektiv va vakuum-mikroto‘lqinli quritishda C vitamini dastlabki miqdorning taxminan 40 foizigacha kamaygan, jarayon sharoitlarini yaxshilash bilan esa uning saqlanishi taxminan 65 foizgacha oshgan. Maqolada qulupnayni quritishda 65 °C dan past haroratni tanlash hamda mikroto‘lqinli va birlashtirilgan usullardan foydalanish tavsiya etiladi.

Kalit so‘zlar: qulupnay, quritish, biologik faol moddalar, C vitamini, antotsianlar, fenol birikmalari, antioksidant faollik, muzlatib quritish, vakuum-mikroto‘lqinli quritish.

ВЛИЯНИЕ ПРОЦЕССА СУШКИ НА БИОЛОГИЧЕСКИ АКТИВНЫЕ ВЕЩЕСТВА В СОСТАВЕ ЗЕМЛЯНИКИ

ТУРГУНОВ АЗИЗБЕК НОРМАТ УГЛИ

Докторант Ташкентского государственного аграрного университета

ORCID: https://orcid.org/0009-0001-9979-8205

Электронная почта: turgunovazizbek@tdau.uz

УМИДОВ ШАВКАТ ЭРГАШЕВИЧ

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Доцент Ташкентского государственного аграрного университета
ORCID: https://orcid.org/0009-0008-5344-0014
Электронная почта: umidov_shavkat@mail.ru

Аннотация. В статье на основе международных научных исследований проанализировано влияние процесса сушки плодов клубники (Fragaria × ananassa) на содержание витамина С, антоцианов, фенольных соединений и антиоксидантную активность. Сопоставлены конвективная, вакуумно-микроволновая и сублимационная сушка по степени сохранения биологически активных веществ, влияние температуры и продолжительности сушки, а также кинетика деградации первого порядка. Анализ показал, что сублимационная сушка лучше всего сохраняет витамин С, антоцианы и фенольные соединения, тогда как после конвективной сушки их сохранность по большинству показателей наименьшая. В одном из исследований при конвективной и вакуумно-микроволновой сушке содержание витамина С снижалось примерно до 40 % от исходного, а при улучшении условий процесса его сохранность возрастала примерно до 65 %. Рекомендуется выбирать для сушки клубники температуру ниже 65 °С, а также применять микроволновые и комбинированные способы.

Ключевые слова: клубника, сушка, биологически активные вещества, витамин С, антоцианы, фенольные соединения, антиоксидантная активность, сублимационная сушка, вакуумно-микроволновая сушка.

KIRISH. Qulupnay (Fragaria × ananassa Duch.) C vitamini, antotsianlar, ellag kislotasi va boshqa fenol birikmalariga boy meva sifatida tanilgan [5]. Meva tarkibida suv miqdori yuqori bo‘lgani uchun u terib olingandan keyin tez buziladi, shu sababli uni qayta ishlash, xususan quritish, saqlash muddatini uzaytirishning keng tarqalgan usullaridan biri hisoblanadi.

Quritish mahsulotning massasi va hajmini kamaytiradi, tashish va saqlashni osonlashtiradi, mikroorganizmlar rivojlanishini cheklaydi. Biroq bu jarayon mevaning kimyoviy tarkibiga, ayniqsa issiqlik, kislorod va fermentlar ta’siriga sezgir

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moddalarga bevosita ta’sir ko‘rsatadi. Tadqiqotlarda quritish jarayonida antotsianlar, flavanollar va askorbin kislota parchalanishi hamda antioksidant faollikning sezilarli pasayishi qayd etilgan [6].

Bioaktiv moddalarning saqlanish darajasi mahsulotga va quritish usuliga bog‘liq bo‘lib, bir xil qoida barcha meva va usullar uchun o‘rinli emas [1]. Turli mualliflar nav, harorat, quritish davomiyligi va tahlil usullari jihatidan farqlanuvchi sharoitlarda ish olib borgani sababli, ularning natijalarini umumlashtirish va solishtirish zarurati tug‘iladi.

Tadqiqotning maqsadi qulupnayni quritish usullari va rejimlarining C vitamini, antotsianlar, fenol birikmalari va antioksidant faollikka ta’sirini xalqaro ilmiy tadqiqotlar asosida tahlil qilish hamda amaliy tavsiyalar ishlab chiqishdan iborat. Maqsadga erishish uchun quyidagi vazifalar belgilandi: issiq havo, vakuum-mikroto‘lqinli va muzlatib quritish usullarida bioaktiv moddalarning saqlanishini taqqoslash; harorat va quritish davomiyligining ta’sirini baholash; parchalanish kinetikasini ko‘rib chiqish.

MATERIAL VA USULLAR. Maqola tahliliy sharh xarakterida bo‘lib, qulupnay mevalarini quritishning biologik faol moddalarga ta’siriga bag‘ishlangan xalqaro ilmiy nashrlar tahliliga asoslangan. Tahlil uchun quyidagi mezonlarga javob beradigan ishlar tanlandi: (a) tadqiqot obyekti qulupnay mevasi yoki uning pyuresi; (b) kamida bitta quritish usuli (issiq havo, vakuum-mikroto‘lqinli, muzlatib quritish yoki boshqa) o‘rganilgan; (c) C vitamini, antotsianlar, fenol birikmalari yoki antioksidant faollik miqdoriy aniqlangan. Tanlangan ishlarda quritish usuli, harorat, davomiylik, tahlil usuli va natijalar solishtirildi; tahlil qilingan nashrlar ro‘yxati maqola oxirida keltirilgan.

Bioaktiv moddalarning saqlanish darajasi quyidagi nisbat bilan ifodalanadi:

$$R = (C_t / C_0) \times 100\ \%, \quad (1)$$

bu yerda R – saqlanish darajasi (%), C_0 – quritishdan oldingi (xom meva) miqdori, C_t – quritilgan mahsulotdagi miqdor. Issiqlik ta’sirida parchalanish kinetikasi ko‘pincha birinchi tartibli reaksiya tenglamasi bilan ta’riflanadi:

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$C_t = C_0 \cdot e^{-kt}$, (2)

bu yerda k – parchalanish tezligi doimiysi, t – vaqt. Tezlik doimiysining haroratga bog‘liqligi Arrhenius tenglamasi bilan ifodalanadi:

$k = A \cdot e^{-E_{-}\{a}/(RT)\}$, (3)

bu yerda A – oldeksponensial ko‘paytuvchi, E_a – faollanish energiyasi, R – universal gaz doimiysi, T – absolyut harorat. Quritilgan va xom mevani solishtirishda miqdorlar bir xil asosda (quruq modda yoki xom massa) keltirilishi zarur.

NATIJALAR VA ULARNING TAHLILI

Quritish usullarining umumiy taqqoslanishi. Nemzer va hammualliflar [1] ko‘k rezavor, olcha, qulupnay va klyukvani issiq havo bilan quritish, muzlatib quritish hamda Refractance Window usulida quritib, antotsianlar, fenollar, flavonoidlar, C va B guruhi vitaminlari hamda antioksidant sig‘im (ORAC) saqlanishini solishtirgan. Mualliflar sifat ko‘rsatkichlarining saqlanishi mahsulotga va quritish usuliga xos ekanini aniqlagan: muzlatib quritilgan namunalarda C vitamini, ORAC, antotsianlar va fenollar issiq havo va Refractance Window usullariga qaraganda yaxshiroq saqlangan. Refractance Window usulida ORAC, antotsianlar va fenollar saqlanishi muzlatib quritishdan past bo‘lgan, lekin umumiy B vitamini yuqoriroq saqlangan. Issiq havo bilan quritilgan mevalarda esa ko‘pchilik sifat ko‘rsatkichlari sezilarli darajada past bo‘lgan [1].

Alonzo-Macías va hammualliflar [2] Camarosa naviga mansub qulupnayni issiq havo bilan, muzlatib va “swell-drying” (issiq havo bilan birga bosimni keskin tushirish, DIC) usullarida quritganda umumiy fenollar miqdoridagi farq katta bo‘lmaganini, antotsianlar va flavonoidlar miqdorida esa katta o‘zgarishlar kuzatilganini ko‘rsatgan. Swell-drying namunalarida antioksidant faollik bilan antotsianlar miqdori o‘rtasida kuchli korrelyatsiya aniqlangan; DIC ning eng maqbul rejimi 0,35 MPa bosimda 10 s ushlash bo‘lgan [2].

Issiq havo bilan quritishda haroratning ta’siri. Méndez-Lagunas va hammualliflar [3] qulupnayni 50 va 60 °C haroratda (havo tezligi 1,5 m/s) quritishda antioksidant faollik, antotsianlar va umumiy fenollar kinetikasini o‘rgangan. Umumiy

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fenollar va antioksidant faollik kinetikasida boshlang‘ich va yakuniy parchalanish davrlari hamda ular orasida o‘zgarmas (plato) davr kuzatilgan; mualliflar buni fermentlar faolligining to‘xtashi bilan izohlagan. Antioksidant birikmalarning issiqlik ta’sirida parchalanishi birinchi tartibli reaksiya kinetikasiga bo‘ysungan va tezlik doimiylari (k) hisoblangan [3]. Ağçam [5] qulupnayni 45, 55 va 65 °C haroratlarda quritib, rang ko‘rsatkichlari (L, a, b, C, Hue, ΔE) harorat ta’sirida sezilarli o‘zgarishini qayd etgan. Namunalarda eng ko‘p miqdorda pelargonidin-3-glyukozid (80,26 mg/100 g quruq modda), undan keyin pelargonidin-3-rutinozid (7,72 mg/100 g) va sianidin-3-glyukozid (5,08 mg/100 g) aniqlangan; quritilgan namunalarda ellag kislotasi miqdori 23,11–37,04 mg/100 g quruq modda oralig‘ida bo‘lgan. Muallif bioaktiv moddalarni saqlash uchun 65 °C dan past o‘rtacha haroratlarni tanlashni tavsiya etgan [5].

Wojdyło va hammualliflar [6] konvektiv, vakuum, vakuum-mikroto‘lqinli (240, 360 va 480 W) va muzlatib quritishni solishtirib, quritish antotsianlar, flavanollar va askorbin kislotani parchalashini hamda antioksidant faollikni sezilarli kamaytirishini aniqlagan. An’anaviy va vakuum quritish ikkala navda ham antioksidant faollikni pasaytirgan, vakuum-mikroto‘lqinli quritishda esa natijalar boshqacha bo‘lgan [6].

Vakuum-mikroto‘lqinli va muzlatib quritish. qulupnay navini vakuum-mikroto‘lqinli (VM) quritish (konvektiv oldindan va keyingi quritish bilan), konvektiv quritish va muzlatib quritish usullarida solishtirgan. Konvektiv va VM quritishda askorbin kislota dastlabki qiymatning taxminan 40 foiziga, fenol birikmalari taxminan 35 foiziga, antioksidant sig‘im esa taxminan 60 foiziga kamaygan; muzlatib quritilgan qulupnayda esa kamayish kuzatilmagan. Oldindan ishlov berish vannasidan voz kechish, oldindan quritish davomiyligini uzaytirib harorat cho‘qqilarini kamaytirish va VM ishlov vaqtini qisqartirish askorbin kislota saqlanishini taxminan 65 foizgacha oshirgan; fenol birikmalari barqaror qolgan, antioksidant sig‘imning kamayishi esa 10–25 foiz bilan cheklangan. Askorbin kislotadan tashqari, ishlov sharoitlari yaxshilangandan keyingi qoldiq konsentratsiyalar muzlatib quritilgan mahsulotdagi qiymatlarga yaqin bo‘lgan

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shakarlangan qulupnayni uch xil vakuum-mikroto‘lqinli rejimda quritib, issiq havo bilan quritish bilan solishtirgan: namlikni 20 ± 2 % gacha tushirish vaqti VM quritishda issiq havodagiga qaraganda sezilarli qisqa bo‘lgan va mikroto‘lqin quvvati oshgani sari qisqargan; VM quritilgan namunalarda L* qiymati, umumiy shakar, antotsianlar va fenollar miqdori issiq havo bilan quritilganidan yuqori bo‘lgan. Biroq quvvat oshgani sari hujayra devori yorilishi kuchaygan [7]. **Natijalarning umumlashtirilishi**

Tahlil qilingan ishlarning asosiy topilmalari 1-jadvalda, miqdoriy natijalar esa 2-jadvalda umumlashtirilgan.

1-jadval. Quritish usullarining qulupnaydagi bioaktiv moddalarga ta’siri (adabiyot ma’lumotlari bo‘yicha)

№	Quritish usuli	Natija
1	Issiq havo bilan (konvektiv) quritish	Ko‘pchilik ko‘rsatkichlar bo‘yicha saqlanish eng past; harorat va davomiylik oshgani sari parchalanish kuchayadi
2	Vakuum bilan quritish	Ikkala navda ham antioksidant faollik pasaygan
3	Vakuum-mikroto‘lqinli quritish	Issiq havoga nisbatan antotsianlar va fenollar yuqoriroq saqlangan; sharoit yaxshilanganda askorbin kislota taxminan 65 % gacha saqlangan
4	Muzlatib quritish	C vitamini, antotsianlar, fenollar va ORAC bo‘yicha eng yaxshi saqlanish; [4] da kamayish kuzatilmagan
5	Refractance Window usuli	ORAC, antotsianlar va fenollar muzlatib quritishdan past, umumiy B vitamini yuqoriroq saqlangan
6	Swell-drying (DIC)	Eng maqbul rejimda (0,35 MPa, 10 s) fenollar, flavonoidlar, antotsianlar va antioksidant faollik eng yuqori

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2-jadval.

Tahlil qilingan tadqiqotlarda keltirilgan miqdoriy natijalar

№	Ko‘rsatkich yoki rejim	Natija
1	Konvektiv va VM quritish (dastlabki rejim)	Askorbin kislota dastlabki qiymatning taxminan 40 %, fenollar taxminan 35 %, antioksidant sig‘im taxminan 60 % gacha kamaygan; muzlatib quritishda kamayish yo‘q
2	VM quritish (yaxshilangan rejim)	Askorbin kislota saqlanishi taxminan 65 %; fenollar barqaror; antioksidant sig‘im kamayishi 10–25 %
3	Quritish harorati 45, 55, 65 °C	Pelargonidin-3-glyukozid 80,26; pelargonidin-3-rutinozid 7,72; sianidin-3-glyukozid 5,08 mg/100 g quruq modda; ellag kislotasi 23,11–37,04 mg/100 g (quritilgan namunalar)
4	Konvektiv quritish 50 va 60 °C, havo tezligi 1,5 m/s	Antioksidant birikmalarning parchalanishi birinchi tartibli kinetikaga bo‘ysungan
5	DIC (swell-drying)	Eng maqbul rejim: 0,35 MPa bosim, 10 s ushlash
6	VM quritish (shakarlangan qulupnay)	Namlikni 20 ± 2 % gacha tushirish vaqti issiq havodagidan qisqa; antotsianlar va fenollar yuqoriroq

MUHOKAMA

Tahlil qilingan ishlarning aksariyatida muzlatib quritish bioaktiv moddalarni saqlashda eng yaxshi natija bergan, issiq havo bilan quritish esa ko‘pchilik ko‘rsatkichlar bo‘yicha eng past saqlanishga olib kelgan [1, 4]. Bunga sabab, ehtimol, issiq havo bilan quritishda mahsulotning yuqori harorat va kislorod ta’sirida uzoq

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vaqt qolishidir: C vitamini oksidlanadi, antotsianlar issiqlik ta’sirida parchalanadi. Böhm va hammualliflar ishida harorat cho‘qqilarini kamaytirish va ishlov vaqtini qisqartirish askorbin kislota saqlanishini taxminan 40 foizdan 65 foizgacha oshirgani bu taxminni qo‘llab-quvvatlaydi [4].

Fenol birikmalari bo‘yicha natijalar bir xil emas: Alonzo-Macías va hammualliflar ishida usullar orasida umumiy fenollar farqi katta bo‘lmagan, antotsianlar va flavonoidlarda esa katta farqlar kuzatilgan [2]; Böhm va hammualliflarning dastlabki rejimlarida esa fenollar taxminan 35 foizgacha kamaygan, sharoitlar yaxshilanganda barqaror qolgan [4]. Bu farq nav, ishlov sharoiti va tahlil usuli bilan bog‘liq bo‘lishi mumkin.

Tadqiqotlar natijalarini to‘g‘ridan-to‘g‘ri solishtirishga imkon bermaydigan omillar mavjud: nav (masalan, Camarosa [2]), oldindan ishlov berish, miqdorlarni quruq modda yoki xom massa asosida ifodalash, antioksidant faollikni aniqlash usullari (masalan, ORAC [1]). Shuning uchun mutlaq qiymatlarni emas, balki usullarning nisbiy afzalligini solishtirish ma’qul.

Amaliy nuqtai nazardan, issiq havo bilan quritishda 65 °C dan past haroratni tanlash [5], quritish davomiyligini va harorat cho‘qqilarini kamaytirish [4], imkoniyat bo‘lsa vakuum-mikroto‘lqinli yoki birlashtirilgan usullardan foydalanish maqsadga muvofiq. Mikroto‘lqin quvvatini oshirish quritish vaqtini qisqartirsa-da, hujayra devori yorilishiga olib kelishi mumkin [7], shu sababli quvvat tajriba yo‘li bilan tanlanishi lozim. Muzlatib quritish bioaktiv moddalarni saqlashda eng yaxshi natija bersa-da, uning boshqa mezonlar (xarajat, davomiylik) bo‘yicha afzalligi ushbu tahlil doirasida baholanmagan.

Tahlilning cheklovlari: sharh oz sonli nashrlarga asoslangan; mahalliy (O‘zbekiston) navlari va sharoitlari bo‘yicha ma’lumotlar kiritilmagan; bioaktiv moddalarning organizmda o‘zlashtirilishi ko‘rib chiqilmagan. Shu sababli keltirilgan tavsiyalarni mahalliy navlarda tajriba orqali tekshirish zarur.

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XULOSA

Xulosa. Tahlil qilingan xalqaro tadqiqotlar qulupnayni quritish usuli va harorati C vitamini, antotsianlar, fenol birikmalari va antioksidant faollikning saqlanishiga sezilarli ta’sir qilishini ko‘rsatdi [1]. Muzlatib quritish bioaktiv moddalarni eng yaxshi saqlaydi, issiq havo bilan quritishda esa saqlanish ko‘pchilik ko‘rsatkichlar bo‘yicha eng past bo‘ladi [1]. Vakuum-mikroto‘lqinli quritish ishlov sharoitlari yaxshilanganda askorbin kislotadan tashqari bioaktiv moddalar bo‘yicha muzlatib quritishga yaqin natija beradi [4]. Issiq havo bilan quritishda bioaktiv moddalarni saqlash uchun 65 °C dan past haroratni tanlash tavsiya etiladi [5]. Keltirilgan tavsiyalarni mahalliy qulupnay navlarida o‘tkaziladigan tajribalarda tekshirish lozim.

FOYDALANILGAN ADABIYOTLAR

1. Abdullaeva X.R., Allayarov A.N. Qulupnay navlari fenologik fazalarining rivojlanishi hamda mevasining kimyoviy tarkibi // Agro kimyo himoya va o‘simliklar karantini. 2024. № 6 (107). Ushbu maqolada qulupnay navlarining quruq modda, shakar va kislotalilik ko‘rsatkichlari o‘rganilgan. Maqolani ko‘rish.

2. Nurullayev N. O‘zbekiston sharoitida qulupnay mevasining iste’mol xossalarini tadqiq etish va ulardan funksional mahsulotlar olish texnologiyasi // Agro ilm. – 2026. – Maxsus son 3. Maqolada qulupnayning askorbin kislotasi, antosianlar, polifenollar, organik kislotalari va quritish usullarining mahsulot sifatiga aloqador jihatlari ko‘rib chiqilgan. Maqolani ko‘rish.

3. Bo‘riyev X.Ch., Jo‘rayev R.J., Alimov O.A. Meva-sabzavotlarni saqlash va ularga dastlabki ishlov berish. Toshkent: Mehnat, 2002. 128–132-betlar. Meva-sabzavotlarni saqlash va dastlabki ishlov berish jarayonlarining nazariy asoslari uchun foydalanish mumkin.

4. Oripov R., Sulaymonov I., Umurzoqov E. Qishloq xo‘jalik mahsulotlarini saqlash va qayta ishlash texnologiyasi. Toshkent: Mehnat, 1991. 198–203-betlar. Qishloq xo‘jaligi mahsulotlarini saqlash va qayta ishlash texnologiyalariga oid manba.

https://creativecommons.org/licenses/by/4.0/

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PUBLISHED: 25.10.2026

5. Kushimov B.A., Mamadaliyev X.J. Qishloq xo‘jaligi hamda meva-sabzavot mahsulotlari quritish uchun energiya tejamkor qurilma va texnologiya // Oriental Renaissance: Innovative, Educational, Natural and Social Sciences. 2021. Jild 1, № 9. B. 869–879. Quritish texnologiyasi va energiya tejamkor usullarni yoritishda foydalanish mumkin.

6. Azizbek, Ozoda. Qishloq xo‘jaligi mahsulotlarini infraqizil nurlari yordamida quritishni takomillashtirish // Eurasian Journal of Technology and Innovation. – 2023. Jild 1, № 10. B. 38–40. DOI: https://doi.org/10.70413/ejti-v01-i10-p1-007. Maqola meva-sabzavotlarni quritishda biologik faol moddalar va sifat ko‘rsatkichlarini saqlash masalasiga texnologik nuqtayi nazardan yondashadi.

7. Choriyev A.J., Qo‘shoqova M., Panjiyeva O‘.B. Qulupnoy mevasini saqlashda, elekter tejamkor texnologiyalarni o‘rni // Zamonaviy dunyoda amaliy fanlar. – 2026. Jild 5, № 18. B. 68–70. DOI: https://doi.org/10.70413/zdaf-v05-i18-s60188. Qulupnayni saqlash va qayta ishlash bo‘yicha qo‘shimcha mahalliy manba.

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CROSS-LINGUISTIC ORTHOGRAPHIC ENCODING AND DYNAMIC MEDIATED LEARNING IN RURAL EMERGENT BILINGUALS: AN EXPERIMENTAL PSYCHOLINGUISTIC STUDY

Gulruh Sohibbek qizi Tillabayeva

Department of Methodology of Primary Education, Fergana State University, Fergana, Uzbekistan Doctor of Philosophy (PhD) in Philological Sciences

E-mail: tillabayevag1995@gmail.com

ORCID: https://orcid.org/0009-0002-7901-6031

Ergasheva Gulixon Shuxratjon qizi

Master's student (second year) at the Faculty of Pedagogy, Psychology, and Art Studies Fergana State University

ORCID: 0000-0002-22031992 Email: gulihon@gmail.com

ABSTRACT

Standardized early literacy metrics routinely conflate educational non-exposure with neurocognitive pathology among children in resource-constrained rural ecologies. This experimental framework delineates an analytical model examining cross-linguistic phonological encoding, orthographic memory, and cognitive modifiability during emergent bilingual acquisition. We articulate a complementary five-task experimental battery—comprising familiar word dictation, pseudoword dictation, direct orthographic copying, spontaneous composition, and receptive recognition—to dissociate central language deficits from peripheral graphomotor execution and home-language transfer phenomena. Because standardized normative cutoffs risk systematic diagnostic misclassification in marginalized cohorts, this design operates strictly as an investigative psycholinguistic protocol rather than a prescriptive diagnostic scale. Methodological triangulation across mediated tasks isolates structural cognitive resilience, providing clinical and pedagogical architectures with objective mechanisms to identify genuine learning impairments without penalizing sociolinguistic divergence.

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KEYWORDS

Dynamic assessment, Orthographic processing, Cross-linguistic transfer, Phonological decoding, Mediated learning experience, Emergent bilingualism, Cognitive modifiability, Error dissociation.

INTRODUCTION

Educational expansion across low- and middle-income regions has rapidly elevated preschool participation without resolving foundational disparities in early instructional environments. In rural South and Central Asian contexts, young children frequently enter institutional settings under marked sociolinguistic asymmetries. Daily home socialization unfolds through vernacular idioms or regional minority tongues, whereas state preschools mandate instruction in national standard languages governed by unfamiliar orthographies. These divergent exposure trajectories generate predictable friction during initial literacy acquisition (Bialystok, 2007). When conventional standardized inventories evaluate rural emergent bilinguals against urban monocultural benchmarks, superficial orthographic variations are frequently misconstrued as severe neurodevelopmental deficits. Children omit grammatical markers, substitute unfamiliar graphemes, or exhibit hesitant phonological blending due to restricted instructional exposure. These performance profiles reflect cross-linguistic phonetic transfer rather than structural learning impairments.

Psycholinguistic research demonstrates that isolated accuracy scores fail to capture the underlying cognitive mechanisms that govern early written language processing. A single error event on an omnibus screening instrument accounts for multiple competing cognitive etiologies. The observed failure may stem from immature auditory-phonetic segmentation, degraded orthographic working memory, cross-linguistic interference, or unstable peripheral graphomotor execution. Conflating these distinct etiologies risks severe diagnostic misclassification. This paper develops an experimental psycholinguistic framework designed to isolate environmental non-exposure from neurocognitive pathology in marginalized educational settings. We articulate our central research question: How do systematic

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task dissociations and dynamic mediated learning protocols distinguish benign cross-linguistic interference from structural neurocognitive impairment in resource-constrained emergent bilinguals?

THEORETICAL / COGNITIVE ACCOUNT

Dual-route cascaded models of written word processing explain these divergent etiologies by isolating two functional pathways: the sublexical phonological assembly route and the direct lexical-orthographic retrieval route (Coltheart et al., 2001). Complementary connectionist architectures conceptualize emergent literacy as a continuous settling process across mutually constraining phonological, orthographic, and semantic layers (Harm & Seidenberg, 2004). Cognitive architecture demands hierarchical processing across four discrete functional tiers. Auditory-phonetic input encoding converts acoustic speech streams into segmented phonological units. Orthographic memory preserves internal lexical templates, retrieving specific graphemic configurations from long-term storage during production. Morphological analysis parses bound morphemes and derivational affixes to maintain syntactic concordance. Peripheral motor execution translates these central linguistic decisions into coordinated graphomotor sequences on paper.

A processing breakdown across any individual tier generates visible surface errors. Traditional assessment tools fail because they aggregate these discrete processing levels into a single undifferentiated summary score. Task dissociations prevent diagnostic false positives by evaluating individual tiers in isolation. Contrasting auditory dictation with direct visual copying isolates peripheral graphomotor execution from central phonological assembly. If a learner fails an auditory spelling item but reproduces complex visual letterforms with normal spatial stability, graphomotor apraxia is definitively excluded. Similarly, evaluating receptive orthographic choice alongside written production dissociates lexical retrieval failure from absent orthographic representations. Mediated learning theory demonstrates that cognitive structures exhibit substantial modifiability when supported by structured, intentional scaffolding (Feuerstein et al., 1979; Grigorenko

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& Sternberg, 1998). Assessing learner responsiveness through iterative mediation systematically separates static experiential deprivation from genuine neurocognitive impairment.

PHENOMENOLOGICAL / MECHANISM CHARACTERISTICS

Delineating these experiential deprivations demands detailed analysis of the sociolinguistic terrain where emergent bilinguals encounter early print conventions. In rural Central Asian communities, children routinely negotiate concurrent exposures to Cyrillic home texts alongside Latin-based state educational scripts. Divergent grapheme-phoneme correspondences create severe cross-script interference. When an emergent bilingual accustomed to a transparent vernacular encounters an opaque target language, the child systematically applies regularized phonetic spelling strategies. An emergent bilingual writing the Russian lexical item собака (dog) as сабака demonstrates intact auditory-phonemic encoding of unstressed vowel reduction rather than orthographic disability. Graphemic substitution here represents heightened acoustic fidelity to regional spoken phonetics.

Clinicians cannot pathologize these systematic substitutions as internal working-memory deficits. In the absence of sustained, high-quality exposure to target-language print conventions, cross-linguistic phonetic assimilation represents an expected, intact developmental adaptation. Establishing a valid diagnosis of neurodevelopmental disorder demands rigorous operational criteria. A classification of intrinsic cognitive impairment requires persistent breakdown across multiple distinct processing modalities. The processing impairment must manifest symmetrically across both the dominant home idiom and the acquired school language. The observed error pattern must persist during direct visual copying tasks where central auditory-phonological translation demands are neutralized. The learner must demonstrate negligible cognitive modifiability when provided with explicit, standardized dynamic scaffolding. Errors restricted to phonologically divergent tokens in the non-dominant language indicate cross-linguistic influence. Attributing

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these localized linguistic phenomena to internal cognitive pathology constitutes an invalid clinical conclusion.

EXPERIMENTAL STUDY DESIGN

To eliminate this empirical confound, the proposed experimental design establishes a rigorous investigative testing protocol. The target cohort comprises emergent bilingual children aged 60 to 72 months enrolled in public preschools across rural administrative districts characterized by documented infrastructural constraints. Cohort balancing requires balanced representation across biological sex, regional socio-economic strata, and home-language dominance profiles. To prevent circularity, group allocation must decouple entirely from performance on the experimental tasks. Diagnostic grouping integrates triaged teacher observational matrices, historical classroom portfolios, and independent evaluations conducted by licensed clinical speech-language pathologists.

Detailed background variation is captured through a comprehensive language-history questionnaire administered to primary caregivers. This instrument quantifies relative language exposure ratios, caregiver literacy attainment, household economic resource indices, and early nutritional status. The experimental protocol deploys a complementary five-task battery administered across distinct testing sessions. Familiar word dictation evaluates lexical-orthographic retrieval under direct auditory presentation. Pseudoword dictation bypasses stored lexical templates, isolating sublexical phoneme-grapheme assembly mechanisms. Direct orthographic copying measures peripheral visuo-motor execution while holding phonological retrieval demands constant. Spontaneous free composition evaluates continuous semantic, syntactic, and orthographic coordination in an open narrative context. Receptive orthographic choice presents target stimuli alongside phonologically and visually plausible distractors, evaluating underlying recognition memory without motor or retrieval demands. Methodological controls eliminate standard linguistic confounds. Real-word stimuli are matched for word length, orthographic transparency, and spoken corpus frequency. Pseudowords adhere strictly to the phonotactic constraints

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of the target language. Task blocks and language orders are counterbalanced across participants to control for order and fatigue effects. Testing sessions are limited to twenty-minute intervals, conducted under institutional ethical clearance and parental consent.

CODING AND STATISTICAL ANALYSIS

Operationalizing this experimental battery into objective quantitative measures requires transparent coding units. Statistical modeling evaluates data at three nested analytical units: participant level, task level, and single stimulus trial. Methodological rigor demands separating individual error occurrences from aggregate incorrect-word tallies. A single word token may exhibit several distinct processing breakdowns. We deploy a multi-tiered coding matrix that classifies each error event into one of six mutually exclusive analytical categories: phonological substitutions, graphemic sequencing errors, orthographic vowel or consonant omissions, morphological agreement failures, peripheral execution distortions, or candidate cross-linguistic transfer tokens. Inter-rater reliability protocols mandate independent double-coding for thirty percent of all testing scripts by blinded research assistants. Inter-rater agreement is evaluated using Cohen’s kappa, requiring a minimum concordance threshold of kappa ≥ 0.85 before formal consensus adjudication by a third expert reviewer. Error frequencies are normalized by computing explicit opportunity counts, establishing precise mathematical denominators across phonological and orthographic categories.

We articulate three formally testable hypotheses:

Hypothesis 1: Children presenting with typical neurocognitive profiles but restricted instructional exposure will exhibit significant performance advantages on receptive orthographic choice and direct copying relative to auditory dictation tasks, whereas children exhibiting structural neurodevelopmental deficits will display generalized impairments across all five testing modalities.

Hypothesis 2: Cross-linguistic transfer tokens will constitute the majority of non-target graphemic selections produced by emergent bilinguals during sublexical

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pseudoword dictation, with error rates modulating as a function of phonotactic divergence between home and school languages rather than global executive dysfunction.

Hypothesis 3: Providing structured dynamic mediation during test-intervene-retest sequences will yield significant performance gains in developmentally typical learners from resource-constrained environments, producing post-intervention gain scores substantially higher than those observed in peers with intrinsic neurocognitive pathologies.

Quantitative evaluation utilizes generalized linear mixed-effects models (GLMM) with a logit link function for binary accuracy trials. The model incorporates crossed random intercepts for participants and items, with random slopes for task modality where permitted. Fixed effects comprise diagnostic classification, task modality, language exposure indices, and dynamic intervention stage. Statistical reporting includes odds ratios, effect sizes, and 95% confidence intervals, applying Benjamini-Hochberg false discovery rate corrections across multiple planned comparisons.

DISCUSSION AND PRACTICAL IMPLICATIONS

Translating these statistical parameters into clinical practice requires bridging experimental dissociations with educational environments. Granular mechanistic profiling allows educational teams to formulate targeted pedagogical interventions rather than routing children prematurely into specialized clinical tracks. If dynamic assessment demonstrates that an emergent bilingual learner possesses intact receptive recognition and rapid cognitive modifiability, educators should deliver contextual scaffolding and explicit orthographic instruction. An isolated error on an auditory dictation task does not confirm neurodevelopmental pathology. Peripheral graphomotor delays and cross-linguistic phonetic transfers must be recognized as instructional milestones rather than intrinsic cognitive deficits.

Several analytical caveats and empirical limitations require explicit acknowledgment. The proposed experimental battery requires preliminary validation

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across distinct regional dialects and diverse orthographic systems before wide implementation. The testing framework assumes availability of bilingual examiners trained in dynamic mediated interaction, a human resource constraint across many low-income rural schooling systems. Furthermore, dynamic gain scores must be tracked longitudinally to determine whether short-term cognitive modifiability predicts sustained academic achievement. Cross-sectional task dissociations provide diagnostic hypotheses rather than immutable neurological conclusions.

CONCLUSION

Evaluating emergent bilinguals in resource-constrained ecologies through static, omnibus screening metrics misdiagnoses environmental non-exposure as intrinsic cognitive deficit. Deconstructing early literacy into discrete functional components reveals underlying processing mechanisms. By integrating multi-task experimental dissociations with dynamic mediated testing protocols, this framework systematically isolates neurodevelopmental pathology from benign cross-linguistic transfer. The resulting diagnostic precision provides a concrete foundation for equitable clinical assessment and targeted educational remediation.

References

1. Bialystok, E. (2007). Acquisition of literacy in bilingual children: A framework for research. *Language Learning*, 57(s1), 45–77. https://doi.org/10.1111/j.1467-9922.2007.00412.x

2. Coltheart, M., Rastle, K., Perry, C., Langdon, R., & Ziegler, J. (2001). DRC: A dual route cascaded model of visual word recognition and reading aloud. *Psychological Review*, 108(1), 204–256. https://doi.org/10.1037/0033-295X.108.1.204

3. Ellis, B. J., Bianchi, J., Griskevicius, V., & Frankenhuis, W. E. (2017). Beyond lack of control: Harsh environments, unpredictable environments, and the development of alternative cognitive styles. *Development and Psychopathology*, 29(5), 1845–1864. https://doi.org/10.1017/S095457941700143X

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 27.10.2026
PUBLISHED: 27.10.2026

4. Feuerstein, R., Rand, Y., & Hoffman, M. B. (1979). *The dynamic assessment of retarded performers: The Learning Potential Assessment Device, theory, instruments, and techniques*. University Park Press.

5. Frankenhuis, W. E., Panchanathan, K., & Nettle, D. (2016). Cognition in harsh and unpredictable environments. *Current Opinion in Behavioral Sciences*, 7, 76–80. https://doi.org/10.1016/j.cobeha.2015.11.011

6. Grigorenko, E. L., & Sternberg, R. J. (1998). Dynamic testing. *Psychological Bulletin*, 124(1), 75–111. https://doi.org/10.1037/0033-2909.124.1.75

7. Harm, M. W., & Seidenberg, M. S. (2004). Computing the meanings of words in reading: Cooperative division of labor between visual and phonological processes. *Psychological Review*, 111(3), 662–720. https://doi.org/10.1037/0033-295X.111.3.662

8. Shonkoff, J. P., Garner, A. S., Siegel, B. S., Dobbins, M. I., Earls, M. F., McGuinn, L., Pascoe, J., & Wood, D. L. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*, 129(1), e232–e246. https://doi.org/10.1542/peds.2011-2663

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Civil Liability for Damage Caused by Artificial Intelligence: Uzbek Legislation and International Experience

Azimov Kholbek Bakhtiyorovich

a second-year student at the Faculty of Criminal Justice, Tashkent State University of Law.

Abstract

This article analyzes issues of civil liability for damage arising from the use of artificial intelligence technologies. It examines the challenges associated with identifying the liable party, proving damage and causation, and restoring the violated rights of victims when harm is caused by the operation of artificial intelligence systems. Based on the civil legislation of the Republic of Uzbekistan, regulatory legal acts governing the field of artificial intelligence, and international experience, the article develops proposals for improving existing legal mechanisms.

Keywords

artificial intelligence, civil liability, damage, compensation for damage, causation, digital technologies, legal regulation, victims' rights.

Sun'iy intellekt tomonidan yetkazilgan zarar uchun fuqarolik-huquqiy javobgarlik: O'zbekiston qonunchiligi va Xalqaro tajriba

Toshkent davlat yuridik universiteti Jinoiy odil sudlov fakultetining 2-kurs talabasi Azimov Xolbek Baxtiyorovich

Annotatsiya. Mazkur maqolada sun'iy intellekt texnologiyalaridan foydalanish natijasida yuzaga keladigan zarar uchun fuqarolik-huquqiy javobgarlik masalalari tahlil qilinadi. Sun'iy intellekt tizimlarining faoliyati natijasida zarar yetkazilganda javobgar subyektni aniqlash, zarar va sababiy bog'lanishni isbotlash hamda jabrlanuvchining buzilgan huquqlarini tiklash bilan bog'liq muammolar o'rganiladi. O'zbekiston Respublikasining fuqarolik qonunchiligi, sun'iy intellekt sohasidagi normativ-huquqiy hujjatlari va xalqaro tajriba asosida mavjud huquqiy mexanizmlarni takomillashtirish bo'yicha takliflar ishlab chiqiladi.

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Kalit so‘zlar: sun’iy intellekt, fuqarolik-huquqiy javobgarlik, zarar, zararni qoplash, sababiy bog‘lanish, raqamli texnologiyalar, huquqiy tartibga solish, jabrlanuvchi huquqlari.

Kirish

Bugungi kunda sun’iy intellekt texnologiyalari iqtisodiyot, tibbiyot, ta’lim, moliya, transport va boshqa ko‘plab sohalarda keng qo‘llanilmoqda. Ushbu texnologiyalar inson faoliyatini yengillashtirish, ma’lumotlarni tezkor qayta ishlash va murakkab vazifalarni avtomatlashtirish imkonini bermoqda. Shu bilan birga, sun’iy intellektdan foydalanish jarayonida noto‘g‘ri qarorlar qabul qilinishi, shaxsga doir ma’lumotlar noqonuniy qayta ishlanishi, fuqarolarning mol-mulkiga zarar yetishi yoki ularning qonun bilan qo‘riqlanadigan huquqlari buzilishi ehtimoli ham mavjud.

Mazkur holatlar fuqarolik huquqi oldiga yangi vazifalarni qo‘ymoqda. Xususan, sun’iy intellekt tizimining xatosi tufayli zarar yuzaga kelganida kim javobgar bo‘lishi, zararni qoplash majburiyati qaysi shaxs zimmasiga yuklatilishi va jabrlanuvchi o‘z talablarini qanday isbotlashi kerakligi dolzarb masalalardan hisoblanadi.

O‘zbekiston Respublikasida sun’iy intellektdan foydalanishning huquqiy asoslarini shakllantirish yo‘lida muhim qadamlar qo‘yilmoqda. Jumladan, 2026-yil 21-yanvardagi O‘RQ–1115-son Qonun bilan sun’iy intellektdan foydalanishning umumiy asoslari belgilandi hamda shaxsga doir ma’lumotlarni sun’iy intellekt orqali qonunga xilof ravishda qayta ishlash bilan bog‘liq ma’muriy javobgarlik nazarda tutildi.[1]

Shunga qaramay, sun’iy intellekt faoliyati natijasida yetkazilgan zararni fuqarolik-huquqiy tartibda qoplash, javobgar shaxsni aniqlash va dalillarni taqdim etish bilan bog‘liq masalalarni alohida ilmiy-huquqiy o‘rganish zarur.Tadqiqotning maqsadi sun’iy intellekt tomonidan yetkazilgan zarar uchun fuqarolik-huquqiy javobgarlikning amaldagi asoslarini tahlil qilish hamda O‘zbekiston qonunchiligini

[1] O‘zbekiston Respublikasining Qonuni, 21.01.2026 yildagi O‘RQ-1115-son

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takomillashtirish bo‘yicha ilmiy-amaliy takliflar ishlab chiqishdan iborat.Tadqiqotda huquqiy tahlil, tizimli yondashuv va qiyosiy-huquqiy tahlil usullaridan foydalanildi.

1. Sun’iy intellekt tomonidan yetkazilgan zarar uchun javobgarlikning huquqiy asoslari

Fuqarolik-huquqiy javobgarlikning asosiy vazifalaridan biri buzilgan huquqlarni tiklash va yetkazilgan zararning o‘rnini qoplashdan iborat. O‘zbekiston Respublikasi Fuqarolik kodeksining 57-bobida zarar yetkazishdan kelib chiqadigan majburiyatlar tartibga solingan. Xususan, Fuqarolik kodeksining 985-moddasiga muvofiq, fuqaroning shaxsi yoki mol-mulkiga, shuningdek yuridik shaxsga qonunga xilof harakat yoki harakatsizlik natijasida yetkazilgan zarar, shu jumladan boy berilgan foyda, zararni yetkazgan shaxs tomonidan to‘liq hajmda qoplanishi lozim.[2] Mazkur modda ayrim hollarda zararni qoplash majburiyati zarar yetkazuvchi bo‘lmagan shaxs zimmasiga ham yuklatilishi mumkinligini nazarda tutadi.Ushbu normani sun’iy intellektdan foydalanish bilan bog‘liq munosabatlarga tatbiq etishda, avvalo, zarar uchun javobgar bo‘lishi mumkin bo‘lgan subyektlarni aniqlash lozim. Bular jumlasiga sun’iy intellekt tizimini ishlab chiquvchi, uni muayyan mahsulot yoki xizmatga joriy etuvchi, tizimdan foydalanuvchi hamda undan foydalanish jarayonini nazorat qiluvchi shaxslar kirishi mumkin.Masalan, tibbiyot muassasasi kasallikni aniqlashda sun’iy intellekt tizimidan foydalandi, biroq tizim noto‘g‘ri tavsiya bergani sababli bemorga zarar yetdi. Bunday vaziyatda javobgarlikni faqat texnologiyani ishlab chiquvchiga yuklash har doim ham to‘g‘ri bo‘lmaydi. Chunki zarar tizimdagi texnik nuqson, noto‘g‘ri ma’lumotlar, tibbiyot xodimining tavsiyani tekshirmasligi yoki bir nechta omilning birgalikdagi ta’siri natijasida yuzaga kelgan bo‘lishi mumkin.Shu sababli javobgarlikni belgilashda har bir ishtirokchining vazifalari, harakati yoki harakatsizligi, zarar bilan sababiy bog‘lanish hamda qonunchilikda nazarda tutilgan boshqa shartlar baholanishi kerak.Bunda sun’iy intellektning o‘zini mustaqil javobgar subyekt sifatida ko‘rishdan ko‘ra, uning ishlab chiqilishi va qo‘llanilishi ustidan nazorat qiluvchi insonlar hamda tashkilotlarning huquq va

[2] O’zbekiston Respublikasi Fuqarolik kodeksi 2-qismi, 29.08.1996

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majburiyatlarini aniqlash muhimdir. Sun’iy intellekt tizimi texnik vosita bo‘lib, zarar yuzaga kelganining o‘zi muayyan ishlab chiquvchi yoki foydalanuvchining avtomatik ravishda javobgar bo‘lishini anglatmaydi. Javobgarlik tegishli qonunchilik normalari va ish holatlari asosida belgilanadi.

2. Sun’iy intellekt faoliyati natijasida yetkazilgan zararni isbotlash muammolari

Sun’iy intellekt bilan bog‘liq fuqarolik-huquqiy nizolarning muhim xususiyatlaridan biri zarar kelib chiqishining texnik sabablarini aniqlash murakkabligidir.An’anaviy huquqiy munosabatlarda zarar yetkazgan shaxsning xatti-harakati va uning oqibatlari o‘rtasidagi sababiy bog‘lanishni aniqlash ko‘pincha bevosita dalillar asosida amalga oshiriladi. Sun’iy intellekt tizimlarida esa qaror yoki natija ko‘plab ma’lumotlar, algoritmlar, dasturiy yangilanishlar va avtomatik qayta ishlash jarayonlari ta’sirida shakllanishi mumkin.

Birinchidan, **sababiy bog‘lanishni aniqlash muammosi** mavjud. Zarar sun’iy intellekt tizimining texnik xatosi, sifatsiz ma’lumotlar, foydalanuvchining noto‘g‘ri harakati yoki inson nazoratining yetarli emasligi natijasida yuzaga kelganini aniqlash uchun maxsus texnik ekspertiza talab etilishi mumkin.

Ikkinchidan, **axborotga kirish imkoniyatining teng emasligi** kuzatiladi. Tizimni ishlab chiquvchi yoki undan foydalanayotgan tashkilot algoritm, texnik hujjatlar va tizim faoliyati qaydlariga ega bo‘lishi mumkin. Jabrlanuvchi esa bunday ma’lumotlarga mustaqil ravishda kira olmasligi sababli o‘z talabini asoslashda qiyinchilikka duch keladi.

Uchinchidan, **javobgarlikning bir nechta subyekt o‘rtasida taqsimlanishi** muammosi mavjud. Masalan, dasturiy ta’minotni bir tashkilot ishlab chiqqan, boshqa tashkilot uni o‘z xizmatiga joriy etgan, uchinchi shaxs esa undan bevosita foydalangan bo‘lishi mumkin. Bunday holatda zarar uchun kim va qay darajada javobgar bo‘lishi kerakligini aniqlash alohida tahlilni talab etadi.

Mazkur muammolarni bartaraf etishda dalillarni saqlash, tizimning ishlash tarixini qayd etish va texnik ekspertizadan foydalanish muhim ahamiyatga ega.

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Shuningdek, sud nizoni ko‘rib chiqishda tegishli hujjatlarni talab qilish hamda taraflarning dalillarini qonunchilikda belgilangan tartibda baholash imkoniyatiga ega bo‘lishi lozim.

Muallifning fikricha, sun’iy intellekt bilan bog‘liq nizolarda jabrlanuvchining dalillarga kirish imkoniyatini oshirish zarur. Biroq bu tizimni ishlab chiquvchi yoki foydalanuvchiga barcha holatlarda avtomatik javobgarlik yuklashni anglatmasligi kerak. Huquqiy mexanizm jabrlanuvchining manfaatlarini himoya qilish bilan birga, javobgar deb ko‘rsatilgan shaxsning o‘z e’tirozlarini bildirish va aybi mavjud emasligini asoslash imkoniyatini ham ta’minlashi zarur.

3. Xalqaro tajriba va uni O’zbekiston qonunchiligida qo’llash imkoniyatlari

Sun’iy intellektni huquqiy tartibga solish bo‘yicha xalqaro tajriba ushbu texnologiyalardan xavfsiz foydalanish, inson huquqlarini himoya qilish va javobgarlik mexanizmlarini takomillashtirishga qaratilgan.

Yevropa Ittifoqida 2024-yil 13-iyunda qabul qilingan 2024/1689-son Sun’iy intellekt to‘g‘risidagi reglament (AI Act) sun’iy intellekt tizimlarini xavf darajasiga qarab tartibga solish, ayrim tizimlar uchun maxsus talablar belgilash hamda inson huquqlari va xavfsizligini himoya qilishga qaratilgan. [3]Bu reglamentga ko’ra sun’iy intellekt tizimlari xavf darajasiga ko’ra quyidagilarga ajratiladi:

1. **Qabul qilib bo‘lmaydigan xavf.** Odamlar xavfsizligi va asosiy huquqlariga jiddiy tahdid soluvchi tizimlar qat'iyan taqiqlanadi. Bunga ijtimoiy reytinglash odamlarni yashirincha manipulyatsiya qilish, ish joylarida emotsiyalarni aniqlash va jamoat joylarida real vaqt rejimida ruxsatsiz biometrik identifikatsiya qilish kiradi.

2. **Yuqori xavf.** Jamiyat va insonlar hayotiga katta ta'sir ko'rsatadigan sohalardagi tizimlar. Bunga tibbiy asboblar, kritik infratuzilma, ta'lim, ishga qabul

[3] Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations

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qilish va huquqni muhofaza qilish organlari dasturlari kiradi. Ular uchun qat'iy texnik hujjatlar, xavfni boshqarish va doimiy inson nazorati talab etiladi.

3. **Cheklangan xavf .** Foydalanuvchilar bilan muloqot qiladigan yoki kontent yaratadigan tizimlar. Chat-botlar, sun'iy intellekt yaratgan rasm va matnlar hamda soxta video va ovoz mahsulotlari foydalanuvchiga ular sun'iy ekanligi haqida ochiq bildirilishi shart.

4. **Minimal xavf .** Xavfi deyarli yo'q tizimlar. Masalan, kompyuter o'yinlari yoki elektron pochtadagi spam-filterlar. Ular uchun qo'shimcha majburiyatlar qo'yilmaydi.

Mazkur reglament sun’iy intellektni tartibga solishning muhim huquqiy asoslaridan biri hisoblanadi. Chunki yuqorida keltirilgan xavf darajalari asosida suniy intellektdan foyldalanishimiz kelgusida kelib chiqishi mumkin bo’lgan xavflarni kamaytirishga yordam beruvchi omil sifatida xizmat qiladi.

Bundan tashqari, Yevropa Ittifoqining 2024/2853-sonli Mahsulotlar uchun javobgarlik to‘g‘risidagi direktivasida dasturiy ta’minot, shu jumladan sun’iy intellekt tizimlari ham mahsulot sifatida ko‘rilishi mumkinligi belgilangan.[4] Bu yondashuv nuqsonli dasturiy ta’minot tufayli zarar yuzaga kelgan holatlarda mahsulot uchun javobgarlik qoidalarini qo‘llash masalasini aniqlashtirishga xizmat qiladi. Biroq direktivaning mazmunini barcha turdagi sun’iy intellekt zararlariga tatbiq etiladigan universal javobgarlik tizimi sifatida talqin qilish to‘g‘ri emas.

Xalqaro darajada yana bir muhim hujjat — Yevropa Kengashining Sun’iy intellekt va inson huquqlari, demokratiya hamda qonun ustuvorligi to‘g‘risidagi doiraviy konvensiyasidir[5]. Ushbu konvensiya 2024-yil 5-sentabrda imzolash uchun ochilgan bo‘lib, sun’iy intellekt tizimlarining butun hayotiy sikli davomida inson huquqlariga rioya etish, shaffoflik, javobgarlik va xavflarni baholash tamoyillariga urg‘u beradi. Mazkur tajribadan kelib chiqib, O‘zbekiston qonunchiligini takomillashtirishda bir nechta yo‘nalishga e’tibor qaratish mumkin.

[4] DIRECTIVE (EU) 2024/2853 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2024 on liability for defective products and repealing Council Directive 85/374/EEC
[5] Council of Europe Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law

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Birinchidan, sun’iy intellekt tizimlari bilan bog‘liq zararlarni qoplash masalasida ishlab chiquvchi, tizimni joriy etuvchi va foydalanuvchining majburiyatlarini aniqroq belgilash lozim.

Ikkinchidan, yuqori xavfli tizimlardan foydalanishda xavflarni oldindan baholash, inson nazoratini ta’minlash va tizim faoliyatiga oid muhim ma’lumotlarni saqlash talablarini rivojlantirish maqsadga muvofiq.

Uchinchidan, zarar yuzaga kelgan taqdirda jabrlanuvchining tegishli texnik dalillarni olish imkoniyatini ta’minlaydigan protsessual mexanizmlarni takomillashtirish zarur.

Shuni alohida ta’kidlash kerakki, xorijiy davlatlarning huquqiy tajribasini O‘zbekiston qonunchiligiga to‘g‘ridan-to‘g‘ri ko‘chirish emas, balki milliy huquq tizimi va amaldagi fuqarolik qonunchiligi bilan uyg‘unlashtirish maqsadga muvofiqdir.

4. O‘zbekiston qonunchiligini takomillashtirish bo’yicha takliflar

O‘zbekiston Respublikasida sun’iy intellektdan foydalanishning umumiy huquqiy asoslari belgilangan bo‘lsa-da, mazkur texnologiyalar bilan bog‘liq zararlarni qoplash mexanizmlarini yanada aniqlashtirish istiqbolli yo‘nalish hisoblanadi.

Muallifning fikricha, quyidagi takliflarni ko‘rib chiqish maqsadga muvofiq:

Birinchi taklif — fuqarolik qonunchiligida sun’iy intellekt bilan bog‘liq zararlarni qoplashga doir maxsus normalarni ishlab chiqish. Bunda ishlab chiquvchi, tizimni joriy etuvchi va foydalanuvchining vazifalari, xavfsizlik choralariga rioya etish majburiyatlari hamda zarar yuzaga kelgandagi javobgarlik asoslari aniq belgilanishi mumkin.

Ikkinchi taklif — yuqori xavfli sun’iy intellekt tizimlari faoliyatiga oid ma’lumotlarni saqlash talablarini joriy etish. Tizimning muhim qarorlari, texnik nosozliklari, yangilanishlari va inson tomonidan amalga oshirilgan nazorat harakatlari qayd etilishi zararni keltirib chiqargan sabablarni aniqlashni osonlashtiradi.

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Uchinchi taklif — sun’iy intellekt bilan bog‘liq fuqarolik nizolarida dalillarni olish mexanizmlarini takomillashtirish. Agar muhim texnik ma’lumotlar faqat javobgar tarafda mavjud bo‘lsa, sud tomonidan tegishli dalillarni talab qilish va ularni ekspertiza orqali tekshirish imkoniyatlarini samarali qo‘llash lozim.

To‘rtinchi taklif — xavfi yuqori bo‘lgan sohalarda javobgarlikni sug‘urtalash imkoniyatini o‘rganish. Masalan, avtonom transport, ayrim tibbiy texnologiyalar yoki katta moliyaviy xavf tug‘diradigan tizimlardan foydalanishda majburiy yoki ixtiyoriy sug‘urta mexanizmlarini joriy etish masalasi iqtisodiy va huquqiy jihatdan baholanishi mumkin.

Beshinchi taklif — zarar uchun javobgarlikni belgilashda mutanosiblik tamoyiliga rioya qilish. Tizimdan foydalanishda o‘z majburiyatlarini buzmagan shaxsni faqat sun’iy intellekt natijasi salbiy bo‘lgani sababli javobgar deb topish to‘g‘ri emas. Shu bilan birga, ishlab chiquvchi yoki foydalanuvchining xavfsizlik talablarini buzishi, zarur nazoratni amalga oshirmasligi yoki aniqlangan xavflarni bartaraf etmasligi javobgarlik masalasida tegishli baho olishi kerak.

Ushbu takliflar amaldagi qonunchilikda mavjud normalarni inkor etmaydi. Aksincha, Fuqarolik kodeksining 985-moddasida mustahkamlangan zararni to‘liq qoplash tamoyilini sun’iy intellektdan foydalanish bilan bog‘liq munosabatlarda samarali amalga oshirishga qaratilgan.

Xulosa

O‘tkazilgan tahlil shuni ko‘rsatadiki, sun’iy intellekt texnologiyalarining rivojlanishi fuqarolik-huquqiy javobgarlik institutini yangi sharoitlarda qo‘llash zaruratini yuzaga keltirmoqda. Bunda asosiy masala sun’iy intellektning o‘zini javobgar deb e’lon qilish emas, balki uning ishlab chiqilishi, joriy etilishi va qo‘llanilishi jarayonida ishtirok etuvchi shaxslarning huquq va majburiyatlarini aniq belgilashdan iborat. O‘zbekiston Respublikasi Fuqarolik kodeksining 985-moddasi zarar yetkazganlik uchun javobgarlikning umumiy asoslarini belgilaydi. Shu bilan birga, sun’iy intellekt bilan bog‘liq nizolarda zarar sababini aniqlash, texnik dalillarga

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kirish va bir nechta subyektning harakatlarini baholash kabi masalalar alohida yondashuvni talab qiladi.

Xalqaro tajriba sun’iy intellektni xavf darajasiga qarab tartibga solish, tizim faoliyatining shaffofligini oshirish, xavflarni oldindan baholash va zararlarni qoplash mexanizmlarini takomillashtirish muhimligini ko‘rsatadi. Shu munosabat bilan O‘zbekiston qonunchiligida sun’iy intellekt bilan bog‘liq zararlar uchun javobgarlik asoslarini aniqlashtirish, texnik dalillarni saqlash va olish tartibini takomillashtirish hamda yuqori xavfli tizimlar uchun qo‘shimcha xavfsizlik choralarini belgilash maqsadga muvofiqdir. Mazkur yo‘nalishdagi huquqiy islohotlar jabrlanuvchilarning buzilgan huquqlarini samarali tiklash, tadbirkorlik subyektlari uchun huquqiy aniqlikni ta’minlash va sun’iy intellekt texnologiyalaridan mas’uliyatli foydalanishni rivojlantirishga xizmat qiladi.

Foydalanilgan adabiyotlar:

1. O‘zbekiston Respublikasining 2026-yil 21-yanvardagi O‘RQ–1115-son Qonuni. “Sun’iy intellektni qo‘llash orqali yuzaga keladigan munosabatlar tartibga solinishi munosabati bilan O‘zbekiston Respublikasining ayrim qonun hujjatlariga qo‘shimcha va o‘zgartirishlar kiritish to‘g‘risida”. https://lex.uz/uz/docs/-8008401

2. O‘zbekiston Respublikasining Fuqarolik kodeksi (ikkinchi qism). 1996-yil 29-avgust. 57-bob, 985-modda. https://lex.uz/docs/-180552

3. Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act). EUR-Lex.

4. Directive (EU) 2024/2853 of the European Parliament and of the Council of 23 October 2024 on liability for defective products. EUR-Lex.

5. Council of Europe. Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law. 2024. Council of Europe.

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THE LITERARY INTERPRETATION OF THE OPPOSITION BETWEEN PROGRESS AND TRADITIONS IN THE NOVEL "YALDO KECHASI"

Xo‘jamurodova Oydin Xo‘jamurod qizi

Head of the Department of Languages, Asia University of Technology, Doctor of Philosophy (PhD) in Philology, Associate Professor, Karshi, Uzbekistan

Abstract

This article examines the literary interpretation of the opposition between progress and traditions in Khayriddin Sulton's novel Yaldo kechasi (2025). It substantiates the portrayal of tradition in the novel not as an immutable phenomenon, but as a cultural phenomenon that is reshaped in meaning under new social conditions. The article analyzes the conflict surrounding the "Najot" school, the connection between the confrontation of traditionalists and Jadid reformers and colonial policies, and the contradictions underlying the choices made by different generations.

Keywords

progress, tradition, customs, Jadidism, traditionalism, opposition, modernization, Yaldo kechasi, national awakening

«YALDO KECHASI» ROMANIDA TARAQQIYOT VA URF-ODATLAR OPPOZITSIYASINING BADIIY TALQINI

Xo‘jamurodova Oydin Xo‘jamurod qizi

Osiyo texnologiyalar universiteti "Tillar" kafedrasi mudiri, filologiya fanlari bo‘yicha falsafa doktori (PhD), dotsent, Qarshi shahri, O‘zbekiston

Annotatsiya: Maqolada Xayriddin Sultonning «Yaldo kechasi» (2025) romanida taraqqiyot va urf-odatlar oppozitsiyasining badiiy talqini tadqiq etiladi. Asarda an'ana o‘zgarmas hodisa emas, balki yangi ijtimoiy sharoitda mazmunan qayta shakllanadigan madaniy hodisa sifatida ko‘rsatilishi asoslanadi. «Najot» maktabi atrofidagi to‘qnashuv, qadimchilar va jadidlar qarama-qarshiligining mustamlaka siyosati bilan bog‘lanishi hamda avlodlar tanlovidagi ziddiyat tahlil qilinadi.

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Kalit so‘zlar: taraqqiyot, an’ana, urf-odat, jadidchilik, qadimchilik, oppozitsiya, modernizatsiya, «Yaldo kechasi», milliy uyg‘onish

Kirish. Taraqqiyot va an’ana munosabati o‘zbek ma’rifatparvarlik nasrining o‘zak mavzularidan biridir. Bu muammo Abdulla Qodiriy ijodida badiiy shaklda birinchi marta keng qo‘yilgan va keyingi bir asr davomida turli avlod yozuvchilari tomonidan qayta-qayta murojaat qilingan [1; 3; 5]. Xayriddin Sultonning «Yaldo kechasi» romani mazkur an’anani XX asr boshidagi tarixiy sharoitga ko‘chirib, unga yangi mazmun beradi. Asarda muammo mavhum bahs sifatida emas, balki aniq ijtimoiy to‘qnashuv - yangi usuldagi maktabning qurilishi va uning atrofida yuzaga kelgan kurash orqali ochib beriladi.

Masalaga kirishishdan oldin bir metodologik aniqlik kiritish zarur. Ommaviy tasavvurda taraqqiyot va urf-odat ko‘pincha bir-birini inkor etuvchi qutblar sifatida qabul qilinadi: taraqqiyot an’anani yemiradi, an’ana esa taraqqiyotga to‘sqinlik qiladi. Zamonaviy ijtimoiy-gumanitar fanlarda bu qarash ancha murakkablashtirilgan. E.Hobsbawm va T.Ranger an’analarning sezilarli qismi qadimdan kelayotgan o‘zgarmas meros emas, balki muayyan tarixiy sharoitda shakllangan, ya’ni «ixtiro qilingan» hodisa ekanini ko‘rsatib bergan [10]. Bundan kelib chiqadigan xulosa muhim: an’ana statik emas, u o‘zgaruvchan va qayta talqin qilinuvchi.

«Yaldo kechasi» romanining badiiy mantig‘i aynan shu qarashga yaqin turadi. Asarda an’ana bir butun, monolit kuch sifatida tasvirlanmaydi. Uning ichida kamida ikki qarama-qarshi pozitsiya mavjud: an’anani o‘zgarmas qolip deb biluvchi va uni yangi sharoitga moslashtirishga intiluvchi pozitsiyalar. Birinchisi qadimchilik muhitida, ikkinchisi jadidchilik harakatida namoyon bo‘ladi. Shu bois romandagi asosiy ziddiyat an’ana bilan taraqqiyot o‘rtasida emas, balki an’anani ikki xil tushunish o‘rtasidadir. Bu ziddiyatning badiiy markazi - Yodgorbek qurgan yangi usuldagi «Najot» maktabi [7; 8]. Muallif maktab qurilishini muqaddas imorat barpo etilayotgandek tasvirlaydi. Bu tasvirning uslubiy tanlovi tasodifiy emas: ma’rifat maskani diniy qadriyat tilida ta’riflanadi va shu orqali jadidchilikning diniy an’anaga qarshi emas, aksincha, undan oziqlanuvchi harakat ekani ko‘rsatiladi. Atrofdagi

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mutaassib muhit esa shu maktabni «butxona», «kofirona dargoh» deb qoralaydi [8]. Bir jismoniy obyektning ikki qarama-qarshi nomlanishi oppozitsiyaning matndagi eng ixcham ifodasidir. Tarixiy tadqiqotlar ham jadidchilikni diniy an'anadan uzilish sifatida emas, uning ichidagi islohotchilik oqimi sifatida baholaydi. A.Khalid Markaziy Osiyodagi jadid harakatini tahlil qilar ekan, uning namoyandalari o'zlarini dindan chekinuvchi emas, balki dinning asl mohiyatini tiklovchi kuch deb bilganini ta'kidlaydi [11]. B.Qosimov ham milliy uyg'onish g'oyasining ildizlari milliy-diniy merosda ekanini ko'rsatadi [3]. Romandagi talqin shu ilmiy qarashga mos keladi va bu uning tarixiy asoslanganligini ta'minlaydi.

Oppozitsiyaning ikkinchi qirrasi - uning mustamlaka siyosati bilan bog'lanishidir. Romanda Rafiq maxzumning chaqimchilik maktubi, ulamolarning harbiy gubernatorga jadidlardan qutqarish so'rab yozgan arzi va mustamlaka ma'muri Ostroumovning «bo'lib tashla va hukmronlik qil» siyosati yonma-yon keltiriladi [7]. Bu uch hujjatning ketma-ket joylashtirilishi muallifning muhim g'oyaviy xulosasini ifodalaydi: ichki nizodan eng ko'p manfaat ko'ruvchi tomon - tashqi hokimiyatdir. An'ana himoyachilari o'zlari bilmagan holda mustamlaka ma'muriyatining qo'lida qurol bo'lib qoladi. Bu xulosa oppozitsiya muammosini yangi darajaga ko'taradi. Agar taraqqiyot va an'ana kurashi faqat ikki tomonning bahsi bo'lganda, uning natijasi birining g'alabasi bilan yakunlanishi kerak edi. Romanda esa uchinchi, ko'rinmas ishtirokchi bor va u ikkala tomonning zaiflashuvidan foyda ko'radi. Shu bois asardagi fojia alohida bir qahramonning emas, balki o'zaro nizoga tushgan jamiyatning fojiasi sifatida idrok etiladi.

Oppozitsiyaning uchinchi qirrasi - avlodlar tanlovidagi ziddiyat. Romanda to'rt avlod tasvirlanadi va ularning har biri o'z davrining sharoitiga mos kurash shaklini tanlaydi [7; 9]. Otabek davlatni ogohlantirish va qurolli himoya yo'lini tanlaydi; Yodgorbek millatni ilm, maktab va matbuot orqali uyg'otishga intiladi [8]; Ozodbek ehtiyotkorlik bilan xalqni yo'qolishdan asrashga harakat qiladi; Odilbek yana qurolli kurashga qaytadi. Bu ketma-ketlik chiziqli taraqqiyot emas: kurash shakli bir martalik emas, tarixiy sharoitga qarab qayta-qayta o'zgaradi.

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Mazkur jihat romanning tarixga munosabatini aniqlaydi. Agar muallif taraqqiyotni chiziqli jarayon deb hisoblaganda, har bir keyingi avlod oldingisidan ilg‘orroq ko‘rsatilishi kerak edi. «Yaldo kechasi»da bunday ierarxiya yo‘q. Odilbekning qurolli kurashi Otabek yo‘lining takrori bo‘lsa-da, u orqaga qaytish sifatida baholanmaydi, chunki tarixiy sharoit o‘zgargan va bir xil harakat boshqa mazmun kasb etgan. Bu - tarixiy jarayonni spiral shaklida tushunish bo‘lib, tarixiy romanda nisbatan murakkab va yetuk pozitsiyadir.

Alohida e’tiborga loyiq nuqta - Ozodbek va Odilbek taqdirining qiyosi. Ikkalasi ham Yodgorbek tarbiyasining natijasi, ammo ular bir merosdan ikki qarama-qarshi yo‘l chiqaradi: biri ehtiyotkorlik, ikkinchisi fidoyilik yo‘lini tanlaydi [9]. Qodiriy «O‘tkan kunlar» xotimasida bu ikki yo‘lga faqat ishora qilgan edi - o‘g‘illardan biri «mas’ul ishchi», ikkinchisi «bosmachilar orasida» [1]. Xayriddin Sulton ana shu ishorani badiiy talqin qiladi va ikkala tanlovni ham bir xil hurmat bilan tasvirlaydi.

Bu tasvir usulining g‘oyaviy ma’nosi muhim. Muallif ikki aka-uka o‘rtasida hakamlik qilmaydi, birini to‘g‘ri, ikkinchisini xato deb e’lon qilmaydi. Shu tariqa an’ana va taraqqiyot oppozitsiyasi oddiy qutblanishdan chiqib, insoniy tanlov muammosiga aylanadi. Har bir tanlovning o‘z asosi, o‘z narxi va o‘z fojiasi bor. Badiiy adabiyotning ijtimoiy fandan farqi aynan shunda namoyon bo‘ladi: u muammoni hal qilmaydi, uning insoniy mazmunini ochadi.

Oppozitsiyaning til darajasidagi ifodasi ham diqqatga sazovor. Romandagi personajlar guruhlari turli leksik qatlamlar bilan tavsiflanadi: qadimchi muhit diniy-ilmiy atamalar bilan, jadidlar esa ma’rifat, maktab, matbuot, najot kabi birliklar bilan [7; 8]. Bir obyektning ikki xil nomlanishi - maktabning «najot» va «butxona» deb atalishi - mafkuraviy kurashning eng aniq lisoniy belgisidir. Nomlash usuli bu yerda dunyoqarashning bevosita ifodasi bo‘lib xizmat qiladi.

Romandagi oppozitsiya talqinini Qodiriy tajribasi bilan qiyoslash yondashuvning uzviyligini ko‘rsatadi. «O‘tkan kunlar»da taraqqiyot va an’ana ziddiyati, asosan, davlat boshqaruvi va oilaviy munosabatlar doirasida - Otabekning islohotchilik qarashlari hamda eski urf-odatlarning shaxs taqdiriga ta’siri orqali

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ko‘rsatilgan [1; 5]. «Yaldo kechasi»da esa ziddiyat ta’lim va matbuot sohasiga ko‘chadi. Bu ko‘chish tarixiy mantiqqa mos: xonliklar qulagach, kurash maydoni siyosiy boshqaruvdan madaniy-ma’rifiy sohaga o‘tgan edi. Nihoyat, oppozitsiyaning zamonaviy o‘quvchi uchun ahamiyati masalasi bor. L.Hutcheon tarixiy nasrning zamonaviy shakllarini tahlil qilar ekan, ularda o‘tmish hech qachon neytral tasvirlanmasligini, bugungi savollarga javob izlash maydoniga aylanishini ta’kidlaydi [13]. «Yaldo kechasi»dagi taraqqiyot va an’ana munosabati ham shunday o‘qiladi: globallashuv sharoitida milliy o‘zlikni saqlash bilan yangilanishni uyg‘unlashtirish muammosi bugun ham dolzarbligicha qolmoqda. Roman bu muammoga tayyor javob bermaydi, ammo uni tarixiy tajriba kontekstida ko‘rish imkonini beradi.

Oppozitsiyaning oilaviy-maishiy qatlami ham e’tibordan chetda qolmasligi kerak. Urf-odat jamiyat hayotining eng kundalik, eng shaxsiy sohalarida - nikoh, tarbiya, ota-bola munosabatlarida eng qattiq namoyon bo‘ladi. Romanda Yusufbek hojining nabirasini ko‘rish armoni haqidagi maktubi va Otabekning ikkinchi marta uylanishdan qat’iy bosh tortishi tasvirlanadi [7]. Bu epizodda an’anaviy oilaviy majburiyat bilan shaxsiy sadoqat to‘qnashadi. Qodiriy romanidagi mashhur ziddiyatning davomi bo‘lgan bu holat oppozitsiyaning mavhum mafkuraviy bahs emas, balki aniq inson taqdirlarida kechadigan jarayon ekanini ko‘rsatadi.

Tadqiqotda bir xavfdan ehtiyot bo‘lish zarur: asarni jadidchilik g‘oyalarining badiiy targ‘iboti sifatida bir yoqlama talqin qilish. Romanda jadidlar ijobiy, qadimchilar salbiy qutbga joylashtirilgani rost, ammo matn bu sxema bilan cheklanmaydi. Qadimchilarning qarshiligi shunchaki johillik emas - u o‘z qadriyatlar tizimini himoya qilish sifatida ham asoslanadi; jadidlarning yo‘li esa, barcha ezguligiga qaramay, fojia bilan yakunlanadi. Yodgorbekning surgun qilinishi va halokati [7] g‘oyaning to‘g‘riligi uning g‘alabasini kafolatlamasligini ko‘rsatadi. Badiiy matnning ilmiy qiymati aynan shu murakkablikda.

Shu nuqtai nazardan romanda tasvirlangan davrni o‘tish davri sifatida tushunish o‘rinli bo‘ladi. O‘tish davrining o‘ziga xosligi shundaki, unda eski tartib o‘z kuchini yo‘qotgan, yangisi esa hali shakllanmagan bo‘ladi; natijada jamiyat bir vaqtda ikki

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qadriyatlar tizimi bo‘yicha yashashga majbur bo‘ladi. Qahramonlarning ikkilanishi, bir oiladan qarama-qarshi yo‘l tanlagan farzandlarning chiqishi, hatto bitta inson ongidagi ziddiyat - bularning barchasi shu holatning tabiiy natijasidir. Oppozitsiya, demak, ikki guruh o‘rtasidagina emas, ko‘pincha bitta shaxs ichida ham kechadi.

Umuman olganda, «Yaldo kechasi»da taraqqiyot va urf-odatlar oppozitsiyasi uch bosqichli tizim sifatida qurilgan: avval an’ananing ichidagi bo‘linish ko‘rsatiladi, so‘ngra bu bo‘linishning tashqi kuch tomonidan foydalanilishi ochiladi, nihoyat masala avlodlar tanlovi orqali insoniy mazmun kasb etadi. Shu uch bosqich asarning g‘oyaviy strukturasini belgilaydi va uni oddiy ma’rifatparvarlik sxemasidan ajratib turadi.

1. «Yaldo kechasi»da asosiy ziddiyat an’ana bilan taraqqiyot o‘rtasida emas, balki an’anani ikki xil tushunish - uni o‘zgarmas qolip deb biluvchi va yangi sharoitga moslashtirishga intiluvchi pozitsiyalar o‘rtasidadir.

2. Oppozitsiyaning badiiy markazi - «Najot» maktabi. Uning jadidlar nutqida najot, qadimchilar nutqida «butxona» deb atalishi mafkuraviy kurashning til darajasidagi eng ixcham ifodasidir.

3. Maktab qurilishining muqaddas imorat tasviri orqali berilishi jadidchilikning diniy an’anaga qarshi emas, undan oziqlanuvchi islohotchilik harakati ekanini ko‘rsatadi; bu talqin jadidshunoslikdagi zamonaviy ilmiy qarashga mos keladi.

4. Chaqimchilik maktubi, ulamolarning arzi va mustamlaka ma’muriyatining «bo‘lib tashla va hukmronlik qil» siyosatining yonma-yon berilishi muhim g‘oyaviy xulosani ifodalaydi: ichki nizodan eng ko‘p manfaat ko‘ruvchi tomon tashqi hokimiyatdir.

5. To‘rt avlod tanlovi chiziqli taraqqiyot sxemasiga bo‘ysunmaydi: kurash shakli tarixiy sharoitga qarab qayta-qayta o‘zgaradi. Bu - tarixiy jarayonni spiral shaklida tushunish bo‘lib, asarning nazariy yetukligini ko‘rsatadi.

6. Muallif Ozodbek va Odilbekning qarama-qarshi tanlovlari o‘rtasida hakamlik qilmaydi. Shu tariqa oppozitsiya oddiy qutblanishdan chiqib, insoniy tanlov muammosiga aylanadi - adabiyotning ijtimoiy fandan farqi aynan shunda namoyon bo‘ladi.

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Foydalanilgan adabiyotlar

1. Qodiriy A. O‘tkan kunlar // Besh jildlik. I jild. – Toshkent: Info Capital Group, 2017.

2. Sulton X. Yaldo kechasi («O‘tkan kunlar»ga ilova): tarixiy roman. – Toshkent: Xaybar-25, 2025. – 461 b.

3. Qosimov B. Milliy uyg‘onish. – Toshkent: Ma’naviyat, 2002.

4. Karimov B. Abdulla Qodiriy: tanqid, tahlil va talqin. – Toshkent, 2006.

5. Normatov U. «O‘tkan kunlar» hayrati. – Toshkent, 1996.

6. Iskandar I. «Yaldo kechasi»: xulosa va saboqlar // Jadid. – 2026. – 9-yanvar, 2-son. Elektron manba.

7. Shavkat Sh. «Yaldo kechasi»ni kuting va o‘qing! (Sh.Sohibov bilan suhbat) // Jadid. – 2025. – 28-noyabr, 48-son. Elektron manba.

8. Pulatov I. Millatning eng uzun va qorong‘i kechasi haqida bilasizmi? // Kun.uz. – 2026. – 9-may. Elektron manba.

9. Nurmurodova F.R. Xayriddin Sultonning «Yaldo kechasi» qissasida tarixiy xotira va milliy taqdir talqini. – Zenodo, 2026. – B. 973–978. – DOI: 10.5281/zenodo.21012705.

10. Hobsbawm E., Ranger T. (eds.) The Invention of Tradition. – Cambridge: Cambridge University Press, 1983.

11. Khalid A. The Politics of Muslim Cultural Reform: Jadidism in Central Asia. – Berkeley: University of California Press, 1998.

12. Xo‘jamurodova O.X. Yodgorbek obrazi: ma’naviy vorislik va milliy uyg‘onish g‘oyasi («Yaldo kechasi» romani misolida) // Barqarorlik va yetakchi tadqiqotlar onlayn ilmiy jurnali. – 2026. – 6-jild, 10-son. – B. 8–11.

13. Hutcheon L. A Poetics of Postmodernism: History, Theory, Fiction. – New York: Routledge, 1988.

14. Lukács G. The Historical Novel. – London: Merlin Press, 1962.

15. Yurt qayg‘usi haqidagi asar – «Yaldo kechasi» tajallisi // Oyina.uz. – 2026. Elektron manba.

https://creativecommons.org/licenses/by/4.0/

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LEGAL RESPONSIBILITY OF THE FAMILY IN PREVENTING JUVENILE DELINQUENCY

Mardonova Malak Lutfilla qizi

Sarbon University, First-Year Student, Jurisprudence Program

Eshonqulov Otajon Davlat o‘g‘li

Sarbon University, First-Year Student, Jurisprudence Program

Abstract

This article comprehensively covers the essence of the concept of family's legal responsibility in preventing delinquency committed by minors, its role in social development, and its practical importance in citizens' lives. Furthermore, the roles of state policy, the normative-legal framework, and social institutions are analyzed as core factors in shaping and developing juvenile delinquency prevention. The research substantiates that enhancing parental responsibility within the family can ensure the rule of law in society, prevent delinquency, and maintain social stability. Additionally, it highlights the necessity of improving the educational process and utilizing modern pedagogical and legal methods in this field. At the conclusion of the article, scientific and practical recommendations have been developed to improve the family's legal mechanisms in preventing juvenile delinquency.

Keywords: Minors, juvenile delinquency, prevention, family's legal responsibility, parental obligation, legal education, social environment.

Keywords

Minors, prevention of offenses, family responsibility, parental obligations, legal education, social environment.

VOYAGA YETMAGANLAR TOMONIDAN SODIR ETILGAN HUQUQBUZARLIKLARNING OLDINI OLISHDA OILANING HUQUQIY MAS’ULIYATI

Eshonqulov Otajon Davlat o‘g‘li

Sarbon universiteti, “Yurisprudensiya” ta’lim yo‘nalishi, 2-bosqich talabasi

Mardonova Malak Lutfilla qizi

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Annotatsiya: Mazkur maqolada voyaga yetmaganlar tomonidan sodir etilgan huquqbuzarliklarning oldini olishda oilaning huquqiy mas’uliyati tushunchalarining mazmun-mohiyati, ularning jamiyat taraqqiyotidagi o‘rni hamda fuqarolar hayotidagi amaliy ahamiyati keng yoritilgan. Shuningdek, yoshlar o‘rtasida huquqbuzarliklar profilaktikasini shakllantirish va rivojlantirishning asosiy omillari sifatida davlat siyosati, normativ-huquqiy baza hamda ijtimoiy institutlarning roli tahlil qilinadi. Tadqiqotda oilada ota-onaning mas’uliyatini oshirish orqali jamiyatda qonun ustuvorligini mustahkamlash, huquqbuzarliklarning oldini olish va ijtimoiy barqarorlikni ta’minlash mumkinligi asoslab berilgan. Shuningdek, tarbiya jarayonini takomillashtirish, sohada zamonaviy pedagogik va huquqiy usullardan foydalanish zarurligi ko‘rsatib o‘tilgan. Maqola yakunida voyaga yetmaganlar o‘rtasida huquqbuzarliklar profilaktikasida oilaning huquqiy mexanizmlarini takomillashtirish bo‘yicha ilmiy-amaliy tavsiyalar ishlab chiqilgan.

Kalit so‘zlar: Voyaga yetmaganlar, huquqbuzarliklar profilaktikasi, oilaning mas’uliyati, ota-ona majburiyati, huquqiy tarbiya, ijtimoiy muhit.

Аннотация: В данной статье широко раскрываются содержание и сущность понятий правовой ответственности семьи в профилактике правонарушений, совершаемых несовершеннолетними, их роль в развитии общества, а также практическое значение в жизни граждан. Кроме того, анализируется роль государственной политики, нормативно-правовой базы и социальных институтов как основных факторов формирования и развития профилактики правонарушений среди молодёжи. В исследовании обосновывается, что повышение ответственности родителей в семье способствует укреплению верховенства закона в обществе, предупреждению правонарушений и обеспечению социальной стабильности. Также подчёркивается необходимость совершенствования процесса воспитания и применения современных педагогических и правовых методов в данной сфере. В заключительной части статьи разработаны научно-практические

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рекомендации по совершенствованию правовых механизмов семьи в профилактике правонарушений среди несовершеннолетних.

Ключевые слова: несовершеннолетние, профилактика правонарушений, ответственность семьи, обязанности родителей, правовое воспитание, социальная среда.

Kirish: Bugungi kunda har qanday demokratik va huquqiy davlatning barqaror rivojlanishi, avvalo, voyaga yetmaganlar tomonidan sodir etilgan huquqbuzarliklarning oldini olishda oilaning huquqiy mas’uliyati darajasi bilan bevosita bog‘liqdir. Jamiyatda qonun ustuvorligini ta’minlash, inson huquq va erkinliklarini himoya qilish hamda ijtimoiy adolatni qaror toptirishda oila institutining huquqiy asosga ega bo‘lishi muhim o‘rin tutadi. Shu sababli yosh avlod tarbiyasi samaradorligini oshirish har bir davlatning strategik vazifalaridan biri hisoblanadi. Oila muhitida huquqiy prinsiplarga tayanish bugungi voqelikni anglash, qonunlarga nisbatan munosabat bildirish, jarayonlarni tahlil qilish va baholash qobiliyatidir. Oilada huquqiy mas’uliyat tizimi esa amaldagi qonunlarga rioya etish, sohadagi bilimlarni kundalik hayotda qo‘llash hamda huquqiy qadriyatlarni hurmat qilish darajasini ifodalaydi. Ushbu ikki tushuncha o‘zaro uzviy bog‘liq bo‘lib, biri ikkinchisini to‘ldiradi va jamiyatda huquqiy transformatsiyani mustahkamlashga xizmat qiladi. So‘nggi yillarda O‘zbekistonda keng ko‘lamli islohotlar amalga oshirilmoqda. Xususan, voyaga yetmaganlar o‘rtasida huquqbuzarliklar profilaktikasini kuchaytirish hamda oila institutini mustahkamlash strategiyasi doirasida huquqiy davlat va shaffof jamiyat institutlarini rivojlantirishga alohida e’tibor qaratilmoqda. Bu jarayonda ota-onalarning farzand tarbiyasidagi huquqiy mas’uliyatini oshirish hamda sohada huquqiy targ‘ibot ishlarini kuchaytirish dolzarb vazifaga aylangan. Chunki oilaviy huquqiy tarbiya madaniyati yuqori bo‘lgan jamiyatda huquqbuzarliklar kamayadi, ijtimoiy barqarorlik mustahkamlanadi va davlat boshqaruvi samaradorligi oshadi. Shu bilan birga, bugungi globallashuv va axborot texnologiyalari rivojlanayotgan davrda yoshlar ongiga ta’sir etuvchi ma’lumotlarga tezkor kirish imkoniyati ortgan bo‘lsa-da, ularni to‘g‘ri tushunish va amaliyotda qo‘llash masalasi dolzarbligicha qolmoqda. Ayniqsa, davlat organlari va mahalla

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institutlari o‘rtasida oilaviy nazorat mexanizmlari hamda zamonaviy profilaktika usullaridan foydalanish, ijtimoiy nazoratni kuchaytirish muhim ahamiyat kasb etadi. Mazkur maqolada voyaga yetmaganlar tomonidan sodir etilgan huquqbuzarliklarning oldini olishda oilaning huquqiy mas’uliyatining nazariy asoslari, mavjud muammolar hamda ularni bartaraf etish yo‘llari ilmiy jihatdan tahlil qilinadi.

Adabiyotlar tahlili: Voyaga yetmaganlar tomonidan sodir etilgan huquqbuzarliklarning oldini olishda oilaning huquqiy mas’uliyati masalasi huquqiy davlat va fuqarolik jamiyatini rivojlantirishning asosiy ilmiy-amaliy yo‘nalishlaridan biri hisoblanadi. Mavzu doirasida tahlil qilingan adabiyotlar sohadagi huquqiy profilaktikaning nazariy asoslarini, davlat siyosatini va oila tizimidagi o‘rnini qamrab oladi. Avvalo, “O‘zbekiston Respublikasi Konstitutsiyasi” [1] huquqiy davlatning asosiy poydevori sifatida fuqarolarning huquq va erkinliklarini belgilab beradi hamda oilaning farzandlar oldidagi majburiyatlarini shakllantirishning eng muhim manbasi hisoblanadi. Konstitutsiya normalari jamiyatda qonun ustuvorligini ta’minlash va oilada sog‘lom huquqiy muhitni joriy etishda asosiy huquqiy baza vazifasini bajaradi. “O‘zbekiston Respublikasining Jinoyat kodeksi” [2] voyaga yetmaganlar tomonidan sodir etilgan jinoyatlar uchun javobgarlik shartlarini belgilaydi, huquqbuzarliklar profilaktikasiga oid qonunchilik hujjatlari esa sohadagi munosabatlarni tartibga solib, ota-onaning javobgarlik tizimini yuridik jihatdan mustahkamlashga xizmat qiladi. Shuningdek, “O‘zbekiston Respublikasining Oila kodeksi” [3] ota-onalarning voyaga yetmagan bolalarini tarbiyalash va ularga ta’lim berishga oid huquq hamda majburiyatlarini belgilashning asosiy qonunchilik kafolati bo‘lib xizmat qiladi. “O‘zbekiston Respublikasining Huquqbuzarliklar profilaktikasi to‘g‘risida”gi Qonuni [4] esa yoshlar o‘rtasida g‘ayriijtimoiy xatti-harakatlarning barvaqt oldini olishda oila va mahallaning hamkorlik mexanizmlarini mustahkamlaydi. Ilmiy maqolalar tahliliga to‘xtaladigan bo‘lsak, dastlab A.E. Burxonov [5] o‘zining ilmiy ishlarida oilaviy munosabatlarda huquqiy mas’uliyat tanqisligi va buning voyaga yetmaganlar o‘rtasida jinoyatchilikning ortishiga ta’siri muammolarini tizimli o‘rgangan. M.A. Ubaydullayev [6] esa yoshlar tarbiyasida ijtimoiy-huquqiy komplaens tizimlarini

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qo‘llash hamda oilaviy tarbiya usullarini takomillashtirish orqali voyaga yetmaganlar orasida huquqbuzarliklarni kamaytirishning huquqiy va amaliy afzalliklarini asoslab bergan. Bu yondashuv profilaktika amaliyotiga yangi konseptual qarashlarni olib kiradi. Yoshlar muhitidagi g‘ayriqonuniy xulq-atvorning o‘ziga xos xususiyatlari va oiladagi tarbiyaviy mezonlardagi kamchiliklar Sh.H. Nazarov [7] tomonidan tahlil qilingan bo‘lib, olim huquqiy mas’uliyatni qonunchilik prinsiplari bilan uyg‘unlashtirish zarurligini ta’kidlaydi. D.A. Saidov [8] voyaga yetmaganlarning huquqiy ongi va huquqiy madaniyatini oila davrasida yuksaltirishning ijtimoiy-huquqiy zaruriyatini ilmiy jihatdan asoslab, oiladagi huquqiy parokandalikni bartaraf etish yo‘llarini ko‘rsatgan. X.B. Rajapov [9] o‘z tadqiqotlarida nosog‘lom oilaviy muhitda o‘sayotgan voyaga yetmaganlarning kriminogen faollik darajasini chuqur o‘rganib, ularni profilaktik nazorat qilish va ijtimoiy reabilitatsiya algoritmlarini ishlab chiqish masalalariga alohida urg‘u beradi. Oila institutida ota-onaning huquqiy majburiyatlarini bajarish samaradorligini matematik-statistik modellar va sotsiologik so‘rovlar asosida baholash metodologiyasi I.R. Ergashevning [10] ilmiy maqolalarida o‘z aksini topgan. Darsliklar va o‘quv qo‘llanmalari tahlilida, xususan, huquqbuzarliklar profilaktikasi organlarining ilmiy-metodologik nashrida [11] oilaviy pedagogika va huquqiy tarbiya mexanizmlarini amaliyotga tatbiq etishning tahliliy asoslari tizimli bayon etilgan. Yuridik universitet olimlari tomonidan tayyorlangan darslikda [12] esa oila huquqi sharoitida voyaga yetmaganlar profilaktikasini samarali tashkil etishning nazariy modellariga metodologik tavsif berilgan. Shunday qilib, tahlil qilingan adabiyotlar oilada huquqiy tarbiyani va mas’uliyat tizimlarini yuksaltirishda quyidagi asosiy yo‘nalishlarni ajratib ko‘rsatadi:qonunchilik bazasini takomillashtirish, oilani qo‘llab-quvvatlash bo‘yicha davlat siyosatini kuchaytirish, ota-onalarning huquqiy savodxonligini oshirish hamda xalqaro profilaktika tajribasini keng joriy etish.

Metodologiya: Metodologiya: Tadqiqotda formal-yuridik, tizimli tahlil, qiyosiy-huquqiy va mantiqiy tahlil metodlaridan foydalanildi.

Formal-yuridik metod orqali voyaga yetmaganlar o‘rtasida huquqbuzarliklar profilaktikasi va oilaning huquqiy mas’uliyatiga oid konstitutsiyaviy normalar, Oila

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kodeksi, Ma’muriy javobgarlik to‘g‘risidagi kodeks qoidalari hamda sohaga doir normativ-huquqiy hujjatlar o‘rganildi. Ushbu metod ota-onalarning farzand tarbiyasi borasidagi majburiyatlarining huquqiy asoslari va mas’uliyatni belgilash tartibini aniqlashga xizmat qildi. Tizimli tahlil metodi yordamida voyaga yetmaganlar tomonidan sodir etilgan huquqbuzarliklarning oldini olish tizimining moddiy-huquqiy va protsessual jihatlari o‘zaro bog‘liqlikda ko‘rib chiqildi. Jumladan, oilaning huquqiy profilaktikadagi rolini aniqlash, huquqbuzarlikka moyil voyaga yetmaganlarni monitoring qilish, profilaktika inspektorlari va vasiylik organlari bilan hamkorlik qilish hamda sud orqali huquqiy ta’sir choralarini qo‘llash bosqichlari yagona jarayonning tarkibiy qismlari sifatida tahlil qilindi.

Qiyosiy-huquqiy metod voyaga yetmaganlar profilaktikasida oila mas’uliyatini oshirishning turli huquqiy mexanizmlarini o‘zaro taqqoslash, ma’muriy va fuqarolik-huquqiy tartib-taomillarning vazifalarini farqlash uchun qo‘llanildi. Bunda xorijiy davlatlar bo‘yicha alohida empirik ma’lumotlar to‘planmaganligi sababli, xorijiy qonunchilik haqida tekshirilmagan xulosalar chiqarilmadi. Mantiqiy tahlil metodi aniqlangan muammolar (oiladagi nosog‘lom muhit, nazoratsizlik) o‘rtasidagi sabab-oqibat aloqalarini ochib berish hamda voyaga yetmaganlar huquqbuzarliklarining oldini olish jarayonini izchil bosqichlarga ajratish uchun ishlatildi. Tadqiqot normativ-huquqiy hujjatlar va mavjud huquqiy-amaliy manbalarni tahlil qilishga asoslangan. Shu bois maqolada taklif etilgan model nazariy-amaliy taklif hisoblanadi; uning samaradorligi alohida statistik orqali tekshirilgani da’vo qilinmaydi.

Tahlil va natijalar: Mazkur tadqiqotda oilaning huquqiy mas’uliyati masalalari jamiyat rivojlanishining muhim ijtimoiy-huquqiy omili sifatida har tomonlama tahlil qilindi. Tahlil natijalari shuni ko‘rsatadiki, oilada huquqiy nazorat va tarbiya darajasi yuqori bo‘lgan tizimlarda yoshlar qonunlarni chuqur anglaydi, ularga ongli ravishda rioya qiladi hamda ijtimoiy munosabatlarda faol va mas’uliyatli ishtirok etadi. Natijada ijtimoiy tartib mustahkamlanadi, tizimli huquqbuzarliklar kamayadi va jamiyat barqarorligi oshadi. Aksincha, huquqiy savodxonlik va ota-ona nazorati darajasi past bo‘lgan oilaviy muhitda huquqiy befarqlik, qonun va talablarga nisbatan

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loqaydlik hamda turli huquqbuzarlik holatlari ko‘proq uchraydi. Tahlil jarayonida voyaga yetmaganlar o‘rtasida huquqbuzarliklarning barvaqt oldini olish mexanizmlarini shakllantirish bir martalik jarayon emas, balki uzluksiz davom etadigan tizimli faoliyat ekanligi aniqlandi. Bu jarayonda shaxsning oilaviy tarbiyasi, maktab muhiti, ijtimoiy muhit, davlat siyosati hamda ommaviy axborot vositalari o‘zaro uzviy bog‘liq holda ta’sir ko‘rsatadi. Ayniqsa, yosh avlodda qonunbuzarliklarga qarshi murosasizlik kayfiyatini shakllantirishda oilaviy monitoring mexanizmlari hal qiluvchi o‘rin tutadi.

Tadqiqot davomida quyidagi asosiy muammolar aniqlandi:

–oilaviy huquqiy tarbiya modellarining ko‘proq nazariy xarakterda bo‘lib, amaliy pedagogik ko‘nikmalar yetishmasligi;

–ota-onalarga qaratilgan huquqiy targ‘ibot ishlarining yetarli darajada tizimli tashkil etilmaganligi;

–oilalarning zamonaviy huquqiy-psixologik yordam bazasiga kirish imkoniyatlari hamma hududlarda bir xil emasligi;

–ota-onalarda farzand bandligini ta’minlashga nisbatan ichki xohish va motivatsiyaning barqaror emasligi;

–zamonaviy axborot vositalaridan yoshlar tarbiyasini tahlil qilishda yetarli darajada foydalanilmasligi.

Shuningdek, tahlillar shuni ko‘rsatdiki, voyaga yetmaganlar orasida huquqbuzarliklarni bartaraf etishda faqat huquqiy qoidalarni majburlash emas, balki ota-onalarning ijtimoiy faolligi, huquqiy madaniyati va ma’naviy dunyoqarashi ham muhim ahamiyatga ega. Shu sababli oilaning huquqiy mas’uliyatini oshirish jarayoni kompleks yondashuvni talab etadi. Mazkur tadqiqotning ilmiy yangiligi shundan iboratki, voyaga yetmaganlar huquqbuzarliklari profilaktikasi tizimi alohida yo‘nalish sifatida emas, balki ijtimoiy, ta’limiy, ma’naviy va oilaviy omillarni o‘z ichiga olgan yaxlit tizim sifatida tahlil qilindi. Bundan tashqari, voyaga yetmaganlar o‘rtasida jinoyatchilikning oldini olishda oilaviy mas’uliyatni rivojlantirishning zamonaviy konseptual modeli ishlab chiqildi. Ushbu model quyidagi yo‘nalishlarni o‘z ichiga oladi:

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–huquqiy tarbiya jarayonlarini tizimlashtirish va elektron intellektual pedagogik platformalarni rivojlantirish;

–interaktiv va amaliy monitoring metodlarini keng joriy etish;

–ota-onalar uchun huquqiy-pedagogik innovatsion loyihalar yaratish;

–ommaviy axborot vositalari va ijtimoiy tarmoqlarda oilaviy qadriyatlar kontentini kengaytirish;

–ota-onalar va yoshlarga yo‘naltirilgan ochiq huquqiy ma’lumotlar tizimini shakllantirish.

Ushbu yondashuv huquqiy mas’uliyatni nazariy qoida sifatida emas, balki amaliy hayotda qo‘llaniladigan kompetensiya sifatida shakllantirish imkonini beradi. Tadqiqot natijalariga asoslanib, oilaning huquqiy mas’uliyatini oshirish bo‘yicha quyidagi kompleks va tizimli yechimlar taklif etiladi.

Birinchi muammo — oilaviy huquq va risk-menejment asoslarini o‘rgatishda amaliy metodlarning yetishmasligi.Ta’lim, xotin-qizlar va mahalla tizimida oilaviy huquq va risk-menejment asoslarini o‘rgatishda amaliyotga asoslangan metodlarni keng joriy etish lozim. Real hayotiy vaziyatlar va oilaviy muammolarni huquqiy simulyatsiyalar orqali tahlil qilish ota-onalarda huquqiy-tahliliy fikrlashni rivojlantiradi.

Ikkinchi muammo — aholi va ota-onalar uchun integratsiyalashgan raqamli huquqiy-profilaktik platformaning yo‘qligi.Aholi va ota-onalarning barcha qatlamlari uchun ochiq, qulay va tushunarli “Raqamli oilaviy profilaktika va huquqiy maslahat platformasi”ni yaratish zarur. Ushbu platforma qonunlarni va ota-onalik majburiyati mezonlarini soddalashtirilgan tilda tushuntirish, onlayn maslahatlar berish va dolzarb huquqiy yangiliklarni yetkazishga xizmat qiladi.

Uchinchi muammo — ota-onalarning huquqiy dunyoqarashini yuksaltirishga qaratilgan amaliy va interaktiv maydonlarning sustligi.Ota-onalarda huquqiy dunyoqarashni mustahkamlash maqsadida maxsus raqamli oila klublari, debat maydonlari, simulyatsion jarayonlar va amaliy treninglarni tizimli ravishda tashkil etish kerak.

To‘rtinchi muammo — media makonda oilaviy mas’uliyat va ijtimoiy nazoratni kuchaytiruvchi vizual kontentlarning yetishmasligi.Ommaviy axborot

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vositalari va ijtimoiy tarmoqlarda oilaviy mas'uliyat va shaffoflik targ'ibotini kuchaytirish, qisqa, tushunarli va vizual tahliliy kontentlarni ko'paytirish orqali oilalarda ijtimoiy nazoratni kuchaytirish va fuqarolar mas'uliyatini oshirish mumkin.

Beshinchi muammo — voyaga yetmaganlar o'rtasidagi huquqbuzarliklarni kamaytirishda idoralararo kompleks hamkorlik tizimining mukammal emasligi. Davlat organlari,ta'lim muassasalari va fuqarolik jamiyati institutlari o'rtasida o'zaro hamkorlikni kuchaytirgan holda,voyaga yetmaganlar ortasida huquqbuzarliklarni kamaytirishga qaratilgan milliy va hududiy dasturlarni ishlab chiqish hamda amalga oshirish zarur. Shunday qilib, tadqiqot natijalari oilaning huquqiy mas'uliyatini oshirish jamiyat barqarorligi va huquqiy davlat qurilishining asosiy sharti ekanligini tasdiqlaydi. Mazkur jarayon faqat davlat organlarining ichki nazorati bilan cheklanib qolmasdan, balki zamonaviy texnologiyalar yordamida jamoatchilik va fuqarolik jamiyati institutlari ishtirokida amalga oshirilgandagina yuqori samaraga erishish mumkin.

Xulosa: Xulosa qilib aytganda, voyaga yetmaganlar tomonidan sodir etilgan huquqbuzarliklarning oldini olishda oilaning huquqiy mas'uliyatini oshirish jamiyat taraqqiyoti va huquqiy davlat barpo etishning eng muhim omillaridan biri hisoblanadi. Mas'ul shaxslar va ota-onalarning huquqiy nazorat hamda huquqiy savodxonlik darajasi qanchalik yuqori bo'lsa, jamiyatda qonun ustuvorligi shunchalik mustahkam bo'ladi, ijtimoiy tartib va barqarorlik ta'minlanadi. Aksincha, oilaviy monitoring mexanizmlari yetarli darajada shakllanmagan muhitda huquqbuzarliklar, tizimli befarqlik va ijtimoiy muammolar ko'payadi. Tadqiqot natijalari shuni ko'rsatdiki, voyaga yetmaganlar huquqbuzarliklarini barvaqt aniqlash va baholash jarayoni uzluksiz va kompleks xususiyatga ega bo'lib, u ta'lim tizimi, davlat siyosati, maktab va oilaviy tarbiya hamda ommaviy axborot vositalari bilan chambarchas bog'liqdir. Ayniqsa, yosh avlod o'rtasida oilaviy huquqiy nazoratni kuchaytirish kelajakdagi huquqiy barqarorlikni ta'minlashda muhim o'rin tutadi. Shuningdek, oilaviy tizimda huquqbuzarlik xavflarini kamaytirishda zamonaviy raqamli texnologiyalardan foydalanish, interaktiv tahlil usullarini joriy etish va fuqarolarga qulay ochiq ma'lumotlar tizimini yaratish muhim ahamiyat kasb etadi. Bu esa

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aholining davlat apparatiga va ijtimoiy institutlarga bo‘lgan ishonchini oshirish bilan birga, qonunchilikka bo‘lgan ishonchini ham mustahkamlaydi. Umuman olganda, oilaviy baholash va profilaktika modellarini rivojlantirish nafaqat huquqiy tizim samaradorligini oshiradi, balki jamiyatda adolat, qonun ustuvorligi va ijtimoiy barqarorlikni ta’minlashga xizmat qiladi.

FOYDALANILGAN ADABIYOTLAR RO‘YXATI:

1. O‘zbekiston Respublikasi Konstitutsiyasi. – Toshkent: “Yangi asr avlodi”, 2023.
2. O‘zbekiston Respublikasining Jinoyat kodeksi. – Toshkent: “Adolat” nashriyoti, 2024.
3. O‘zbekiston Respublikasining Oila kodeksi. – Toshkent: “Adolat” nashriyoti, 2023.
4. O‘zbekiston Respublikasining “Huquqbuzarliklar profilaktikasi to‘g‘risida”gi Qonuni. – Toshkent, 2014.
5. Burxonov A.E. Oila institutida huquqiy mas’uliyat va voyaga yetmaganlar kriminogen faolligi munosabatlari. // O‘zA ilmiy tahlili, 2026.
6. Ubaydullayev M.A. Yoshlar o‘rtasida jinoyatchilik profilaktikasida oilaviy huquqiy komplaens asoslari. // Ilmiy-ommabop maqolalar bazasi, 2025.
7. Nazarov Sh.H. Voyaga yetmaganlar xulq-atvorini oilaviy nazorat qilishning huquqiy muammolari. // inLibrary: Iqtisodiyot va innovatsion texnologiyalar, 2026.
8. Saidov D.A. Oilada huquqiy tarbiya va yosh avlod huquqiy ongini yuksaltirish prinsiplari. // Yurist axborotnomasi (Lawyer Herald), 2024.
9. Rajapov X.B. Nosog‘lom oilaviy muhitdagi voyaga yetmaganlarni ijtimoiy reabilitatsiya qilish algoritmlari. // Elektron tahliliy jurnal, 2026.
10. Ergashev I.R. Ota-onalar huquqiy majburiyatlari bajarilishini sotsiologik-matematik modellar asosida baholash. // Raqamli boshqaruv muammolari, 2025.
11. Huquqbuzarliklar profilaktikasi organlari ilmiy-metodologik markazi. Oilaviy profilaktika va yoshlar tarbiyasi metodologiyasi. – Toshkent, 2025.
12. Toshkent davlat yuridik universiteti mualliflar jamoasi. Oila huquqi sharoitida voyaga yetmaganlar huquqlarini himoya qilish va profilaktika. Darslik. – Toshkent, 2023.

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Gold and Cotton Price Shocks, Exports and International Reserves in a Gold-Dependent Economy: Evidence from Uzbekistan

Farmonov Bobur Davronovich

Tashkent State University of Economics, Tashkent, Uzbekistan Senior Lecturer of the Department Econometrics

fbobur513@gmail.com, ORCID:0009-0002-3696-7072

Sabirov Karimjon Kabiljanovich

Associate Professor of the Department Econometrics

karimjonsabirov80@gmail.com, ORCID: 0000-0001-8573-2734

Raxmonov Mirvoxid Rajabovich

Associate Professor of the Department Econometrics

mir.raxmonov@tsue.uz, ORCID: 0009-0001-5375-2156

Abstract

Uzbekistan holds one of the most gold-intensive reserve portfolios in the world: monetary gold rose from 71% of official reserves in January 2024 to 90% in October 2026, and gold accounted for 21–33% of exports in 2021–2025. This paper quantifies how world gold and cotton price shocks transmit to the country's exports and international reserves and provides calibrated probabilistic forecasts of reserves to end-2027. Using official monthly export data by SITC section (2021–2026), Central Bank reserve statistics and IMF and World Bank price series, we combine an exact price–volume decomposition of reserves, a dynamic reserve-growth regression for 2002–2025, an ARDL model of textile exports and a stationary block-bootstrap simulation with split-conformal calibration. Price valuation explains 76% of the USD 32.0 billion increase in reserves between January 2024 and October 2026, and the short-run elasticity of reserves to the gold price nearly doubled after 2017 (from 0.49 to 0.90). The dynamic model outperforms an autoregressive benchmark out of sample (RMSE 0.068 vs 0.140; Diebold–Mariano −2.22). Gold export volumes respond to the Central Bank's allocation between sales and accumulation rather than to prices, whereas cotton prices pass through to textile exports with a long-run elasticity of

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0.28. The calibrated 90% interval for reserves at end-2027 is USD 49.7–105.8 billion around a median of 71.6 billion; a 20% gold price fall would reduce reserves by about USD 12 billion. The results call for explicit gold-concentration limits and a rules-based allocation framework for domestic gold purchases.

Keywords

commodity price shocks; gold reserves; reserve adequacy; valuation effects; probabilistic forecasting; conformal prediction; Uzbekistan.

1. Introduction

Background. Commodity-exporting economies are exposed to world price swings through two channels: the value of export receipts and the value of official reserves. For most exporters only the first channel matters. Uzbekistan is unusual because the same commodity — gold — dominates both. The country is a large gold producer, the Central Bank buys domestic output, and it either exports the metal or keeps it as reserves. On 1 January 2026 reserves reached USD 66.3 billion, of which USD 55.1 billion was monetary gold [1]. By 1 October 2026 gold made up 90% of reserves, and a single month of price correction reduced reserves by USD 5.5 billion [2].

Research problem. Concentration of this degree makes reserve adequacy dependent on a highly volatile asset price. Gold exports, meanwhile, ranged between 21% and 33% of total exports in 2021–2025 [3] but collapsed by 70% in January–September 2026 despite record prices. Cotton, historically the second strategic commodity, now enters exports mainly through textiles. Policymakers therefore need to know how much of the recent reserve boom is valuation rather than accumulation, how strongly prices transmit to exports, and how large the downside risk to reserves is.

Research gap. The literature on commodity shocks focuses on output, fiscal outcomes and growth [4–6], and the reserve literature studies optimal reserve levels [7, 8]. The valuation risk of reserves invested predominantly in gold, and the interaction between a central bank's gold purchases and gold exports, has received little attention. To our knowledge, no study quantifies these channels for Uzbekistan with recent official data or provides calibrated probabilistic forecasts of its reserves.

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Aim and objectives. The aim is to quantify the transmission of world gold and cotton price shocks to Uzbekistan's exports and international reserves and to assess reserve risk to end-2027. The objectives are: (i) to decompose recent reserve changes into price and volume effects; (ii) to estimate the elasticity of reserves to gold and cotton prices and test whether it has changed over time; (iii) to estimate price transmission to gold and textile exports; and (iv) to produce calibrated probabilistic forecasts and stress tests of reserves.

Hypotheses. H1: valuation effects account for most of the recent growth in reserves. H2: the elasticity of reserves to the gold price increased as the gold share of reserves rose. H3: gold export volumes are driven by allocation decisions rather than by prices. H4: cotton prices pass through positively to textile exports.

Contribution. The paper makes three contributions. First, it provides an exact price–volume decomposition of a gold-dominated reserve portfolio using monthly central bank data. Second, it documents a structural increase in reserve sensitivity to gold prices and links it to the allocation trade-off between gold sales and accumulation. Third, it applies split-conformal calibration to bootstrap forecasts, which corrects the under-coverage typical of commodity price simulations and yields a Reserves-at-Risk measure with verified out-of-sample coverage.

The rest of the paper is organised as follows. Section 2 reviews the literature, Section 3 describes data and methods, Section 4 reports results, Section 5 discusses implications, and Section 6 concludes.

2. Literature Review

Commodity shocks and the macroeconomy. Deaton [4] showed that commodity price volatility is a central obstacle to macroeconomic management in commodity-dependent economies. Cashin et al. [5] documented that price slumps last longer than booms, so exporters face asymmetric downside risk. Volatility itself, rather than resource abundance, harms growth [9], and commodity booms raise output only in the short run while slumps have persistent negative effects [6]. Kilian [10] demonstrated that the macroeconomic effect of a commodity price change depends

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on whether it is driven by demand or supply, and Arezki et al. [11] found that commodity prices are subject to multiple structural breaks, which complicates long-horizon forecasting.

International reserves. Reserve accumulation in emerging markets is explained by precautionary and mercantilist motives [7] and by financial stability considerations [12]. Jeanne and Rancière [8] derived an optimal reserve level as insurance against sudden stops, and the IMF reserve adequacy framework [13] benchmarks reserves against short-term debt, imports and broad money. These frameworks assume that the reserve portfolio has stable value; they rarely consider portfolios in which a single volatile asset accounts for most of the holdings.

Gold as a reserve asset. Gold acts as a hedge against equities and as a safe haven during market stress [14, 15], which supports its role in reserves. However, a hedge for a global investor is not necessarily a stabiliser for a country whose exports and reserves are both priced in gold. For a gold producer, the same price fall reduces export receipts and the value of reserves simultaneously.

Methods. When levels are not cointegrated, the bounds testing approach of Pesaran et al. [16] supports modelling in growth rates, and Newey–West standard errors [17] address residual autocorrelation in small samples. Forecasts are compared with the Diebold–Mariano test [18]. For price risk, the stationary bootstrap [19] preserves volatility clustering and fat tails without imposing a parametric distribution. Conformal prediction [20, 21] adds finite-sample coverage guarantees by rescaling forecast intervals with out-of-sample non-conformity scores.

Gap. Existing studies do not combine reserve valuation, export transmission and calibrated reserve risk for a gold-producing central bank. This paper fills that gap for Uzbekistan.

3. Data and Methodology

3.1. Data. All data come from official open sources (Table 1). Gold exports are measured by SITC section 9 (commodities and transactions not classified elsewhere), which for Uzbekistan consists almost entirely of non-monetary gold; textiles are

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represented by SITC section 6. The SIAT series are year-to-date cumulative values and were converted into monthly flows. Annual reserves for 2000–2023 come from the IMF, and values for 2024–2026 from the Central Bank of Uzbekistan (CBU), which also reports gold volumes in troy ounces.

Table 1. Data and sources

Variable	Frequency, period	Unit	Source
Gold price	Monthly, 2000M01–2026M09	USD per troy oz	World Bank / LBMA [22]
Cotton price	Monthly, 2000M01–2026M09	US cents per lb	IMF via FRED [23, 24]
Exports by SITC section	Monthly, 2021M01–2026M09	USD million	SIAT, National Statistics Committee [3]
International reserves	Annual, 2000–2025	USD million	IMF REO [25]; CBU [26]
Reserve composition, gold volume	Monthly, 2024M01–2026M10	USD million; mn troy oz	CBU [26]; press reports of CBU data [1, 2, 27, 28]

3.2. Reserve identity and decomposition

Official reserves R_t consist of monetary gold, valued at the market price P_t times the volume Q_t, and non-gold assets F_t (foreign currency, securities and SDR):

$$R_t = P_t Q_t + F_t \quad (1)$$

The change in gold holdings between two observations is decomposed with the midpoint (Bennet) formula, which is exact and symmetric:

$$\Delta(P_t Q_t) = \Delta P_t \cdot \frac{Q_{t-1}+Q_t}{2} + \Delta Q_t \cdot \frac{P_{t-1}+P_t}{2} \quad (2)$$

The first term is the valuation (price) effect and the second is the volume effect from net gold purchases.

3.3. Reserve elasticity model

Because reserves and gold prices are integrated and the bounds test [16] does not

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support a level relationship (F = 3.29, below the lower critical bound), the elasticity of reserves is estimated in growth rates with a lagged dependent variable:

$$\Delta \ln R_t = \alpha + \beta \Delta \ln P_t^g + \gamma \Delta \ln P_t^c + \rho \Delta \ln R_{t-1} + \varepsilon_t \quad (3)$$

where the superscripts g and c denote the year-end gold price and the annual average cotton price. The long-run elasticity and its delta-method variance are:

$$\theta = \frac{\beta}{1-\rho}, \quad Var(\theta) \approx \nabla\theta' \Sigma \nabla\theta \quad (4)$$

To test H2, the gold coefficient is allowed to shift after 2017, when Uzbekistan liberalised its foreign exchange market:

$$\Delta \ln R_t = \alpha + \beta_1 \Delta \ln P_t^g + \beta_2 \left(\Delta \ln P_t^g \times D_t\right) + \eta D_t + \gamma \Delta \ln P_t^c + \rho \Delta \ln R_{t-1} + u_t \quad (5)$$

where D_t = 1 from 2017. Standard errors are Newey–West [17]. Forecast accuracy is assessed with recursive one-step forecasts for 2012–2025 and the Diebold–Mariano test [18] against AR(1) and drift benchmarks.

3.4. Export transmission

Gold exports are lumpy because the CBU sells gold in large blocks, so they are analysed at quarterly frequency (2021Q1–2026Q3). The implied export volume is the export value divided by the average price. Textile exports respond to cotton prices with a distributed lag:

$$\ln X_q^T = a_0 + c_0 \ln P_q^c + c_1 \ln P_{q-1}^c + \tau q + sQ4_q + u_q \quad (6)$$

with long-run pass-through c0 + c1.

3.5. Probabilistic forecasts and Reserves-at-Risk

Future gold prices are simulated from 20,000 paths of demeaned monthly log returns drawn with the stationary block bootstrap [19] (mean block length 12 months), which preserves volatility clustering and momentum:

$$P_{t+h}^{(n)} = P_t \cdot exp\left(\sum_{j=1}^{h} r_{t+j}^{*(n)}\right), \quad n = 1, \ldots, N \quad (7)$$

Raw bootstrap intervals under-cover realised outcomes because commodity prices trend in regimes. We therefore apply split-conformal calibration [20, 21]: for rolling forecast origins we compute the normalised non-conformity score s, and quantiles are

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rescaled around the median m:

$$\tilde{q}_p = m + k_\alpha(q_p - m), \quad k_\alpha = Q_{1-\alpha}(s_1, \ldots, s_M) \tag{8}$$

Reserves are then obtained from identity (1) with gold volume growing at the 2024–2026 median net purchase rate (0.08 million oz per month) and non-gold assets held at their 1 October 2026 level. The Reserves-at-Risk at level α is the α-quantile of the predictive distribution:

$$RaR_{\alpha,t+h} = Q_\alpha(R_{t+h}|\Omega_t) \tag{9}$$

All computations were performed in Python 3 (pandas, statsmodels, NumPy, matplotlib).

4. Results

4.1. Stylised facts. Gold prices quadrupled from about USD 1,200 per ounce in 2016–2018 to a peak above USD 5,000 in early 2026, while cotton prices fluctuated around 70–100 cents per pound with spikes in 2011 and 2022 (Figure 1). The two prices are almost uncorrelated (monthly return correlation 0.03), and their annualised volatilities are 12.9% for gold and 19.6% for cotton.

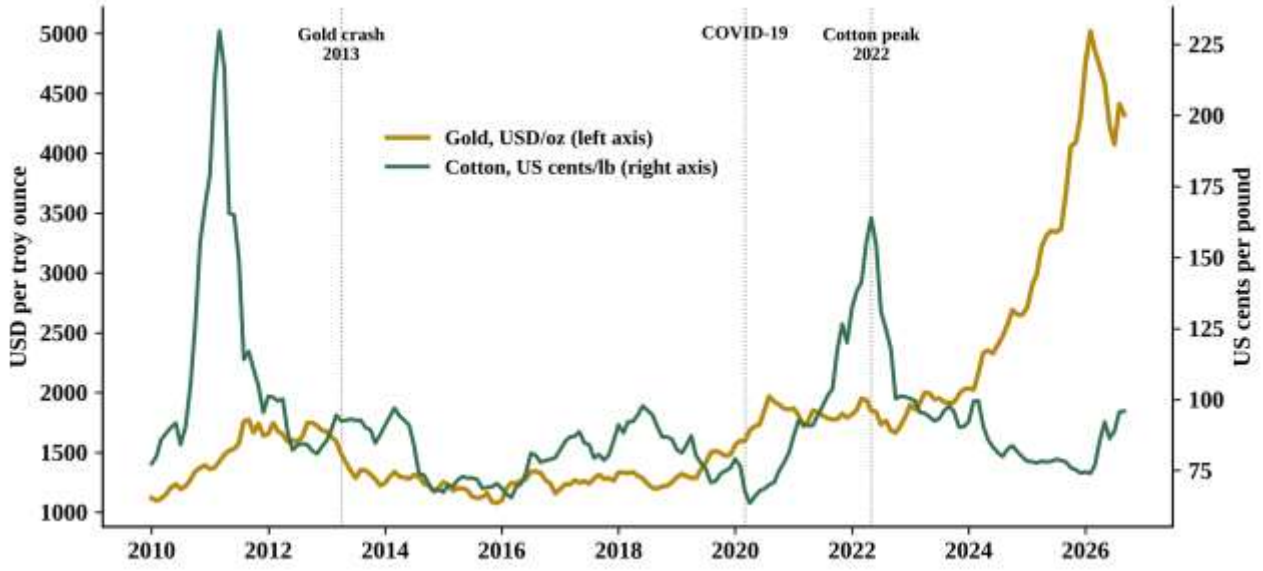


Figure 1. World gold and cotton prices, 2010–2026 (monthly)

Total exports doubled from USD 16.7 billion in 2021 to USD 34.2 billion in 2025, with gold accounting for 21–33% (Figure 2). In January–September 2026 gold exports fell to USD 3.0 billion from USD 9.9 billion a year earlier, cutting their share

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to 12% even though the average gold price was 42% higher. SITC 6 exports, dominated by cotton yarn and fabrics, remained stable at about USD 4 billion per year.

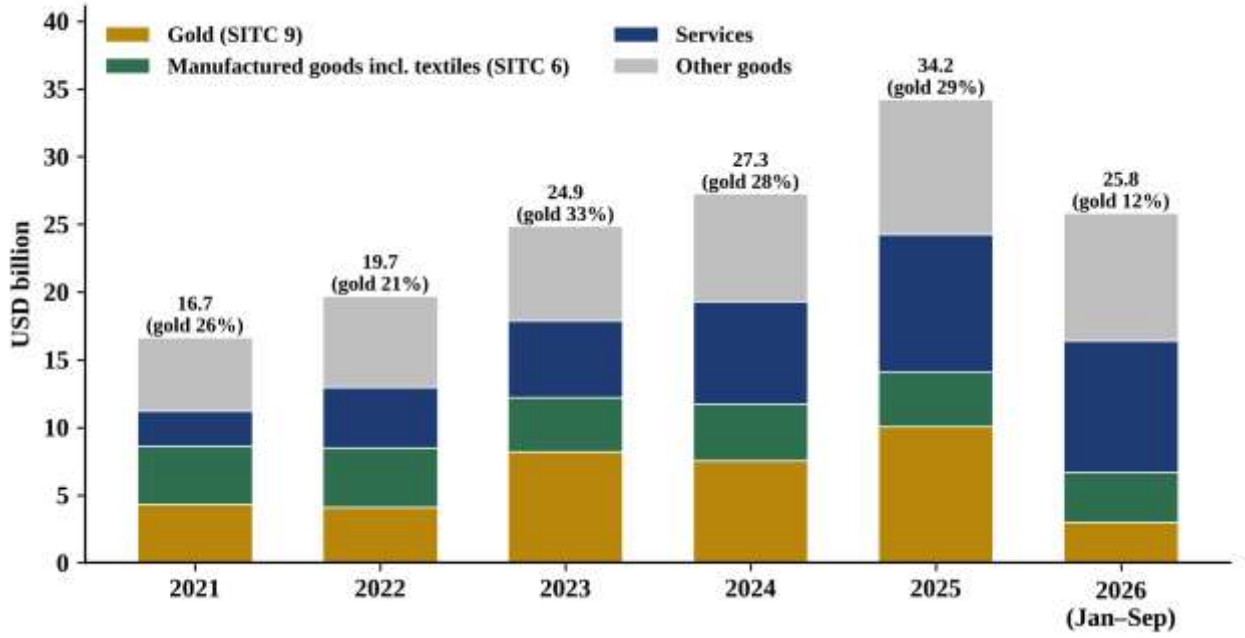


Figure 2. Structure of Uzbekistan's exports, 2021–2026, USD billion

The reserve portfolio has become increasingly concentrated in gold (Figure 3). The gold share rose from 71% on 1 January 2024 to 90% on 1 October 2026, while non-gold assets fell from USD 9.9 billion to USD 6.5 billion.

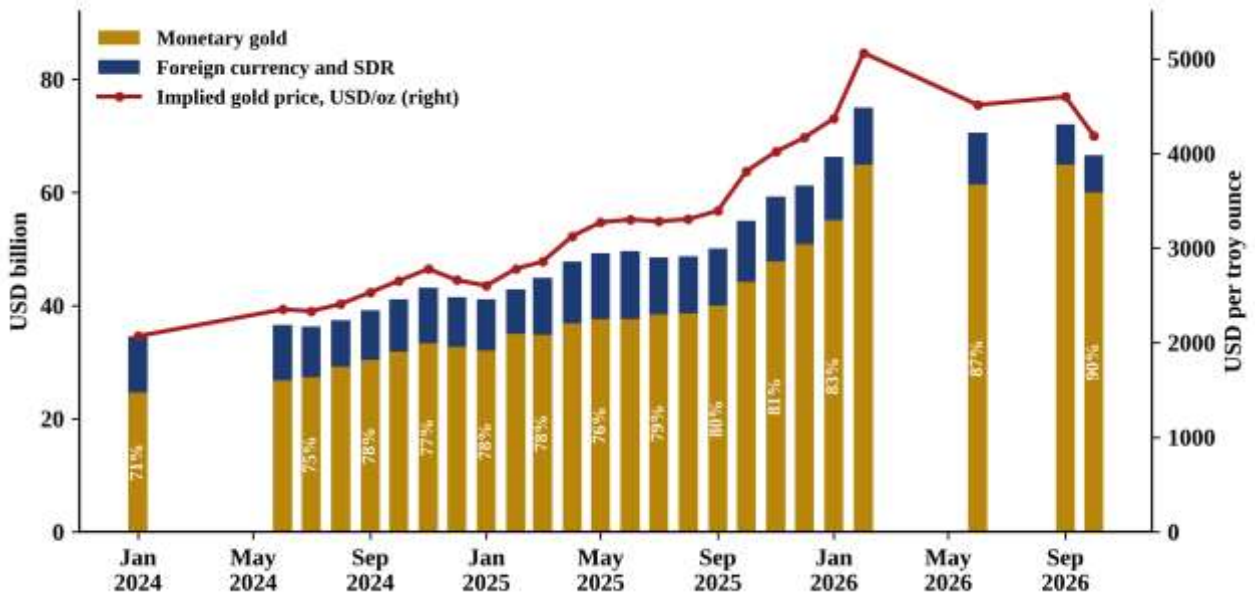


Figure 3. Composition of international reserves and the implied gold price, 2024–2026

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4.2. Decomposition of reserve changes

Between 1 January 2024 and 1 October 2026 reserves increased by USD 32.0 billion. Applying (2) to consecutive observations, the valuation effect contributed USD 24.3 billion (76%), net gold purchases USD 11.1 billion (35%), and non-gold assets declined by USD 3.4 billion (Figure 4). H1 is therefore supported: most of the reserve accumulation reflects the gold price rather than new purchases.

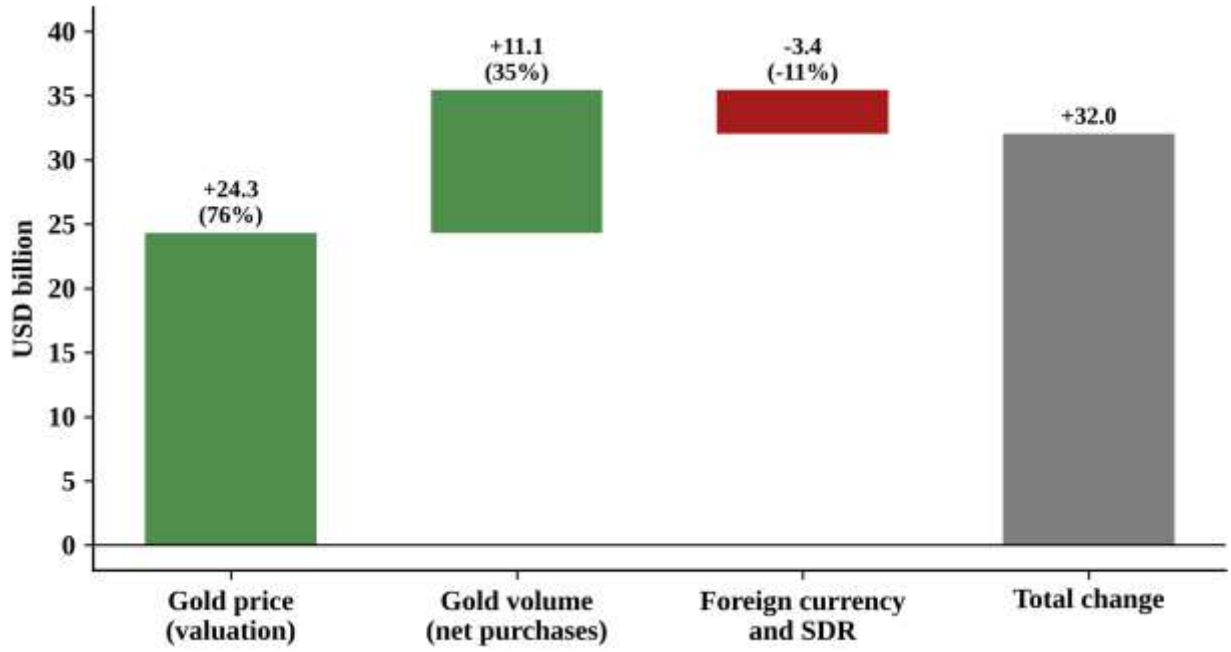


Figure 4. Decomposition of the change in reserves, 1 Jan 2024 – 1 Oct 2026, USD billion

4.3. Elasticity of reserves to commodity prices

KPSS tests [29] reject stationarity of log reserves and log gold prices in levels ($p = 0.01$ and 0.048) but not in first differences ($p \geq 0.10$). Table 2 reports estimates of equations (3) and (5).

Table 2. Determinants of reserve growth, 2002–2025 (dependent variable: Δln R)

Variable	Model (3)	Model (5): break in 2017
Δln gold price	0.608*** (0.101)	0.487*** (0.103)
Δln gold price × D2017	—	0.412*** (0.120)
D2017	—	−0.114*** (0.026)

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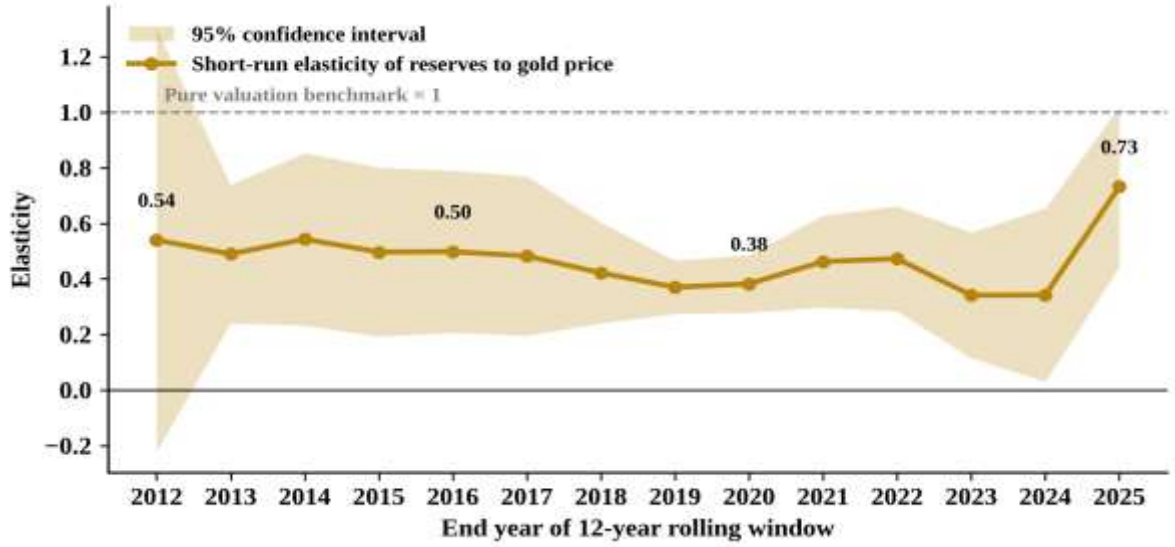
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Variable	Model (3)	Model (5): break in 2017
Δln cotton price	−0.024 (0.073)	0.032 (0.077)
Δln R(t−1)	0.626*** (0.102)	0.532*** (0.105)
Constant	0.007 (0.022)	0.054** (0.022)
Long-run gold elasticity θ	1.62*** (0.55)	—
Gold elasticity after 2017 (β1 + β2)	—	0.90
R^2	0.754	—
Observations	24	24
Jarque–Bera / Breusch–Godfrey(1) / Breusch–Pagan, p	0.71 / 0.39 / 0.62	—

*Note: Newey–West standard errors in parentheses. *** p < 0.01; ** p < 0.05. Source: author's calculations.*

A 10% rise in the gold price raises reserve growth by 6.1% on impact and by 16.2% in the long run, reflecting both valuation and the tendency to accumulate gold when prices rise. The short-run elasticity increased from 0.49 before 2017 to 0.90 afterwards, close to the pure-valuation benchmark of one, so H2 is supported. Cotton prices have no significant effect on reserves. The rolling estimates in Figure 5 show a stable elasticity of 0.34–0.54 in windows ending before 2025 and a jump to 0.73 in the window ending in 2025, when gold reached 83% of reserves.



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Figure 5. Rolling 12-year estimates of the short-run elasticity of reserves to the gold price

In recursive out-of-sample forecasts for 2012–2025, conditional on realised prices, model (3) achieves an RMSE of 0.068 in log points, compared with 0.140 for an AR(1) benchmark and 0.178 for a drift model. The Diebold–Mariano statistic of −2.22 rejects equal accuracy relative to AR(1) at the 5% level.

4.4. Transmission to exports. Gold exports and reserve accumulation are two uses of the same domestic gold flow. Table 3 shows that the combined absorption was stable at about 108–114 tonnes per year in 2024–2025, but the allocation shifted sharply in 2026: the CBU added 54 tonnes to reserves and exported only 21 tonnes in January–September.

Table 3. Allocation of gold between exports and reserves

Period	Exports, t	Change in reserves, t	Total absorption, t	Export share, %	Gold exports, USD bn	Average price, USD/oz
2024	101.1	12.4	113.5	89.0	7.6	2,388
2025	98.7	9.3	108.0	91.4	10.1	3,442
2026 (Jan–Sep)	21.4	54.1	75.5	28.3	3.0	4,552

Consistent with this, the quarterly elasticity of gold export volumes to the gold price is statistically zero (0.51, SE 1.60), so H3 is supported: gold price shocks pass through to export values roughly one-for-one, but volumes are set by the allocation decision. For textiles, model (6) yields an impact elasticity of 0.72 (SE 0.17) and a lagged coefficient of −0.44 (SE 0.13), giving a long-run pass-through of 0.28 (SE 0.13, $R^2 = 0.43$, N = 22). H4 is supported: a 20% fall in cotton prices lowers textile exports by about 6% in the long run.

4.5. Probabilistic forecasts and stress tests

Before calibration, the bootstrap 50% and 90% intervals for 12-month gold returns covered only 41% and 66% of realised outcomes at 83 rolling origins (2005–2025).

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After split-conformal calibration on origins up to 2015, coverage on the 2016–2025 test origins rose to 69% and 95%, matching or exceeding nominal levels. The final scaling factors are k50 = 1.55 and k90 = 1.52.

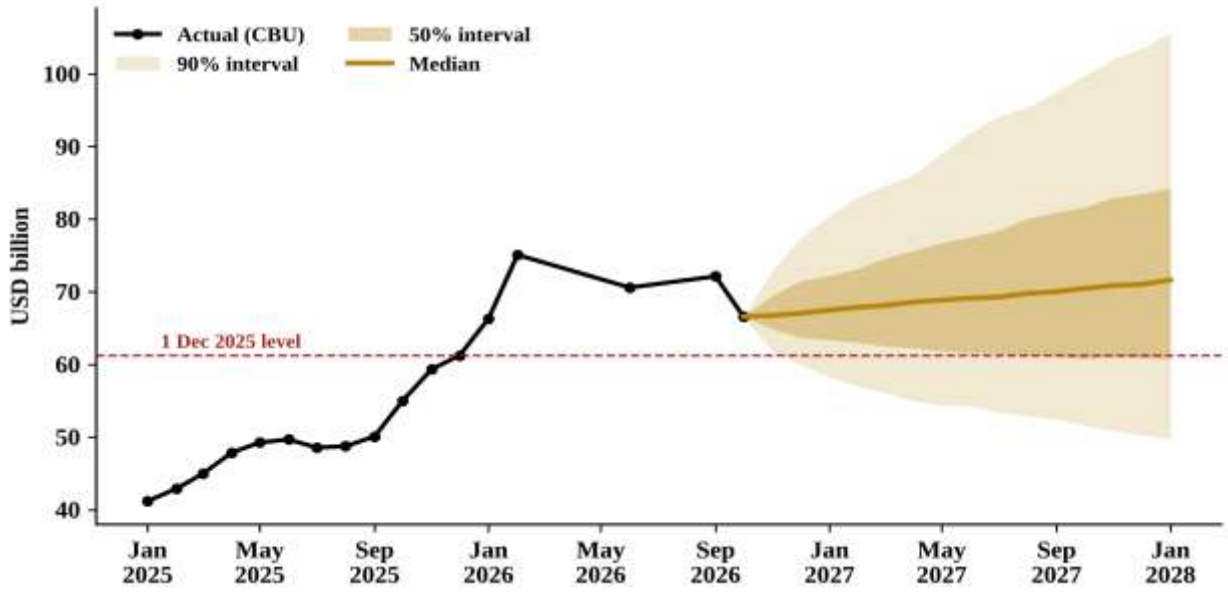


Figure 6. Calibrated probabilistic forecast of international reserves to December 2027

The median forecast of reserves is USD 67.5 billion at end-2026 and USD 71.6 billion at end-2027, with calibrated 90% intervals of USD 58.2–80.4 billion and USD 49.7–105.8 billion respectively (Figure 6). The 5% Reserves-at-Risk for December 2027 is therefore USD 49.7 billion, about 25% below the October 2026 level. Table 4 reports deterministic stress scenarios.

Table 4. Stress scenarios: instantaneous gold and cotton price shocks from 1 October 2026

Price shock	Gold reserves, USD bn	Total reserves, USD bn	Gold exports at 2025 volume, USD bn	Textile exports, long-run change, %
−30%	42.1	48.6	9.3	−9.5
−20%	48.1	54.6	10.6	−6.1
−10%	54.1	60.6	12.0	−2.9

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Price shock	Gold reserves, USD bn	Total reserves, USD bn	Gold exports at 2025 volume, USD bn	Textile exports, long-run change, %
Baseline	60.1	66.6	13.3	0.0
+10%	66.1	72.6	14.6	+2.7
+20%	72.1	78.6	16.0	+5.2

Note: the gold shock applies to gold reserves and gold exports; the cotton shock of the same size applies to textile exports via the long-run elasticity from model (6).

A 30% gold price decline, similar in magnitude to the 2013 crash, would reduce reserves by USD 18.0 billion and lower gold export receipts at 2025 volumes by USD 4.0 billion. Each 10% change in the gold price moves reserves by about USD 6.0 billion.

5. Discussion

The results show that Uzbekistan's recent reserve boom is primarily a valuation phenomenon. This matters for reserve adequacy assessment [8, 13]: reserves measured at peak gold prices overstate the buffer available in a downturn, because the scenarios in which reserves are needed — external shocks and sudden stops — are not necessarily those in which gold prices rise. Gold does act as a safe haven in global equity sell-offs [14, 15], but our calibrated forecasts show that a 5% tail outcome would remove a quarter of reserves within 15 months.

The rising elasticity of reserves to gold prices is consistent with the literature on commodity concentration and volatility [6, 9]. As gold rose from 71% to 90% of reserves, the portfolio's sensitivity converged towards one. Unlike exporters exposed through trade only [4, 5], Uzbekistan faces a double exposure: a price fall simultaneously lowers export receipts and reserve values. The 2026 shift from exporting to accumulating gold intensified the reserve channel and weakened the export channel. It supported the reserve stock but reduced foreign currency inflows, and non-gold reserves fell from USD 11.2 billion in January 2026 to USD 6.5 billion in October 2026.

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For cotton, transmission now works through textiles rather than raw fibre: SITC 2 raw materials accounted for only USD 0.3 billion of exports in 2025. The positive but incomplete pass-through (0.28) suggests that processors absorb part of world price movements through margins, which partially insulates the economy from cotton shocks.

Policy implications. Four measures follow from the evidence:

Concentration limits. Adopt an explicit ceiling or target range for the gold share of reserves and rebalance gradually towards liquid foreign currency assets when the share exceeds it.

Rules-based allocation. Make the split of domestic gold purchases between exports and reserves rule-based (for example, linked to the non-gold reserve level and the current account), which would stabilise both export receipts and liquid reserves.

Risk-based reporting. Publish Reserves-at-Risk and stress-test indicators alongside headline reserves so that markets and policymakers assess reserves net of valuation risk.

Hedging. Consider partial hedging of gold price risk or a gradual increase in gold sales when prices are far above their historical trend.

Limitations. Monthly reserve composition is available only from 2024, so the decomposition covers a period of rising prices; the annual reserve model has 24 observations; SITC 9 may include small non-gold items; and export volumes are inferred from values and average prices. The forecasts are conditional on unchanged non-gold reserves and a constant gold accumulation rate. Future work could use high-frequency data on CBU gold transactions and structural identification of price shocks [10].

6. Conclusion

Gold price shocks are the dominant external risk for Uzbekistan's international reserves. Valuation explains 76% of the USD 32.0 billion reserve increase in 2024–2026, and the elasticity of reserves to gold prices rose from 0.49 to 0.90 after 2017. Gold export volumes reflect the Central Bank's allocation between sales and

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accumulation rather than prices, while cotton prices transmit to textile exports with a long-run elasticity of 0.28. Calibrated forecasts put reserves at USD 71.6 billion by end-2027 with a 5% Reserves-at-Risk of USD 49.7 billion. Concentration limits, a rules-based gold allocation framework and risk-based reserve reporting would reduce the vulnerability of the economy to gold price reversals.

References

[1] Kun.uz. Uzbekistan's gold holdings drive reserves to historic highs. 9 Jan 2026. Available from: https://kun.uz/en/news/2026/01/09/uzbekistans-gold-holdings-drive-reserves-to-historic-highs

[2] Spot.uz. Uzbekistan's international reserves fall by $5.5 billion in September to below $67 billion. 9 Oct 2026. Available from: https://www.spot.uz/en/2026/10/09/gold-reserves

[3] National Statistics Committee of the Republic of Uzbekistan. Structure of exports (SITC-2008), monthly, indicator 1.08.02.0039. SIAT; 2026. Available from: https://api.siat.stat.uz/media /uploads/sdmx/sdmx _data_3082.pdf

[4] Deaton A. Commodity prices and growth in Africa. Journal of Economic Perspectives. 1999;13(3):23–40.

[5] Cashin P, McDermott CJ, Scott A. Booms and slumps in world commodity prices. Journal of Development Economics. 2002;69(1):277–296.

[6] Collier P, Goderis B. Commodity prices and growth: An empirical investigation. European Economic Review. 2012;56(6):1241–1260.

[7] Aizenman J, Lee J. International reserves: Precautionary versus mercantilist views, theory and evidence. Open Economies Review. 2007;18(2):191–214.

[8] Jeanne O, Rancière R. The optimal level of international reserves for emerging market countries: A new formula and some applications. Economic Journal. 2011;121(555):905–930.

[9] van der Ploeg F, Poelhekke S. Volatility and the natural resource curse. Oxford Economic Papers. 2009;61(4):727–760.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 27.10.2026
PUBLISHED: 27.10.2026

[10] Kilian L. Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. American Economic Review. 2009;99(3):1053–1069.

[11] Arezki R, Hadri K, Loungani P, Rao Y. Testing the Prebisch–Singer hypothesis since 1650: Evidence from panel techniques that allow for multiple breaks. Journal of International Money and Finance. 2014;42:208–223.

[12] Obstfeld M, Shambaugh JC, Taylor AM. Financial stability, the trilemma, and international reserves. American Economic Journal: Macroeconomics. 2010;2(2):57–94.

[13] International Monetary Fund. Assessing reserve adequacy. IMF Policy Paper. Washington, DC: IMF; 2011.

[14] Baur DG, Lucey BM. Is gold a hedge or a safe haven? An analysis of stocks, bonds and gold. Financial Review. 2010;45(2):217–229.

[15] Baur DG, McDermott TK. Is gold a safe haven? International evidence. Journal of Banking & Finance. 2010;34(8):1886–1898.

[16] Pesaran MH, Shin Y, Smith RJ. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics. 2001;16(3):289–326.

[17] Newey WK, West KD. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. Econometrica. 1987;55(3):703–708.

[18] Diebold FX, Mariano RS. Comparing predictive accuracy. Journal of Business & Economic Statistics. 1995;13(3):253–263.

[19] Politis DN, Romano JP. The stationary bootstrap. Journal of the American Statistical Association. 1994;89(428):1303–1313.

[20] Vovk V, Gammerman A, Shafer G. Algorithmic learning in a random world. New York: Springer; 2005.

[21] Romano Y, Patterson E, Candès E. Conformalized quantile regression. Advances in Neural Information Processing Systems. 2019;32:3543–3553.

[22] World Bank / LBMA. Gold prices, monthly average, USD per troy ounce. Datahub core dataset; 2026. Available from: https://github.com/datasets/gold-prices

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 27.10.2026
PUBLISHED: 27.10.2026

[23] International Monetary Fund. Global price of cotton (PCOTTINDUSDM), US cents per pound, monthly. FRED, Federal Reserve Bank of St. Louis; 2026. Available from: https://fred.stlouisfed.org/series/PCOTTINDUSDM

[24] International Monetary Fund. Primary commodity prices, monthly, 1980–2017. Datahub core dataset; 2017. Available from: https://github.com/datasets/commodity-prices

[25] International Monetary Fund. Gross international reserves held by central bank for Uzbekistan (UZBFAFARUSD), Regional Economic Outlook. FRED; 2024. Available from: https://fred.stlouisfed.org/series/UZBFAFARUSD

[26] Central Bank of the Republic of Uzbekistan. International reserves of the Republic of Uzbekistan. Tashkent; 2026. Available from: https://cbu.uz/en/statistics/intlreserves/3110273/

[27] Kun.uz. Uzbekistan's international reserves hit record $75bn. 9 Feb 2026. Available from: https://kun.uz/en/news/2026/02/09/uzbekistans-international-reserves-hit-record-75bn

[28] Gazeta.uz. Uzbekistan's gold reserves reach record physical volume while value falls. 9 Jun 2026. Available from: https://www.gazeta.uz/en/2026/06/09/reserves/

[29] Kwiatkowski D, Phillips PCB, Schmidt P, Shin Y. Testing the null hypothesis of stationarity against the alternative of a unit root. Journal of Econometrics. 1992;54(1–3):159–178.

https://creativecommons.org/licenses/by/4.0/

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Legal protection of green spaces during construction: Challenges in Uzbekistan's legislation and prospects for improvement

Azimov Xolbek Baxtiyorovich

a second-year student at the Faculty of Criminal Justice,

Tashkent State University of Law.

Abstract

This article analyzes the legal protection of green spaces during construction, the legislation of the Republic of Uzbekistan in this field, and prospects for its improvement. In the context of expanding urban development, preserving green spaces, protecting trees and shrubs, and ensuring the environmental safety of construction projects are of particular importance. The article examines the Constitution of the Republic of Uzbekistan, the Urban Planning Code, legislation on environmental assessment and environmental impact assessment, as well as regulations governing the protection of trees and shrubs. It also addresses issues related to compliance with environmental requirements, transparency of information concerning green spaces, public participation, and liability for environmental damage. Finally, the article puts forward proposals aimed at improving the mechanisms for protecting green spaces.

Keywords

green spaces, construction, environmental law, urban planning, environmental assessment, trees and shrubs, public oversight, environmental liability.

Qurilish jarayonida yashil hududlarni huquqiy muhofaza qilish: O'zbekiston Qonunchiligining muammolari va takommillashtirish istiqbollari

Toshkent davlat yuridik universiteti Jinoiy odil sudlov fakultetining 2-kurs talabasi Azimov Xolbek Baxtiyorovich

Annotatsiya

Ushbu maqolada qurilish jarayonida yashil hududlarni huquqiy muhofaza qilish masalalari, O'zbekiston Respublikasining ushbu sohadagi qonunchiligi va uni takomillashtirish istiqbollari tahlil qilinadi. Shaharsozlik faoliyatining kengayishi

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sharoitida yashil hududlarni saqlash, daraxt va butalarni muhofaza qilish hamda qurilish loyihalarining ekologik xavfsizligini ta’minlash muhim ahamiyat kasb etadi. Maqolada O‘zbekiston Respublikasi Konstitutsiyasi, Shaharsozlik kodeksi, ekologik ekspertiza va atrof-muhitga ta’sirni baholashga oid qonunchilik hamda daraxt va butalarni muhofaza qilish tartiblari o‘rganiladi. Shuningdek, ekologik talablarning bajarilishi, yashil hududlar to‘g‘risidagi axborotning ochiqligi, jamoatchilik ishtiroki va ekologik zarar uchun javobgarlik masalalari yoritiladi. Yakunda yashil hududlarni muhofaza qilish mexanizmlarini takomillashtirishga qaratilgan takliflar ilgari suriladi.

Kalit so‘zlar: yashil hududlar, qurilish, ekologik huquq, shaharsozlik, ekologik ekspertiza, daraxt va butalar, jamoatchilik nazorati, ekologik javobgarlik.

Kirish

Bugungi kunda urbanizatsiya jarayonlarining jadallashuvi, aholi sonining o‘sishi va infratuzilma obyektlariga bo‘lgan ehtiyojning ortishi qurilish faoliyatining kengayishiga sabab bo‘lmoqda. Ushbu jarayonlar iqtisodiy va ijtimoiy rivojlanish uchun muhim bo‘lsa-da, tabiiy muhitga, xususan, shahar va aholi punktlaridagi yashil hududlarga salbiy ta’sir ko‘rsatishi mumkin. Shu sababli qurilish faoliyatida ekologik talablarni ta’minlash va yashil hududlarni huquqiy muhofaza qilish dolzarb masalalardan biri hisoblanadi.

Yashil hududlar atmosfera havosini yaxshilash, chang tarqalishini kamaytirish, shahar ekologik muvozanatini saqlash va aholiga qulay yashash muhitini yaratishda muhim o‘rin tutadi. Daraxtlar, bog‘lar, xiyobonlar va boshqa ko‘kalamzorlashtirilgan maydonlarning qisqarishi ekologik holatga hamda aholining dam olish imkoniyatlariga ta’sir qilishi mumkin. Shu bois qurilish loyihalarini amalga oshirishda mavjud yashil hududlarni saqlash, daraxtlarga zarar yetkazilishining oldini olish va ko‘kalamzorlashtirish ishlarini huquqiy jihatdan ta’minlash zarur.

O‘zbekiston Respublikasi Konstitutsiyasining 49-moddasida har kimning qulay atrof-muhitga va uning holati to‘g‘risidagi ishonchli axborotga ega bo‘lish huquqi belgilangan. Shuningdek, davlatning atrof-muhitga zararli ta’sirning oldini olish va shaharsozlik sohasida jamoatchilik nazorati uchun sharoit yaratish majburiyati

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mustahkamlangan.[1] Bu norma yashil hududlarni muhofaza qilishning konstitutsiyaviy asosini tashkil etadi.

Tadqiqotning maqsadi qurilish jarayonida yashil hududlarni huquqiy muhofaza qilishga oid O‘zbekiston qonunchiligini tahlil qilish, mavjud muammolarni aniqlash va qonunchilikni takomillashtirish bo‘yicha takliflar ishlab chiqishdan iborat.

1. Yashil hududlarni muhofaza qilishning huquqiy asoslari

O‘zbekistonda qurilish jarayonida yashil hududlarni muhofaza qilish bir nechta normativ-huquqiy hujjatlar bilan tartibga solinadi. Ular orasida Konstitutsiya, Shaharsozlik kodeksi, ekologik baholashga oid qonunchilik va daraxt hamda butalarni muhofaza qilish tartiblari muhim o‘rin egallaydi.

O‘zbekiston Respublikasi Shaharsozlik kodeksining 4-moddasida shaharsozlik faoliyatining asosiy prinsiplari, jumladan, fuqarolar salomatligini muhofaza qilish, qulay hayot faoliyati muhitini yaratish va atrof-muhitga ehtiyotkorona munosabatda bo‘lish belgilangan. Kodeksning 9-moddasida esa fuqarolarning qulay hayot faoliyati muhitiga bo‘lgan huquqi mustahkamlangan.[2] Ushbu normalar qurilish loyihalarini ishlab chiqish va amalga oshirishda ekologik manfaatlarni hisobga olish zarurligini ko‘rsatadi. Mazkur sohada O‘zbekiston Respublikasining 2025-yil 24-fevraldagi O‘RQ–1036-son “Ekologik ekspertiza, atrof-muhitga ta’sirni baholash va strategik ekologik baholash to‘g‘risida”gi Qonuni ham muhim ahamiyatga ega. Ushbu qonun rejalashtirilayotgan faoliyatning ekologik xavflarini oldindan aniqlash va ekologik talablarga muvofiqligini baholashning huquqiy asoslarini belgilaydi. Uning 4-moddasiga muvofiq, ekologik baholash faoliyat yuzasidan qaror qabul qilinishidan oldingi bosqichlarda salbiy ekologik ta’sirlarni aniqlashga qaratilgan.

Qonunning 30-moddasida shaharsozlik hujjatlari strategik ekologik baholash obyektlari qatoriga kiritilgan. Bu qoida yashil hududlarni faqat alohida qurilish maydoni darajasida emas, balki shahar va aholi punktlarini rivojlantirish rejalari doirasida ham muhofaza qilish zarurligini ko‘rsatadi. [3]

[1] O’zbekiston Respublikasi Konstitutsiyasi 30.04.2023
[2] O’zbekiston Respublikasi Shaharsozlik kodeksi 22.02.2021
[3] O‘zbekiston Respublikasining Qonuni, 24.02.2025 yildagi O‘RQ-1036-son

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Bundan tashqari, Vazirlar Mahkamasining 2022-yil 22-avgustdagi 464-son qarori bilan davlat o‘rmon fondiga kirmaydigan daraxt va butalarni ekish, parvarish qilish, xatlovdan o‘tkazish, ko‘chirib o‘tkazish hamda kompensatsiyaviy ekish tartibi belgilangan.[4] Mazkur hujjat daraxtlarni muhofaza qilish va ularga yetkazilgan zararni qoplash bilan bog‘liq munosabatlarni tartibga solishda muhim ahamiyatga ega.

2. Qurilish jarayonida yashil hududlarni muhofaza qilish muammolari

Qonunchilikda yashil hududlarni muhofaza qilishga qaratilgan normalar mavjud bo‘lsa-da, ularning samarali ijrosi bir qator huquqiy va tashkiliy masalalarga bog‘liq.

Birinchidan, qurilishdan oldin mavjud yashil hududlarning holatini to‘liq aniqlash muhimdir. Daraxtlarning soni, turi, joylashuvi va holati haqida ishonchli ma’lumotlar mavjud bo‘lmasa, qurilish natijasida yuz bergan o‘zgarishlarni baholash qiyinlashadi. Shu sababli yashil hududlarni inventarizatsiya qilish va ma’lumotlarni muntazam yangilab borish tizimini rivojlantirish lozim.

Ikkinchidan, ekologik talablarning faqat loyiha hujjatlarida aks ettirilishi yetarli emas. Qurilish davomida daraxtlarning ildiz tizimiga zarar yetishi, tuproq qatlamining buzilishi yoki yashil maydonlarning qisqarishi mumkin. Shuning uchun ekologik ekspertiza xulosalarida belgilangan talablarning amalda bajarilishini nazorat qilish muhim hisoblanadi.

Uchinchidan, jamoatchilikning qurilish loyihalari muhokamasidagi ishtiroki yashil hududlarni saqlashda muhim vositadir. Konstitutsiya va ekologik baholashga oid qonunchilik ekologik axborotdan foydalanish hamda jamoatchilik ishtirokiga huquqiy asos yaratadi. Biroq ushbu mexanizmlarning samaradorligi axborotning o‘z vaqtida, tushunarli va yetarli hajmda taqdim etilishiga bog‘liq.

To‘rtinchidan, daraxtlarga noqonuniy zarar yetkazilgan hollarda javobgarlik va zararni qoplash masalalari muhim ahamiyatga ega. Jarima yoki kompensatsiya to‘lashning o‘zi yo‘qotilgan daraxtning ekologik vazifasini darhol tiklamaydi. Shu sababli zararni qoplash bilan birga, tiklash tadbirlarining bajarilishi va ekilgan ko‘chatlarning yashab ketishi ham nazorat qilinishi maqsadga muvofiq.

[4] O‘zbekiston Respublikasi Vazirlar Mahkamasining qarori, 22.08.2022 yildagi 464-son

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Mazkur masalalar qonunchilikda umuman tartibga solish mavjud emasligini anglatmaydi. Aksincha, mavjud huquqiy normalarning o‘zaro muvofiqligi, amaliy ijrosi va nazorat samaradorligini yanada kuchaytirish zarurligini ko‘rsatadi.

3. Qonunchilikni takomillashtirish istiqbollari

Qurilish jarayonida yashil hududlarni samarali muhofaza qilish uchun quyidagi takliflarni ilgari surish mumkin.

Birinchidan, shahar va aholi punktlaridagi yashil hududlarning yagona raqamli hisobini yuritish mexanizmlarini takomillashtirish zarur. Bunda daraxtlarning joylashuvi, turi, holati va qurilish loyihalari natijasida yuz bergan o‘zgarishlar haqidagi ma’lumotlarni muntazam yangilab borish maqsadga muvofiq.

Ikkinchidan, qurilish loyihalarini ishlab chiqishda mavjud daraxtlar va ko‘kalamzorlashtirilgan maydonlarni saqlab qolish imkoniyatlarini alohida baholash kerak. Loyiha hujjatlarida saqlanadigan daraxtlar, ko‘chiriladigan o‘simliklar, yangi ekiladigan ko‘chatlar va ekologik xavflarni kamaytirish choralari aniq ko‘rsatilishi lozim.

Uchinchidan, ekologik ekspertiza xulosalarida belgilangan talablarning bajarilishini qurilishning tegishli bosqichlarida monitoring qilish tizimini kuchaytirish zarur. Bu ekologik talablarning amalda bajarilishini tekshirish va huquqbuzarliklarning oldini olishga yordam beradi.

To‘rtinchidan, qurilish loyihalariga oid ekologik axborotning ochiqligini ta’minlash va jamoatchilik muhokamalarining samaradorligini oshirish lozim. Fuqarolar loyiha hududidagi yashil maydonlarga ta’sir, ekologik baholash natijalari va ko‘kalamzorlashtirish rejalari bilan tanishish imkoniyatiga ega bo‘lishi kerak.

Beshinchidan, ekologik zarar uchun javobgarlikni qo‘llashda hududni tiklash va kompensatsiyaviy ekish natijalarini baholashga e’tibor qaratish zarur. Ekilgan ko‘chatlarning yashab ketishi va parvarish qilinishi bo‘yicha monitoringni kuchaytirish yashil hududlarni uzoq muddatli muhofaza qilishga xizmat qiladi.

Ushbu takliflarni amalga oshirishda amaldagi normativ-huquqiy hujjatlarni tahlil qilish, vakolatli organlarning vazifalarini muvofiqlashtirish va yangi talablarning mavjud tartiblar bilan uyg‘unligini ta’minlash lozim.

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Xulosa

Qurilish jarayonida yashil hududlarni huquqiy muhofaza qilish ekologik xavfsizlikni ta’minlash va barqaror shaharsozlikni rivojlantirishning muhim shartlaridan biridir. O‘zbekiston Respublikasi Konstitutsiyasi, Shaharsozlik kodeksi, ekologik ekspertiza va atrof-muhitga ta’sirni baholashga oid qonunchilik hamda daraxt va butalarni muhofaza qilish tartiblari ushbu sohaning asosiy huquqiy negizini tashkil etadi.

Tahlil shuni ko‘rsatadiki, yashil hududlarni samarali muhofaza qilish faqat qonunchilik normalarining mavjudligi bilan cheklanmaydi. Ularning amaliy ijrosi, ekologik axborotning ochiqligi, qurilish jarayonidagi nazorat va yetkazilgan zararni tiklash mexanizmlari ham muhim ahamiyatga ega.

Shu munosabat bilan yashil hududlarni raqamli hisobga olish, qurilish loyihalarida ekologik ta’sirni batafsil baholash, jamoatchilik ishtirokini kuchaytirish va kompensatsiyaviy ekish natijalarini monitoring qilish bo‘yicha mexanizmlarni takomillashtirish maqsadga muvofiq. Mazkur chora-tadbirlar qurilish faoliyati va atrof-muhitni muhofaza qilish manfaatlari o‘rtasidagi muvozanatni ta’minlashga xizmat qilishi mumkin.

Foydalanilgan adabiyotlar

1. O‘zbekiston Respublikasi Konstitutsiyasi. 2023-yil 30-apreldagi referendumda qabul qilingan tahrir. 49-modda. https://lex.uz/docs/-6445145

2. O‘zbekiston Respublikasining Shaharsozlik kodeksi. 2021-yil 22-fevral. https://lex.uz/docs/-5307951

3. O‘zbekiston Respublikasining 2025-yil 24-fevraldagi O‘RQ–1036-son “Ekologik ekspertiza, atrof-muhitga ta’sirni baholash va strategik ekologik baholash to‘g‘risida”gi Qonuni https://lex.uz/uz/docs/-7397280

4. O‘zbekiston Respublikasi Vazirlar Mahkamasining 2022-yil 22-avgustdagi 464-son “Davlat o‘rmon fondiga kirmaydigan daraxtlar va butalarni ekish, parvarish qilish va ulardan foydalanish tartibini yanada takomillashtirish to‘g‘risida”gi qarori https://lex.uz/docs/-6165732

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LEGAL PROBLEMS OF INVESTIGATING FRAUD CRIMES COMMITTED THROUGH THE INTERNET

Jabborova Shahzoda Sherzod qizi

Sarbon University, Jurisprudence Programme, First-Year Student

Mardonova Malak Lutfilla qizi

Sarbon University, Jurisprudence Programme, First-Year Student

Abstract

This article examines the legal, organizational and practical issues involved in investigating fraud committed through the Internet. It describes the main features of Internet fraud and its effects on citizens, society and digital security. Particular attention is given to identifying digital traces, obtaining and preserving electronic information, assessing its evidentiary value and documenting it in accordance with procedural requirements. The article considers the role of investigative bodies and the importance of timely cooperation with banks, financial institutions, communication providers and other relevant organizations. It analyzes legal, technical and organizational factors that influence the effectiveness of investigations and emphasizes the need to observe legality, objectivity and the rights of participants when working with digital evidence. The study also highlights the importance of improving investigators' knowledge of information technologies and practical digital-analysis skills. In addition, it considers public legal and digital literacy as an important means of preventing online fraud and encouraging timely reporting. The article identifies shortcomings in current investigative practice and proposes measures to improve investigative procedures, inter-agency cooperation, professional training and preventive awareness. The recommendations are aimed at ensuring a consistent, evidence-based investigation and protecting the rights and legitimate interests of citizens in the digital environment.

Keywords

Internet fraud, cybercrime, digital investigation, law enforcement responsibility, procedural obligation, legal education, digital environment.

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INTERNET ORQALI SODIR ETILADIGAN FIRIBGARLIK JINOYATLARINI TERGOV QILISH MUAMMOLARI

Jabborova Shahzoda Sherzod qizi

Sarbon universiteti, "Yurisprudensiya" ta'lim yo'nalishi, 1-bosqich talabasi

Mardonova Malak Lutfilla qizi

Sarbon universiteti, "Yurisprudensiya" ta'lim yo'nalishi, 1-bosqich talabasi

Annotatsiya: Mazkur maqolada internet orqali sodir etiladigan firibgarlik jinoyatlarini tergov qilish bilan bog'liq huquqiy, tashkiliy va amaliy masalalar yoritilgan. Unda internet firibgarligining o'ziga xos xususiyatlari, uning fuqarolar, jamiyat va raqamli xavfsizlikka ta'siri tahlil qilinadi. Ayniqsa, raqamli izlarni aniqlash, elektron ma'lumotlarni olish va saqlash, ularning daliliy ahamiyatini baholash hamda protsessual tartibda rasmiylashtirish jarayonlariga e'tibor qaratiladi. Maqolada tergov organlarining vazifalari, bank-moliya muassasalari, aloqa operatorlari va boshqa tashkilotlar bilan o'z vaqtida hamkorlik qilishning ahamiyati ko'rib chiqiladi. Tadqiqotda tergov samaradorligiga ta'sir etuvchi huquqiy, texnik va tashkiliy omillar o'rganilib, raqamli dalillar bilan ishlashda qonuniylik, xolislik va protsessual talablarni ta'minlash zarurligi asoslanadi. Shuningdek, tergovchilarning axborot texnologiyalari bo'yicha bilimlarini va amaliy raqamli tahlil ko'nikmalarini oshirish masalalari bayon etiladi. Aholining huquqiy hamda raqamli savodxonligini yuksaltirish internet firibgarligining oldini olishdagi muhim omil sifatida baholanadi. Maqola yakunida tergov tartiblarini takomillashtirish, idoralararo hamkorlikni kuchaytirish, kasbiy tayyorgarlikni rivojlantirish va profilaktik tushuntirish ishlarini kengaytirishga doir ilmiy-amaliy takliflar ilgari suriladi.

Kalit so'zlar: Internet firibgarligi, kiberjinoyatchilik, raqamli tergov, huquqni muhofaza qilish mas'uliyati, protsessual majburiyat, huquqiy tarbiya, raqamli muhit.

Аннотация: В статье рассматриваются правовые, организационные и практические вопросы расследования мошенничества, совершаемого через Интернет. Раскрываются характерные особенности интернет-мошенничества и его влияние на граждан, общество и цифровую безопасность. Особое внимание

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уделяется выявлению цифровых следов, получению и сохранению электронной информации, оценке её доказательственного значения и процессуальному оформлению. Анализируются задачи следственных органов и значение своевременного взаимодействия с банками, финансовыми учреждениями, операторами связи и другими организациями. В исследовании рассматриваются правовые, технические и организационные факторы, влияющие на эффективность расследования. Подчёркивается необходимость соблюдения законности, объективности, процессуальных требований и прав участников при работе с цифровыми доказательствами. Также отмечается важность повышения знаний следователей в области информационных технологий и развития практических навыков цифрового анализа. Правовая и цифровая грамотность населения рассматривается как одно из важных условий предупреждения интернет-мошенничества и своевременного обращения за защитой прав. В заключение предлагаются научно-практические меры по совершенствованию следственных процедур, укреплению межведомственного сотрудничества, повышению профессиональной подготовки и расширению профилактической работы. Реализация этих мер может способствовать более последовательному расследованию и защите законных интересов граждан в цифровой среде.

Ключевые слова: Интернет-мошенничество, киберпреступность, цифровое расследование, ответственность правоохранительных органов, процессуальная обязанность, правовое воспитание, цифровая среда.

Kirish. Bugungi kunda har qanday demokratik va huquqiy davlatning barqaror rivojlanishi, avvalo, internet makonida fuqarolarning huquq va erkinliklarini kafolatlash hamda axborot texnologiyalari yordamida sodir etiladigan jinoyatchilikning oldini olish darajasi bilan bevosita bog‘liqdir. Jamiyatda qonun ustuvorligini ta’minlash, inson huquq va erkinliklarini himoya qilish hamda raqamli adolatni qaror toptirishda jinoiy-protsessual institutlarning huquqiy asosga ega bo‘ishi muhim o‘rin tutadi. Shu sababli kiber-makonda sodir etilayotgan firibgarlik jinoyatlarini tezkor fosh etish va tergov qilish samaradorligini oshirish har bir

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davlatning strategik vazifalaridan biri hisoblanadi. Raqamli muhitda huquqiy prinsiplarga tayanib bugungi voqelikni anglash, qonunlarga nisbatan munosabat bildirish, raqamli dalillarni tahlil qilish va baholash qobiliyatidir. Tergov tizimida raqamli mas'uliyat esa amaldagi qonunlarga rioya etish, sohadagi bilimlarni kundalik tergov amaliyotida qo‘llash hamda kibermakondagi huquqiy qadriyatlarni hurmat qilish darajasini ifodalaydi. Ushbu ikki tushuncha o‘zaro uzviy bog‘liq bo‘lib, biri ikkinchisini to‘ldiradi va jamiyatda huquqiy transformatsiyani mustahkamlashga xizmat qiladi. So‘nggi yillarda O‘zbekistonda keng ko‘lamli islohotlar amalga oshirilmoqda. Xususan, internet orqali sodir etiladigan firibgarlik jinoyatlari profilaktikasini kuchaytirish hamda tergov organlarining texnik salohiyatini mustahkamlash strategiyasi doirasida raqamli davlat va shaffof jamiyat institutlarini rivojlantirishga alohida e'tibor qaratilmoqda. Bu jarayonda tergovchilarning kiber-kriminalistika sohasidagi malakasini oshirish hamda sohada huquqiy targ‘ibot ishlarini kuchaytirish dolzarb vazifaga aylangan. Chunki raqamli huquqiy madaniyat yuqori bo‘lgan jamiyatda kiber-firibgarliklar kamayadi, ijtimoiy barqarorlik mustahkamlanadi va davlat boshkaruvi samaradorligi oshadi. Shu bilan birga, bugungi globallashuv va axborot texnologiyalari rivojlanayotgan davrda kiber-makondagi ma'lumotlarga tezkor kirish imkoniyati ortgan bo‘lsa-da, ularni to‘g‘ri tushunish va protsessual amaliyotda dalil sifatida qo‘llash masalasi dolzarbligicha qolmoqda. Ayniqsa, davlat organlari va bank institutlari o‘rtasida tezkor axborot almashish mexanizmlari hamda zamonaviy raqamli profilaktika usullaridan foydalanish, ijtimoiy nazoratni kuchaytirish muhim ahamiyat kasb etadi. Mazkur maqolada internet orqali sodir etiladigan firibgarlik jinoyatlarini tergov qilishning nazariy asoslari, mavjud muammolar hamda ularni bartaraf etish yo‘llari ilmiy jihatdan tahlil qilinadi.

Adabiyotlar tahlili. Internet orqali sodir etiladigan firibgarlik jinoyatlarini tergov qilish masalasi huquqiy davlat va fuqarolik jamiyatini rivojlantirishning asosiy ilmiy-amaliy yo‘nalishlaridan biri hisoblanadi. Mavzu doirasida tahlil qilingan adabiyotlar sohadagi raqamli profilaktikaning nazariy asoslarini, davlat siyosatini va

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huquqiy tizimdagi o‘rnini qamrab oladi. Avvalo, “O‘zbekiston Respublikasi Konstitutsiyasi” [1] huquqiy davlatning asosiy poydevori sifatida fuqarolarning axborot olish va undan foydalanish huquq va erkinliklarini belgilab beradi hamda shaxsiy ma’lumotlar daxlsizligini shakllantirishning eng muhim manbasi hisoblanadi. Konstitutsiya normalari jamiyatda qonun ustuvorligini ta’minlash va kiber-makonda sog‘lom huquqiy muhitni joriy etishda asosiy huquqiy baza vazifasini bajaradi. “O‘zbekiston Respublikasining Jinoyat kodeksi” [2] internet orqali sodir etiladigan firibgarliklar (168-modda tegishli bandlari) va kiber-jinoyatlar uchun javobgarlik shartlarini belgilaydi, jinoyat-protsessual qonunchilik hujjatlari esa sohadagi munosabatlarni tartibga solib, kiber-dalillarni to‘plash tizimini yuridik jihatdan mustahkamlashga xizmat qiladi. Shuningdek, “O‘zbekiston Respublikasining Kiberxavfsizlik to‘g‘risida”gi Qonuni [3] va “Huquqbuzarliklar profilaktikasi to‘g‘risida”gi Qonuni [4] esa kiber-makonda g‘ayriijtimoiy xatti-harakatlarning barvaqt oldini olishda davlat organlari va bank-moliya muassasalari muassasalari muassasalarining hamkorlik mexanizmlarini mustahkamlaydi.

Ilmiy maqolalar tahliliga to‘xtaladigan bo‘lsak, dastlab A.E. Burxonov [5] o‘zining ilmiy ishlarida raqamli makonda huquqiy mas’uliyat tanqisligi va buning yoshlar o‘rtasida kiber-firibgarlikning ortishiga ta’siri muammolarini tizimli o‘rgangan. M.A. Ubaydullayev [6] esa raqamli muhitda ijtimoiy-huquqiy komplaens tizimlarini qo‘llash hamda tergov usullarini takomillashtirish orqali virtual makonda firibgarliklarni kamaytirishning huquqiy va amaliy afzalliklarini asoslab bergan. Bu yondashuv kiber-tergov amaliyotiga yeni konseptual qarashlarni olib kiradi. Kiber-muhitdagi g‘ayriqonuniy xulq-atvorning o‘ziga xos xususiyatlari va tergov dagi protsessual mezonlardagi kamchiliklar Sh.H. Nazarov [7] tomonidan tahlil qilingan bo‘lib, olim raqamli dalillarni rasmiylashtirishni qonunchilik prinsiplari bilan uyg‘unlashtirish zarurligini ta’kidlaydi. D.A. Saidov [8] raqamli makonda huquqiy ongi va huquqiy madaniyatni yuksaltirish prinsiplarini ilmiy jihatdan asoslab, kiber-jinoyatchilik xavfini bartaraf etish yo‘llarini ko‘rsatgan. X.B. Rajapov [9] o‘z tadqiqotlarida kiber-kriminal makonda faoliyat ko‘rsatayotgan subyektlarning

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kriminogen faollik darajasini chuqur o‘rganib, ularni profilaktik nazorat qilish va ijtimoiy reabilitatsiya algoritmlarini ishlab chiqish masalalariga alohida urg‘u beradi. Tergov tizimida raqamli texnologiyalarni qo‘llash samaradorligini matematik-statistik modellar va sotsiologik so‘rovlar asosida baholash metodologiyasi I.R. Ergashevning [10] ilmiy maqolalarida o‘z aksini topgan. Darsliklar va o‘quv qo‘llanmalari tahlilida, xususan, huquqbuzarliklar profilaktikasi organlarining ilmiy-metodik nashrida [11] raqamli dalillar bilan ishlash mexanizmlarini amaliyotga tatbiq etishning tahliliy asoslari tizimli bayon etilgan. Yuridik universitet olimlari tomonidan tayyorlangan darslikda [12] esa raqamli makonda shaxs huquqlarini himoya qilish va kiber-tergovni samarali tashkil etishning nazariy modellariga metodolik tavsif berilgan. Shunday qilib, tahlil qilingan adabiyotlar tergov tizimida raqamli texnologiyalar va mas’uliyat tizimlarini vuksalirishda quyidagi asosiy yo‘nalishlarni ajratib ko‘rsatadi: qonunchilik bazasini takomillashtirish, kiber-tergovni qo‘llab-quvvatlash bo‘yicha davlat siyosatini kuchaytirish, tergovchilarning raqamli savodxonligini oshirish hamda xalqaro kiber-tergov tajribasini keng joriy etish.

Metodologiya. Tadqiqotda quyidagi metodlardan foydalanildi:

Formal-yuridik metod orqali internet orqali sodir etiladigan firibgarlik jinoyatlarini tergov qilish amaliyotiga oid konstitutsiyaviy normalar, Jinoyat kodeksi, Jinoyat-protsessual kodeksi qoidalari hamda sohaga doir normativ-huquqiy hujjatlar o‘rganildi. Ushbu metod tergovchilarning kiber-makondagi majburiyatlarining huquqiy asoslari va raqamli dalillarni belgilash tartibini aniqlashga xizmat qildi.

Tizimli tahlil metodi yordamida internet firibgarligini tergov qilish tizimining moddiy-huquqiy va protsessual jihatlari o‘zaro bog‘liqlikda ko‘rib chiqildi. Jumladan, bank-moliya tizimi bilan hamkorlikdagi rolini aniqlash, kiber-tahdidlarga moyil resurslarni monitoring qilish, tergov organlari va kiberxavfsizlik tuzilmalari bilan hamkorlik qilish hamda sud orqali huquqiy ta’sir choralarini qo‘llash bosqichlari yagona jarayonning tarkibiy qismlari sifatida tahlil qilindi.

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Qiyosiy-huquqiy metod kiber-tergov samaradorligini oshirishning turli huquqiy mexanizmlarini o‘zaro taqqoslash, milliy va xorijiy ilg‘or tajribalarning vazifalarini farqlash uchun qo‘llanildi. Bunda xorijiy davlatlar bo‘yicha alohida empirik ma’lumotlar to‘planmaganligi sababli, xorijiy qonunchilik haqida tekshirilmagan xulosalar chiqarilmadi.

Mantiqiy tahlil metodi aniqlangan muammolar o‘rtasidagi sabab-oqibat aloqalarini ochib berish hamda raqamli dalillarni to‘plash jarayonini izchil bosqichlarga ajratish uchun ishlatildi.

Tadqiqot normativ-huquqiy hujjatlar va mavjud huquqiy-amaliy manbalarni tahlil qilishga asoslangan. Shu bois maqolada taklif etilgan model nazariy-amaliy taklif hisoblanadi; uning samaradorligi alohida statistik orqali tekshirilgani da’vo qilinmaydi.

Tahlil va natijalar. Mazkur tadqiqotda internet orqali sodir etiladigan firibgarlik jinoyatlarini tergov qilish masalalari jamiyat rivojlanishining muhim ijtimoiy-huquqiy omili sifatida har tomonlama tahlil qilindi. Tahlil natijalari shuni ko‘rsatadiki, tergov jarayonida raqamli nazorat va tezkorlik darajasi yuqori bo‘lgan tizimlarda kiber-jinoyatlar chuqur anglanadi, raqamli izlar o‘z vaqtida aniqlanadi hamda jinoiy oqibatlarning oldi olinadi. Natijada raqamli huquqiy tartib mustahkamlanadi, internetdagi firibgarliklar kamayadi va fuqarolarning axborot makoniga bo‘lgan ishonchi oshadi. Aksincha, raqamli savodxonlik va tergov nazorati darajasi past bo‘lgan sharoitlarda huquqiy befarqlik, kiber-tahdidlarga nisbatan loqaydlik hamda turli firibgarlik holatlari ko‘proq uchraydi. Tahlil jarayonida internet orqali sodir etiladigan firibgarliklarni barvaqt aniqlash va baholash mexanizmlarini shakllantirish bir martalik jarayon emas, balki uzluksiz davom etadigan tizimli faoliyat ekanligi aniqlandi. Bu jarayonda shaxsning raqamli madaniyati, bank-moliya muhiti, davlat siyosati hamda ommaviy axborot vositalari o‘zaro uzviy bog‘liq holda ta’sir ko‘rsatadi. Ayniqsa, kiber-firibgarliklarga qarshi murosasizlik kayfiyatini shakllantirishda raqamli monitoring mexanizmlari hal qiluvchi o‘rin tutadi.

Tadqiqot davomida quyidagi asosiy muammolar aniqlandi:

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— raqamli tergov va kiber-kriminalistika modellarining ko‘proq nazariy xarakterda bo‘lib, amaliy raqamli-pedagogik ko‘nikmalar yetishmasligi

— tergov organlari tomonidan bank tranzaksiyalarini to'xtatish va kiber-blokirovka qilish bo‘yicha tezkor targ‘ibot va amaliy ishlarning yetarli darajada tizimli tashkil etilmaganligi

— tergov bo‘linmalarining zamonaviy kiber-labaratoriyalar va raqamli-psixologik yordam bazasiga kirish imkoniyatlari hamma hududlarda bir xil emasligi

— tergov jarayonida banklar va provayderlar bilan tezkor integratsiyani ta’minlashga nisbatan ichki idoraviy motivatsiyaning barqaror emasligi

— zamonaviy axborot vositalaridan tergovchilarning kiber-malakasini oshirish tahlil qilishda yetarli darajada foydalanilmasligi

Shuningdek, tahlillar shuni ko‘rsatdiki, internet firibgarliklarini bartaraf etishda faqat huquqiy qoidalarni majburlash emas, balki tergov organlarining raqamli faolligi, kiber-madaniyati va texnik dunyoqarashi ham muhim ahamiyatga ega. Shu sababli tergov samaradorligini oshirish jarayoni kompleks yondashuvni talab etadi. Mazkur tadqiqotning ilmiy yangiligi shundan iboratki, internet orqali sodir etiladigan firibgarlik jinoyatlarini tergov qilish tizimi alohida yo‘nalish sifatida emas, balki kiber-texnik, huquqiy, ta’limiy va tashkiliy omillarni o‘z ichiga olgan yaxlit tizim sifatida tahlil qilindi. Bundan tashqari, kiber-firibgarlikning oldini olishda tergov mexanizmlarini rivojlantirishning zamonaviy konseptual modeli ishlab chiqildi. Ushbu model quyidagi yo‘nalishlarni o‘z ichiga oladi:

— raqamli tergov jarayonlarini tizimlashtirish va elektron intellektual kriminalistik platformalarni rivojlantirish

— interaktiv va amaliy raqamli monitoring metodlarini keng joriy etish

— tergovchilar uchun kiber-huquqiy va texnologik innovatsion loyihalar yaratish

— ommaviy axborot vositalari va ijtimoiy tarmoqlarda kiberxavfsizlik va firibgarlikdan himoyalanish kontentini kengaytirish

— tergovchilar va mutaxassislarga yo‘naltirilgan ochiq raqamli ma’lumotlar tizimini shakllantirish

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Ushbu yondashuv raqamli tergov samaradorligini nazariy qoida sifatida emas, balki amaliy hayotda qo‘llaniladigan kompetensiya sifatida shakllantirish imkonini beradi. Tadqiqot natijalariga asoslanib, internet firibgarliklarini tergov qilish bo‘yicha quyidagi kompleks va tizimli yechimlar taklif etiladi

Birinchi muammo — tergov amaliyotida kiber-tahlil va raqamli risk-menejment asoslarini o‘rgatishda amaliy metodlarning yetishmasligi. Ta’lim va malaka oshirish tizimida kiber-jinoyatlarni aniqlash tizimida amaliyotga asoslangan metodlarni keng joriy etish lozim. Real hayotiy vaziyatlar va kiber-firibgarlik muammolarini raqamli simulyatsiyalar orqali tahlil qilish tergovchilarda huquqiy-tahliliy fikrlashni rivojlantiradi.

Ikkinchi muammo — tergov organlari va bank-moliya muassasalari uchun integratsiyalashgan raqamli huquqiy-profilaktik platformaning yo‘qligi. Aholi va tergovchilarning barcha qatlamlari uchun ochiq, qulay va tushunarli “Raqamli kiber-tergov va tezkor hamkorlik platformasi”ni yaratish zarur. Ushbu platforma qonunlarni va majburiyat mezonlarini soddalashtirilgan tilda tushuntirish, onlayn maslahatlar berish va dolzarb huquqiy yangiliklarni yetkazishga xizmat qiladi.

Uchinchi muammo — tergovchilarning raqamli dunyoqarashini va texnik malakasini yuksaltirishga qaratilgan amaliy va interaktiv maydonlarning sustligi. Tergovchilarda kiber-dunyoqarashni mustahkamlash maqsadida maxsus raqamli kiber-klublar, debat maydonlari, simulyatsion jarayonlar va amaliy treninglarni tizimli ravishda tashkil etish kerak.

To‘rtinchi muammo — media makonda raqamli tergov mas’uliyati va kiber-tahdidlardan ogohlantiruvchi vizual kontentlarning yetishmasligi. Ommaviy axborot vositalari va ijtimoiy tarmoqlarda kiber-firibgarlik ssenariylari targ‘ibotini kuchaytirish, qisqa, tushunarli va vizual tahliliy kontentlarni ko‘paytirish orqali aholida raqamli daxlsizlikni va tergovga ko‘maklashish mas’uliyatini oshirish mumkin.

Beshinchi muammo — internet orqali sodir etiladigan firibgarliklarni kamaytirishda idoralararo kompleks hamkorlik tizimining mukammal emasligi.

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Davlat organlari, ta’lim muassasalari va fuqarolik jamiyati institutlari o‘rtasida o‘zaro hamkorlikni kuchaytirgan holda, kiber-firibgarliklarga qarshi qaratilgan milliy va hududiy dasturlarni ishlab chiqish hamda amalga oshirish zarur. Shunday qilib, tadqiqot natijalari kiber-tergov samaradorligini oshirish jamiyat barqarorligi va huquqiy davlat qurilishining asosiy sharti ekanligini tasdiqlaydi. Mazkur jarayon faqat davlat organlarining ichki nazorati bilan cheklanib qolmasdan, balki zamonaviy texnologiyalar yordamida jamoatchilik va fuqarolik jamiyati institutlari ishtirokida amalga oshirilgandagina yuqori samaraga erishish mumkin.

Xulosa. Xulosa qilib aytganda, internet orqali sodir etiladigan firibgarlik jinoyatlarining oldini olish va ularni samarali tergov qilish jamiyat taraqqiyoti va huquqiy davlat barpo etishning eng muhim omillaridan biri hisoblanadi. Mas’ul shaxslar va tergovchilarning raqamli nazorat hamda kiber-savodxonlik darajasi qanchalik yuqori bo‘lsa, jamiyatda qonun ustuvorligi shunchalik mustahkam bo‘ladi, kiber-makonda tartib va barqarorlik ta’minlanadi. Aksincha, raqamli monitoring mexanizmlari yetarli darajada shakllanmagan muhitda kiber-firibgarliklar, tizimli befarqlik va raqamli muammolar ko‘payadi. Tadqiqot natijalari shuni ko‘rsatdiki, internet orqali sodir etiladigan firibgarliklarni barvaqt aniqlash va baholash jarayoni uzluksuz va kompleks xususiyatga ega bo‘lib, u ta’lim tizimi, davlat siyosati, maktab va oliy ta’lim hamda ommaviy axborot vositalari bilan chambarchas bog‘liqdir. Ayniqsa, yosh avlod o‘rtasida raqamli huquqiy nazoratni kuchaytirish kelajakdagi raqamli barqarorlikni ta’minlashda muhim o‘rin tutadi. Shuningdek, tergov tizimida kiber-huquqbuzarlik xavflarini kamaytirishda zamonaviy raqamli texnologiyalardan foydalanish, interaktiv tahlil usullarini joriy etish va fuqarolarga qulay ochiq ma’lumotlar tizimini yaratish muhim ahamiyat kasb etadi. Bu esa aholining davlat apparatiga va huquqni muhofaza qiluvchi institutlarga bo‘lgan ishonchini oshirish bilan birga, qonunchilikka bo‘lgan ishonchini ham mustahkamlaydi. Umuman olganda, kiber-tergovni baholash va profilaktika modellarini rivojlantirish nafaqat huquqiy tizim samaradorligini oshiradi, balki jamiyatda adolat, qonun ustuvorligi va raqamli barqarorlikni ta’minlashga xizmat qiladi.

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FOYDALANILGAN ADABIYOTLAR RO‘YXATI:

1. O‘zbekiston Respublikasi Konstitutsiyasi. – Toshkent: “Yangi asr avlodi”, 2023.

2. O‘zbekiston Respublikasining Jinoyat kodeksi. – Toshkent: “Adolat” nashriyoti, 2024.

3. O‘zbekiston Respublikasining “Kiberxavfsizlik to‘g‘risida”gi Qonuni. – Toshkent: “Adolat” nashriyoti, 2022.

4. O‘zbekiston Respublikasining “Huquqbuzarliklar profilaktikasi to‘g‘risida”gi Qonuni. – Toshkent, 2014.

5. Burxonov A.E. Raqamli makonda huquqiy mas’uliyat tanqisligi va uning kiber-jinoyatchilik ortishiga ta’siri muammolari. // O‘zA ilmiy tahlili, 2026.

6. Ubaydullayev M.A. Raqamli muhitda ijtimoiy-huquqiy komplaens asoslari va tergov usullarini takomillashtirish. // Ilmiy-ommabop maqolalar bazasi, 2025.

7. Nazarov Sh.H. Kiber-muhitdagi g‘ayriqonuniy xulq-atvorni tergov qilish va raqamli dalillarni rasmiylashtirish muammolari. // inLibrary: Iqtisodiyot va innovatsion texnologiyalar, 2026.

8. Saidov D.A. Raqamli makonda shaxs huquqiy ongi va huquqiy madaniyatini yuksaltirish prinsiplari. // Yurist axborotnomasi (Lawyer Herald), 2024.

9. Rajapov X.B. Kiber-kriminal makonda faoliyat ko‘rsatayotgan subyektlarni profilaktik nazorat qilish va kiber-tergov algoritmlari. // Elektron tahliliy jurnal, 2026.

10. Ergashev I.R. Tergov tizimida raqamli texnologiyalarni qo‘llash samaradorligini matematik-statistik va sotsiologik modellar asosida baholash. // Raqamli boshqaruv muammolari, 2025.

11. Huquqbuzarliklar profilaktikasi organlarining ilmiy-metodik nashri. // Raqamli tergov metodologiyasi. – Toshkent, 2025.

12. Toshkent davlat yuridik universiteti mualliflar jamoasi. Raqamli makonda shaxs huquqlarini himoya qilish va kiber-tergovni sarkarli tashkil etish. Darslik. – Toshkent, 2023.

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Machine Learning for Early Detection and Progression Prediction of Global Chronic Kidney Disease: A Systematic Review of Externally Validated Models

Mohigul Xakimjon qizi Isanova

MSc Business Intelligence and Analytics, Westminster International University in Tashkent, Uzbekistan

Corresponding author: moxiigul.isanova74@gmail.com

Abstract

Background. Machine learning (ML) models for chronic kidney disease (CKD) are published in large numbers, but most are tested only on the data used to build them. Performance in new populations is what matters for clinical use.

Methods. Following PubMed/MEDLINE, IEEE Xplore and Google Scholar were searched. Eligible studies, published between January 2021 and June 2026, developed or evaluated ML models predicting incident CKD or CKD progression in adults from structured clinical data. They also had to report an area under the curve (AUC) or C-statistics for an ML model in external data, either geographic or temporal.

Results. Of 1,087 records, 155 full texts were assessed and 16 studies were included. Three predicted incident CKD and 13 predicted progressions. Thirteen final models were tree-based. Headline external AUCs or C-statistics ranged from 0.69 to 0.97 and were usually lower than internal estimates. Calibration in external data was reported in some form by eight studies, but mostly as a Brier score alone. Three studies compared ML with the Kidney Failure Risk Equation (KFRE) in the same data, with mixed results. Twelve studies were at high risk of bias and none at low risk. No study used Central Asian data or linked predictions to clinical action.

Conclusions. Externally validated ML models for CKD exist and can perform well, but small external samples, sparse calibration and few fair comparisons with the KFRE limit confidence. Local validation is needed before use in settings such as Uzbekistan.

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Keywords

chronic kidney disease, machine learning, external validation, risk prediction, kidney failure risk equation, PROBAST+AI, systematic review

1. Introduction

Chronic kidney disease affected an estimated 788 million adults in 2023, more than twice the 378 million estimated for 1990, and it is now the ninth leading cause of death worldwide (GBD 2023 Chronic Kidney Disease Collaborators, 2025). Most people with CKD are in stages that cause no symptoms. Two prediction tasks follow from this: identifying people who are about to develop CKD, and identifying, among those who already have it, the people whose kidney function will decline fastest.

For the second task clinicians already have a validated tool. The KFRE uses age, sex, estimated glomerular filtration rate (eGFR) and urine albumin-to-creatinine ratio. In 31 cohorts with 721,357 participants from more than 30 countries it reached C-statistics of 0.90 at two years and 0.88 at five years, although it overestimated risk in some cohorts outside North America (Tangri et al., 2016). The KDIGO 2024 guideline recommends using an externally validated risk equation of this kind for people with CKD G3–G5 (KDIGO CKD Work Group, 2024).

ML methods promise more: they can use many routine laboratory values, cover earlier stages and learn from repeated measurements. However, is dominated by studies that train and test on one dataset. A recent review of 20 ML studies of CKD found that those using the 400-record UCI benchmark reported accuracies of 97.5–99.8%, well above studies using hospital or cohort data (Abdelhag, 2026). Even a carefully built model on 64,059 patients with more than 3,000 features reached an AUC of only 0.743 for short-term worsening of diabetic kidney disease (Makino et al., 2019). Internal performance is therefore a poor guide to what a model will do in a new hospital or country.

This review focused on the subset of studies that matter most for practice: ML models whose performance has been tested in external data. It asked how well externally validated ML models predict incident CKD and CKD progression in

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adults, how much performance changes between development and external data, how often calibration and clinical utility are assessed, how these models compare with the KFRE, and how far they are from use in health systems such as Uzbekistan's.

2. Methods

2.1 Protocol and eligibility

The review is reported according to PRISMA 2020 (Page et al., 2021). It was not registered and no protocol was prepared in advance. Eligible studies were original, peer-reviewed English-language articles first published online between 1 January 2021 and 30 June 2026. They had to develop or evaluate a multivariable ML model (for example a tree ensemble, gradient boosting, support vector machine or neural network) on structured clinical, laboratory, claims, registry or cohort data from adults, to predict either incident CKD (new eGFR below 60 mL/min/1.73 m² or CKD G3–G5 in people without CKD at baseline) or progression of established CKD (kidney failure, kidney replacement therapy, a sustained eGFR decline or stage progression). The ML model itself had to be externally validated, either in data from a different centre, region, country or cohort (geographic validation) or in a later, non-overlapping period (temporal validation), with an AUC or C-statistic reported for that evaluation. Studies were excluded if they addressed cross-sectional diagnosis or staging of current CKD, acute kidney injury, dialysis or mortality outcomes; relied only on imaging, histology or omics inputs, or solely on the UCI CKD dataset; were reviews, preprints or letters; or took only a regression model, rather than the ML model, to external validation.

2.2 Information sources and search

The PubMed strategy was ("Renal Insufficiency, Chronic" OR "Kidney Failure, Chronic" OR "chronic kidney disease" OR CKD OR "kidney failure") AND ("Machine Learning" OR "Artificial Intelligence" OR "Neural Networks, Computer" OR "machine learning" OR "random forest" OR XGBoost OR "gradient boosting" OR "neural network") AND (predict* OR prognose* OR progression OR detect*), limited to the last five years, free full text and English. IEEE Xplore was searched

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with the equivalent command search on all meta data, limited to open-access journal articles from 2021–2026. Google Scholar was searched with “chronic kidney disease” “machine learning” “early detection” “progression and prediction” OR diagnosis (2021–2026; about 15,300 results), and the first 30 records by relevance were screened. Records published outside the eligibility window were removed before screening.

2.3 Selection, data collection and risk of bias

PubMed and IEEE records were exported and de-duplicated, titles were screened against the criteria, potentially eligible reports were assessed in full text, and every study reporting external validation received a second, focused full-text check. Data were extracted into a form based on CHARMS (Moons et al., 2014), covering data source and design, sample sizes and events, population, outcome and horizon, final model, internal and external AUC or C-statistic with 95% confidence intervals (CIs), external calibration, decision-curve analysis, explainability method and any comparison with the KFRE. Risk of bias was judged with PROBAST+AI across participants and data sources, predictors, outcome and analysis (Moons et al., 2025). A study was rated at high overall risk if any domain was high and at low risk only if all were low. No second independent reviewer was involved, and study authors were not contacted.

2.4 Synthesis

Meta-analysis was not attempted. Each study validated a different model, for different outcomes and horizons, so a pooled AUC would have no clear meaning. Studies were grouped by task (incident CKD or progression). Results were summarised as ranges, internal-to-external changes and counts of studies reporting calibration, decision-curve analysis, explainability and KFRE comparisons. Certainty was judged qualitatively from risk of bias, consistency, directness and precision.

3. Results

3.1 Study selection

The searches identified 1,087 records: 994 from PubMed, 63 from IEEE Xplore

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and 30 from Google Scholar (Figure 1). After removal of six duplicates and 128 records published outside the window, 953 records were screened and 781 were excluded. Of 172 reports sought, 17 could not be retrieved: 15 Google Scholar records had no free full text, and the full texts of two Ontario studies by Klamrowski and colleagues (2023, 2024), whose abstracts did not report external results, were inaccessible. Of the 155 reports assessed, 139 were excluded: 71 addressed diagnosis of current CKD or another outcome (most of them on UCI-type data), 40 lacked external validation of an ML model, 10 had no ML prediction model, 9 reported no AUC and 9 were excluded for other reasons. Sixteen studies were included. Several well-known models were excluded at this stage because only internal validation was reported or because the externally validated model was a regression model. These included KDpredict, whose final super-learner selected Cox models, and two studies from the earlier draft of this review (Du et al., 2024; Chen et al., 2025), whose "external" sets came from the same hospital or were not reported separately.

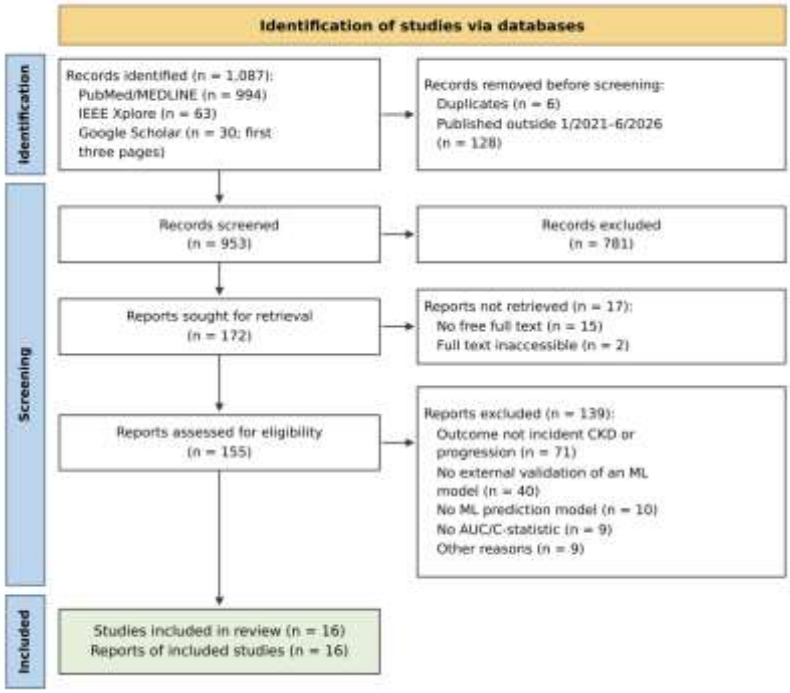


Figure 1. *PRISMA flow diagram of study selection.*

3.2 Characteristics of included studies

The 16 studies were published between 2021 and 2026 (Table 1). Data came from China, Japan, Korea, Canada, and one each from Taiwan, the United States and

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Colombia. Three studies predicted incident CKD (in early type 2 diabetes, in older community-dwelling adults with hyperglycaemia and after cisplatin chemotherapy) and 13 predicted progression, with outcomes ranging from a 30–40% eGFR decline to dialysis and kidney failure and horizons from six months to five years. Thirteen used geographic or cohort-level validation and three used temporal validation, two of them within the same institution. External samples ranged from 105 patients to about 4.8 million insured adults, and at least five studies had fewer than 100 outcome events in their external set.

Table 1. *Characteristics and performance of the 16 included studies*

Study	**Country; external validation**	**Population; outcome (horizon)**	**Final model**	**Internal AUC/C**	**External AUC/C (95% CI)**	**Calibration / DCA / XAI**	**RoB**
Kanda et al. (2022)	Japan; second claims database, n = 16,822	Early T2D; incident CKD by codes (5 y)	XGBoost	0.770	0.690	No / No / SHAP	High
Zhou et al. (2026)	China; fourth community, n = 4,561	≥60 y with hyperglycaemia; incident CKD (2-3 y)	XGBoost	0.809	0.837 (0.818–0.856)	Brier / Yes / SHAP	High
Grant et al. (2025)	Canada; temporal (Ontario)	Cisplatin-treated adults; incident CKD	ML ensemble	NR	ML not better than univariable eGFR model (AUC0.80)	NR / NR / NR	Unclear

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Study	Country; external validation	Population; outcome (horizon)	Final model	Internal AUC/C	External AUC/C (95% CI)	Calibration / DCA / XAI	RoB
Ferguson et al. (2022)	Canada; Alberta, n = 107,097	Adults with eGFR and ACR; ≥40% eGFR decline or KF (1-5 y)	Random survival forest	0.88 (2 y); 0.84 (5 y)	0.87 (0.86–0.88); 0.84 (0.84-0.85)	Yes / No / importance	Unclear
Tangri et al. (2026)	USA; three insurer cohorts, ~4.8 million	Insured adults; ≥40% eGFR decline or KF (2 y)	Klinrisk (random forest)	-	0.80-0.87	Brier, plots / NR / NR	Unclear
Isaza-Ruget et al. (2024)	Colombia; renal unit, temporal, n = 648	CKD G3–5; KRT, stage progression, >25% decline (5 y)	Gradient boosting	0.889 (KRT)	0.952 (KRT, 2 events); 0.693; 0.598	No / No / RFE	High
Hoang et al. (2024)	Taiwan; third hospital, n = 1,627	CKD G3–5; dialysis (1 and 3 y)	Neural network	0.99; 0.95 (training)	0.96; 0.92	No / No / SHAP	High

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Study	Country; external validation	Population; outcome (horizon)	Final model	Internal AUC/C	External AUC/C (95% CI)	Calibration / DCA / XAI	RoB
Wu et al. (2025)	China; temporal, same hospital, n = 3,645	T2D with CKD G3; >30% decline or eGFR <15 (1 y)	XGBoost	0.906	0.768	No / No / SHAP	High
Yu et al. (2026)	Korea; community cohort, 69 events	CKD; ≥40% decline or ESKD (2 y)	Voting ensemble	0.939	0.859 (0.798-0.914); KFRE 0.882-0.889	Overestima-tion / Yes / SHAP	High
Hui et al. (2023)	China; second cohort, 25 events	CKD G1–4; KRT (2 and 5 y)	XGBoost	0.826	0.796 (0.738-0.852)	Brier, over-estimation / No / LIME	High
Kanda et al. (2023)	Japan; temporal, same hospital	CKD; ESKD (3 y)	Random forest	NR	0.966 (0.956-0.976); composite 0.932 vs KFRE 0.905	No / No / importance	High
Wang et al. (2026)	China → England, USA; n = 1,200 and 1,500	≥50 y, eGFR <60; progression (5 y)	XGBoost	0.892 (training)	0.867; 0.871; KFRE 0.745*	Unclear / Yes / SHAP	High

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Study	Country; external validation	Population; outcome (horizon)	Final model	Internal AUC/C	External AUC/C (95% CI)	Calibration / DCA / XAI	RoB
Li J et al. (2025)	China; second hospital, 56 events	CKD G4; stage 5 (25 weeks)	XGBoost	0.93	0.85 (0.78-0.92)	Brier, ECE / No / SHAP	High
Li X et al. (2026)	China; second hospital, n = 137	Biopsy-proven DKD G3–4; composite (1 y)	Random forest	0.898	0.885	No / No / SHAP	High
Kim et al. (2024)	Korea; second hospital, ~16 events	IgA nephropathy; 30% decline or ESKD (2 y)	Random forest	0.993 (apparent)	0.771	Brier only / No / SHAP	High
Chen et al. (2024)	China; 18 centres	IgA nephropathy; KF or 50% decline (dynamic)	LSTM	NR	0.93 (0.92-0.95)	NR / NR / importance	Unclear

**The article attributes 0.745 to both the KFRE and the KDIGO criteria. ACR, albumin-to-creatinine ratio; DCA, decision-curve analysis; DKD, diabetic kidney disease; ECE, expected calibration error; ESKD, end-stage kidney disease; KF, kidney failure; KRT, kidney replacement therapy; NR, not reported; RFE, recursive feature elimination; RoB, risk of bias (PROBAST+AI); T2D, type 2 diabetes; XAI, explainability method.*

3.3 Risk of bias

Twelve studies were at high overall risk of bias and four were unclear; none was at low risk (Table 1). The analysis domain gave the highest ratings. The recurring

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problems were few events in the external set, apparent or training AUCs presented as internal performance, oversampling or case sampling without recalibration, selection of the best of several models on the test data, and missing CIs. In the participants domain, several studies required repeated visits or excluded patients who died, which conditions on future information. Outcome definitions based on diagnosis codes or on a single, unconfirmed eGFR decline raised further concern.

The report by Wang et al. (2026) showed inconsistencies in event counts between tables, and it attributes the same AUC to two comparators. It also describes measurements that are difficult to reconcile with biennial survey cohorts, so its results should be treated with caution. Ferguson et al. (2022) was the strongest study methodologically, with large samples, confirmed outcomes and calibration in external data. It was rated unclear rather than low because its population included many people without CKD and required albuminuria testing.

3.4 Discrimination in external data

Incident CKD. In early type 2 diabetes, XGBoost fell from an AUC of 0.770 internally to 0.690 in a second Japanese database, with CKD identified from diagnosis codes (Kanda et al., 2022). In older adults with hyperglycaemia in Shanghai, it reached 0.837 in a fourth community, slightly above its internal estimate (Zhou et al., 2026). In a population cohort of cisplatin-treated adults in Ontario, complex ML ensembles did not outperform a simple model based on pre-treatment eGFR, which reached 0.80 in the temporal test set (Grant et al., 2025). External discrimination for incident CKD was therefore moderate, and in the one study with a fair simple comparator ML added nothing.

Progression. Headline external AUCs or C-statistics ranged from 0.77 to 0.97. Where internal and external values were available for the same model and horizon, performance usually fell from 0.939 to 0.859 (Yu et al., 2026), from 0.906 to 0.768 (Wu et al., 2025), from 0.93 to 0.85 (Li J et al., 2025), from 0.826 to 0.796 (Hui et al., 2023) and from an apparent 0.993 to 0.771 (Kim et al., 2024). The smallest losses occurred in the largest validations. The Klinrisk random survival forest kept its

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performance when moved from Manitoba to 107,097 Alberta residents (0.87 vs 0.88 at two years; Ferguson et al., 2022) and reached 0.80–0.87 at two years across commercial, Medicare and Medicaid populations in the United States (Tangri et al., 2026), although both reports come from its developers. The highest values came from settings that flatter discrimination: a temporal validation within one hospital (0.966; Kanda et al., 2023), a neural network whose training AUC reached 0.99 (Hoang et al., 2024), and an external C-statistic of 0.952 for kidney replacement therapy resting on two events (Isaza-Ruget et al., 2024).

3.5 Calibration, clinical utility and explainability

Eight studies reported some measure of calibration in external data, but most gave only a Brier score. Calibration was preserved in the Alberta validation of Ferguson et al. (2022), and Brier scores were low in all three US cohorts of Tangri et al. (2026). By contrast, Yu et al. (2026) and Hui et al. (2023) found that their models overestimated risk in external data, so recalibration would be needed before predicted probabilities could guide decisions. Decision-curve analysis was reported by three studies, in the most carefully reported of these, the ensemble's net benefit in the external cohort was at best marginally above treating no one, and individual ML models caused net harm at low thresholds. Nine studies used SHAP and one used LIME. Kidney function, albuminuria or proteinuria, age and glycaemic markers were the most frequent leading predictors.

3.6 Comparison with the KFRE and integration into care

Three studies compared ML with the KFRE in the same data, and they did not agree. In a Korean community cohort, the four- and eight-variable KFRE reached AUCs of 0.882 and 0.889 against 0.859 for the ML ensemble, with no significant difference (Yu et al., 2026). In a temporal validation at one Japanese hospital, a random forest outperformed the KFRE for kidney failure or death (0.932 vs 0.905; Kanda et al., 2023), a composite that the KFRE was not designed to predict. The third study reported a large advantage for ML (0.867–0.871 vs 0.745) against an ambiguously labelled comparator (Wang et al., 2026). No study linked predictions to

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treatment recommendations, alerts or monitoring, or evaluated the effect of a model on clinical decisions or outcomes. Two models were offered as web calculators.

3.7 Certainty of evidence

Certainty was moderate for external discrimination of the Klinrisk model in North American laboratory data. It was low for other progression models, very low for incident CKD, calibration, clinical utility and comparison with the KFRE, and absent for Central Asian populations.

4. Discussion

4.1 Main findings

Only a small fraction of the ML literature on CKD meets the basic requirement of testing a model outside its development data. Of 155 full-text reports assessed, just 16 did so, and 40 otherwise eligible studies were excluded for lacking external validation of an ML model. Among the 16, external discrimination was generally good for progression and moderate for incident CKD. Performance usually fell from development to external data, sometimes by more than 0.1, and the largest fall occurred in small single-centre studies. The model with the most extensive validation, Klinrisk, held its performance across two Canadian provinces and three US insurance populations with reported calibration. That is the strongest evidence in this field so far, although it comes entirely from its developers.

These findings complement the review by Abdelhag (2026), which concluded that ensemble models perform best but did not separate internal from external performance. When only external results are considered and risk of bias is assessed, the picture is less flattering. Twelve of 16 studies were at high risk of bias. Calibration was usually incomplete. And where ML was compared fairly with the KFRE in a population for which the KFRE was intended, ML did not outperform it. The contrast with the near-perfect accuracies reported in UCI-based studies is stark, and it echoes the modest performance obtained by Makino et al. (2019) with a very large dataset.

4.2 Implications for practice

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For people with CKD G3–G5, the KFRE remains the reference tool. Its validation covers hundreds of thousands of patients in more than 30 countries (Tangri et al., 2016), and the guideline endorses it (KDIGO CKD Work Group, 2024). ML models may add value in earlier stages and in populations the KFRE was not built for. Laboratory-based models such as Klinrisk can also be run automatically on routine test results, which suits population screening. Good discrimination alone does not justify adoption, however. Two of the externally validated models overestimated risk in new populations, and one rigorous decision-curve analysis found little net benefit. Before any model is used to trigger referral or treatment, it should be recalibrated and shown to give net benefit at the decision thresholds used locally. SHAP plots, used by most studies, explain the model's behaviour rather than the patient's biology and cannot substitute for external validation.

4.3 Relevance to Uzbekistan and a proposed framework

No included study used data from Uzbekistan or its neighbouring countries. Furthermore, the search found no evidence that either the KFRE or any ML model has been validated in Central Asia. Because model performance fell in most external validations and the KFRE has overestimated risk in some populations outside North America, neither can be assumed to transfer. The first practical step is a local cohort, assembled from laboratory systems and electronic records, in which the KFRE and the best-validated laboratory-based ML models are externally validated and recalibrated.

The gaps identified here also suggest what a clinical system should include. As a conceptual proposal rather than a finding, I outline NefroAI, a closed loop of five modules (Figure 2). Early detection would flag people at risk in stages G1–G2; status assessment would stage each person by GFR and albuminuria category; prediction would estimate short- and long-term risk, keeping the KFRE as the reference for G3–G5 and adopting an ML model only where local validation shows better calibration and net benefit; recommendations would combine guideline rules with predicted risk and require physician approval; and monitoring would update risk as new results

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arrive and feed observed outcomes back into regular recalibration. The framework shares its name with a recently published NefroAI system (Al Huda et al., 2026), but the two differ in purpose and data. That system classifies current CKD status from public UCI and Kaggle datasets. The framework proposed here is planned as a working service built on real clinical and laboratory data from Uzbekistan, covering the whole pathway from early detection to monitoring, with separate interfaces for patients, clinics and health authorities. Any such system would need external validation, an early clinical evaluation and a comparative impact study before it influences care.

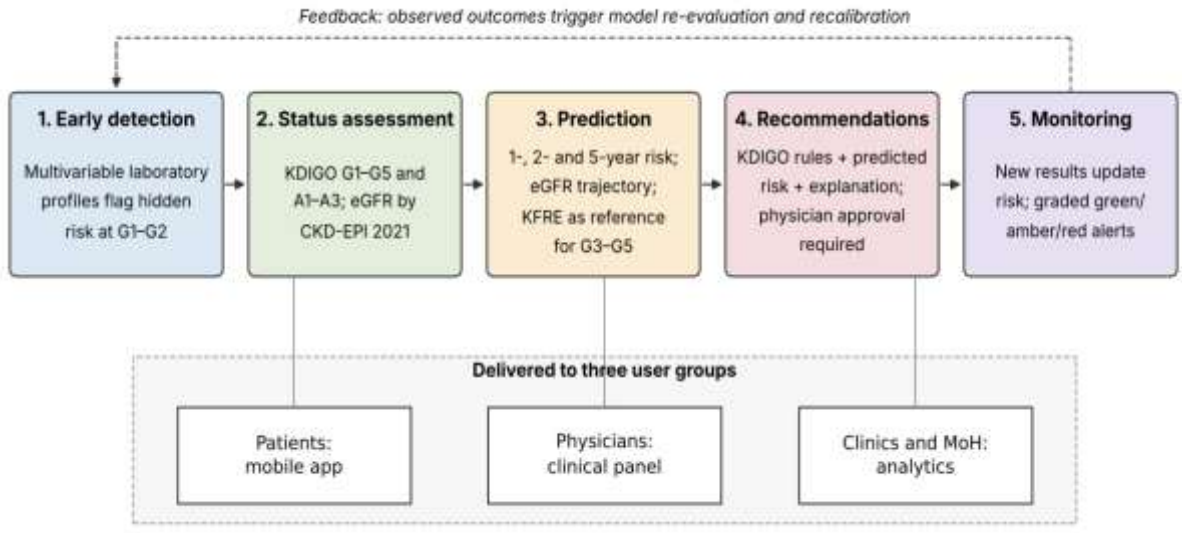


Figure 2. *Proposed NefroAI closed-loop framework (conceptual; not evaluated). MoH, Ministry of Health.*

4.4 Limitations

Most external samples were small, validation designs differed, calibration and CIs were sparsely reported, and in four studies some details could be verified only from abstracts or secondary sources. The review process has its own limitations. A single reviewer, made all decisions, which makes errors in selection and appraisal more likely than independent double review would. The review was not registered and had no protocol. The PubMed and IEEE Xplore searches were restricted to freely available full texts and Google Scholar to its first 30 records, so subscription-only studies were missed. Finally, the requirement for external validation was added after

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a first full-text pass, when the number of eligible studies became clear, and was then applied uniformly to all reports.

5. Conclusion

Externally validated ML models for CKD are few, but they show that progression can be predicted well in new populations. The best-validated example retained an AUC of about 0.84–0.87 across Canadian and US populations. Most external validations were small and at high risk of bias, calibration was often incomplete, and the limited head-to-head evidence does not show that ML consistently outperforms the KFRE. For Uzbekistan and the wider region, the next step is to validate and recalibrate existing models in local data before building new ones.

References

Abdelhag, M. E. (2026). A systematic review of machine learning methods for chronic kidney disease diagnosis and prediction (2020–2025). *SJAST Journal, 2*. https://www.researchgate.net/publication/400687825_A_Systematic_Review_of_Machine_Learning_Methods_for_Chronic_Kidney_Disease_Diagnosis_and_Prediction_2020-2025

Al Huda, M. S., Kanon, E., Pappo, M. S. K., Ali, M. A., & Ahmed, N. (2026). NefroAI: An explainable and real-time framework for predicting chronic kidney disease using diverse machine learning models and different feature selection techniques. *IEEE Access, 14*, 10939–10976. https://doi.org/10.1109/ACCESS.2025.3649006

GBD 2023 Chronic Kidney Disease Collaborators. (2025). Global, regional, and national burden of chronic kidney disease in adults, 1990–2023, and its attributable risk factors: A systematic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10518), 2461–2482. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(25)01853-7/fulltext

KDIGO CKD Work Group. (2024). KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney International*,

https://creativecommons.org/licenses/by/4.0/

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ACCEPTED: 30.10.2026
PUBLISHED: 31.10.2026

105(4S), S117–S314. https://www.kidney-international.org/article/S0085-2538(23)00766-4/fulltext

Makino, M., Yoshimoto, R., Ono, M., Itoko, T., Katsuki, T., Koseki, A., Kudo, M., Haida, K., Kuroda, J., Yanagiya, R., Saitoh, E., Hoshinaga, K., Yuzawa, Y., & Suzuki, A. (2019). Artificial intelligence predicts the progression of diabetic kidney disease using big data machine learning. *Scientific Reports*, *9*, 11862. https://www.nature.com/articles/s41598-019-48263-5

Moons, K. G. M., de Groot, J. A. H., Bouwmeester, W., Vergouwe, Y., Mallett, S., Altman, D. G., Reitsma, J. B., & Collins, G. S. (2014). Critical appraisal and data extraction for systematic reviews of prediction modelling studies: The CHARMS checklist. *PLoS Medicine*, *11*(10), e1001744. https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001744

Moons, K. G. M., Damen, J. A. A., Kaul, T., Hooft, L., Andaur Navarro, C., Dhiman, P., … van Smeden, M. (2025). PROBAST+AI: An updated quality, risk of bias, and applicability assessment tool for prediction models using regression or artificial intelligence methods. *BMJ*, *388*, e082505. https://www.bmj.com/content/388/bmj-2024-082505

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Reviews*, *10*, 89. https://link.springer.com/article/10.1186/s13643-021-01626-4

Tangri, N., Grams, M. E., Levey, A. S., Coresh, J., Appel, L. J., Astor, B. C., … CKD Prognosis Consortium. (2016). Multinational assessment of accuracy of equations for predicting risk of kidney failure: A meta-analysis. *JAMA*, *315*(2), 164–174. https://jamanetwork.com/journals/jama/fullarticle/2481005

https://creativecommons.org/licenses/by/4.0/

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AI ETHICS: FAIRNESS, TRANSPARENCY AND ACCOUNTABILITY CHALLENGES

Jomonqulova Fazilat Esirgapovna

Associate Professor, Department of Information Technologies, Samarkand Institute of Economics and Service.

Alisher Sattorov Joshqin ugli

student, group BH-526, Samarkand Institute of Economics and Service.

Abstract

This article presents a theoretical analysis of the three core principles of AI ethics: fairness, transparency and accountability. It examines racial, gender and social forms of algorithmic bias and its sources at the data, modeling and deployment stages. The article also discusses the “black box” problem, the interpretability of decisions (Explainable AI) and their practical and legal limits. In addition, it justifies the “Ethical by design” principle, which builds ethical requirements into a technology’s life cycle from the very beginning, and its use in education and other high-risk areas. The main conclusion is that AI ethics is not a restriction added after the technology is built, but a basic precondition for a system’s reliability, legality and social acceptability.

Keywords

AI ethics, fairness, algorithmic bias, transparency, accountability, “black box”, Explainable AI (XAI), Ethical by design

Introduction. Artificial intelligence (AI) systems today take part in decisions in areas that directly affect people’s lives, such as lending, recruitment, medical diagnosis, criminal risk assessment and the analysis of student performance in education. The social impact of this technology raises not only technical questions but also normative ones: Who does the algorithm treat fairly? To whom, and how, is its decision explained? Who is responsible when an error occurs? For this reason, AI ethics should not be seen as a “moral decoration” added to technology from outside, but as a condition for the system’s reliability and for its acceptance by society.

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At the international level, this field is increasingly taking a legal form. The 2021 UNESCO Recommendation on the Ethics of Artificial Intelligence, adopted by its member states, sets out human rights, fairness, transparency and human oversight as core values. The European Union's 2024 AI Act classifies systems by risk level, places applications in areas such as education, recruitment and law enforcement in the high-risk category, and requires transparency, human oversight and documentation for them. An analysis by Jobin and colleagues shows that, among more than one hundred AI ethics documents produced by different countries and organizations, there is considerable convergence on the principles of transparency, justice, non-maleficence, responsibility and privacy, but disagreement remains over how to interpret and implement them. The aim of this article is to explain the content of these principles, to analyze the mechanisms through which they are violated in practice, and to justify ways of ensuring them at the design stage.

The topic is especially relevant for Uzbekistan. The Strategy for the Development of Artificial Intelligence Technologies until 2030, approved by Presidential Resolution No. PQ-358 of 14 October 2024, names compliance with ethics and data security as an important direction alongside the introduction of the technology. The national recommendations on ethics in the use of artificial intelligence also set out principles such as legality, human oversight, fairness and non-discrimination, openness and transparency, and responsibility and accountability. The issue of AI and morality is also being discussed in Uzbek academic literature. The task, therefore, is not limited to expanding the use of AI: it is also necessary to make sure that its use is fair, understandable and subject to accountability.

Fairness, transparency and accountability: a triad of principles. These three principles are interconnected, but they cannot be reduced to one another. Fairness means that a system's decisions do not differ without justification between groups and individuals and, where appropriate, that equality and equal opportunity are ensured. Transparency means making clear and open to stakeholders the purpose for which the system works, the data it relies on and the logic it follows. Accountability

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means that specific parties are responsible for the consequences of the system's impact and that a person who has been harmed can object and demand a remedy. They depend on each other in the following way: without transparency, unfairness cannot be detected; if unfairness is detected but no responsible party is identified, it cannot be corrected. Conversely, without an accountability mechanism, transparency ends with simply providing information. Floridi and colleagues describe AI ethics as a framework of principles of beneficence, non-maleficence, autonomy, justice and explicability, in which explicability serves as an "enabling" principle that makes it possible to check the other principles in practice. In this sense, the three principles form a whole: fairness is the goal, transparency is the means of verification, and accountability is the guarantee of correction.

The problem of algorithmic bias: racial, gender and social inequality. Algorithmic bias means a systematic and unjustified deviation of an AI system's results against certain groups or individuals. According to a common misconception, an algorithm is neutral because it is mathematical. In fact, a model is a product of the data it learns from, the objective it is given and the conditions in which it is used; therefore, it can repeat and even strengthen existing inequalities in society. In the systematic review by Mehrabi and colleagues, sources of bias are divided into those in the data, in the algorithm and in the interaction with users. Their main forms are presented below.

The first is historical bias. If data reflect past decisions, the model learns the inequality in those decisions as a "norm". For example, if a recruitment system is trained on résumés of people hired in the past, who were mostly of one gender, it may learn this historical choice as a "sign of success" and rate candidates of the other gender lower. In such a case, the root of the problem is not a technical defect but the social history contained in the data.

The second is representation and sampling bias. If the training data do not cover some groups sufficiently, the model works inaccurately for them. In the "Gender Shades" study by Buolamwini and Gebru, the error rate of commercial facial

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recognition systems reached about 35 percent for darker-skinned women, but was below one percent for lighter-skinned men. Although overall accuracy was high, the large difference between groups was hidden. This is also a risk for systems that work in relatively low-resource languages such as Uzbek: if the data do not sufficiently reflect language, region or social group, the system may work poorly for some users.

The third is measurement and proxy bias. When a system uses a substitute indicator instead of a quantity that cannot be measured directly, this indicator may be wrong for some groups. Obermeyer and colleagues found that a widely used healthcare algorithm in the United States took healthcare costs as a proxy instead of the severity of a patient's illness. Because Black patients spent less on medical care, at the same risk score they were actually sicker, yet they were referred to additional programs less often [10]. The problem is not that the algorithm knew race, but that socio-economic conditions entered the model unnoticed through costs.

The fourth is deployment and institutional bias. Even a technically sound model gives unfair results when it is used in the wrong environment. A ProPublica analysis of COMPAS, a system used in the United States to assess the risk of criminal reoffending, showed that Black defendants were more often wrongly labeled "high risk". In 2020 in the United Kingdom, when exams could not be held because of the pandemic, an algorithm used to standardize grades lowered many students' grades compared with their teachers' predictions, and it affected pupils from historically low-performing schools the most. After public protests, it was withdrawn. This example shows how dangerous it is in education when an individual's achievement is replaced by a school's past results.

There is another theoretical difficulty in eliminating bias: there is no single definition of fairness. As theoretical studies have shown, when the base rates differ between groups, criteria such as calibration and equal error rates cannot be fully satisfied at the same time. Therefore, choosing a "fair model" is not only a technical decision but a value-based one: which error has the heavier social cost must be decided in advance, through open discussion. Discriminatory effects often arise not

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from intent but from design decisions that look “neutral”.

The “black box” problem and the interpretability of decisions (Explainable AI). The term “black box” refers to systems whose inputs and outputs are known but whose internal logic is not understandable to humans. Deep neural networks have millions or even billions of parameters, and how they reach a particular decision cannot be shown as a simple chain of logic. At least three sources of opacity can be distinguished: secrecy linked to commercial or state secrets, users’ lack of technical literacy, and the complexity of the algorithm itself. This distinction is important because each requires a different solution: the first requires legal openness, the second requires education, and the third requires technical explanation methods. Explainable AI (XAI) emerged as a response to this problem and has two main directions. The first is models that are understandable from the start (inherently interpretable), such as decision trees, linear models and rule-based models. The second is explanation methods applied after the fact to a complex model: LIME shows the factors that influenced a single decision through local approximation; SHAP estimates the contribution of each feature based on the Shapley value from game theory; and counterfactual explanations answer the question “What would have had to change for the decision to be different?” The counterfactual approach is especially useful: even without opening the model’s internal structure, it makes clear to a person why a decision was made and how it can be changed.

However, a critical approach to interpretability is necessary. Rudin argues that in high-stakes areas (healthcare, courts) it is better to build an interpretable model from the start than to try to explain a black box afterwards, and that the widespread idea of an “inevitable conflict between accuracy and interpretability” is unfounded in many cases. Post-hoc explanations may not fully reflect the model’s real logic; that is, they may give an explanation that is “plausible but wrong”. It also matters whom the explanation is for: a technical explanation suitable for a developer will not be clear to a student, a patient or a defendant. Therefore, the quality of an explanation is measured not only by technical correctness but also by how useful it is for its

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audience and whether it allows the decision to be reasonably challenged. The legal and regulatory direction is also clear: the national ethical recommendations in Uzbek name "understandability", "openness and transparency" and "constant human oversight" as separate principles, and the EU regulation makes transparency and human oversight mandatory for high-risk systems. So, for systems that influence important decisions, the answer "the system said so" is not enough.

Accountability mechanisms. Unlike transparency, accountability answers the question "Who is responsible, and how is the problem fixed?" In practice, the biggest risk is the "accountability gap", that is, when the distribution of responsibility among the developer, the deployer and the user remains unclear. The UNESCO Recommendation also lists responsibility and accountability, that is, ensuring audit and human oversight throughout the system's life cycle, as a separate requirement, and the national recommendations also include "responsibility and accountability" as an independent item. In practice, standard documentation for datasets and models (for example, datasheets and model cards), independent audits, incident registers, and the right of an affected person to appeal and to have a decision reviewed are very important. Most importantly, final responsibility for important decisions must never be placed on the algorithm; it must remain with a specific person or organization.

The "Ethical by design" principle. Adding ethical requirements as a "fix" after a system is ready is usually ineffective and expensive. The Ethical by design approach changes this logic and proposes including ethical requirements among the technical requirements from the earliest stage of a project. The approach is inspired by the concept of "Privacy by Design", whose main idea is to build protection into the architecture itself as the default rather than adding it later. In practice, this principle applies to the whole life cycle of a system; the table below summarizes its main stages.

Table 1. Ethical by design: ethical questions and tools at each stage of the life cycle

Stage	Key ethical question	Tools used

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1. Defining requirements	Who is affected? Whose rights and interests are at risk?	Stakeholder analysis, ethical impact assessment
2. Data collection	Whom does the data cover, and whom does it leave out?	Datasheets for Datasets, representativeness check
3. Modeling	Are the objective function and proxy variables fair?	Fairness constraints, choosing an interpretable model
4. Testing and validation	How does the error rate differ between groups?	Evaluation by group, Model Cards
5. Deployment	Is there human oversight and a way to object?	Human-in-the-loop, appeal procedure
6. Monitoring	Has the system's behavior changed over time?	Independent audit, incident register, re-evaluation

As the table shows, ethical oversight is not a one-time check but a continuous process. One important aspect is the risk-based approach: the more serious a system's impact is (for example, assessing a student's "academic risk" or distributing scholarships), the stricter the oversight should be. The EU regulation also classifies systems by risk level in this way and sets requirements in proportion to risk. Another important condition is the participation of stakeholders, that is, the people who will be affected by the system: an educational algorithm created without the voice of teachers, students and parents may not be socially accepted, even if it is technically perfect.

Significance for Uzbekistan's education system. Because AI decisions in education (admission, scholarships, assessment, identifying "risk groups") directly affect a person's future, ethical requirements must be especially strict. Analytical modules in digital platforms such as HEMIS can be useful for monitoring student performance, but they should remain advisory, and the final decision should be made by a person on the basis of transparent criteria. In addition, national legislation on the protection of personal data requires that the processing of student data follow the

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principles of purpose limitation and data minimization. Increasing the representation of Uzbek-language data across regions and social groups is also an important condition for reducing the risk of bias.

Conclusions and recommendations

The analysis shows that the AI ethics principles of fairness, transparency and accountability complement each other, and neglecting one of them reduces the effectiveness of the others. Algorithmic bias should be seen not as a technical defect but as an echo of social inequalities in the data, the objective function and the deployment environment; and choosing a balance between different definitions of fairness is a value-based decision, not a technical one. Interpretable methods only partly ease the “black box” problem, but in high-risk areas it is necessary to give priority to inherently interpretable models and to check how useful explanations really are. The Ethical by design approach makes ethics an integral part of the system’s life cycle and allows these problems to be solved in the cheapest and most effective way.

Scientific, theoretical and practical recommendations:

1. For AI systems used in high-risk areas (education, recruitment, finance, healthcare), a mandatory ethical impact assessment and risk classification procedure should be introduced before deployment.
2. A requirement for standard documentation of datasets and models (datasheets, model cards) should be established; evaluation should be carried out by group, not only by overall accuracy.
3. For important decisions (grades, scholarships, admission, disciplinary measures), final responsibility should remain with a human; an affected person should be guaranteed the right to demand an explanation of the decision and to file an appeal.
4. In high-risk applications, priority should be given, wherever possible, to inherently interpretable models; when complex models are used, explanation methods

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(for example, counterfactual explanations) should be presented in a form that users can understand.

5. An independent audit and monitoring mechanism should be created, and a register of detected errors and incidents should be kept.

6. The creation of datasets in Uzbek that are representative across regions should be supported; training programs for teachers and specialists on ethics, AI literacy and data protection should be expanded.

It is clear that the strength of a technology is measured by its reliability. Only fair, understandable and accountable artificial intelligence will earn society's trust and bring long-term benefits.

References:

1. Law of the Republic of Uzbekistan "On Personal Data", 2 July 2019, No. ZRU-547 (in Uzbek). Website: lex.uz.

2. UNESCO. Recommendation on the Ethics of Artificial Intelligence. Paris: UNESCO, 2021. Website: unesdoc.unesco.org.

3. Regulation (EU) 2024/1689 of the European Parliament and of the Council (Artificial Intelligence Act). Official Journal of the European Union, 2024. Website: eur-lex.europa.eu.

4. Jobin A., Ienca M., Vayena E. The global landscape of AI ethics guidelines // Nature Machine Intelligence. 2019. Website: nature.com.

5. Resolution of the President of the Republic of Uzbekistan of 14 October 2024, No. PQ-358, "On approving the Strategy for the development of artificial intelligence technologies until 2030" (in Uzbek). Website: lex.uz.

6. Recommendations on ethics in the use of artificial intelligence technologies (in Uzbek). Website: ai.gov.uz.

7. Primov B. A. Artificial intelligence and morality in the information society (in Uzbek). 2025. Pp. 312–317. Website: oriens.uz.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
ACCEPTED: 30.10.2026
PUBLISHED: 31.10.2026

8. Mehrabi N., Morstatter F., Saxena N., Lerman K., Galstyan A. A Survey on Bias and Fairness in Machine Learning // ACM Computing Surveys. 2021. Vol. 54, No. 6. Website: dl.acm.org.

9. Buolamwini J., Gebru T. Gender Shades: Intersectional Accuracy Disparities in Commercial Geader Classification // Proceedings of Machine Learning Research. 2018. Website: proceedings.mlr.press.

10. Obermeyer Z., Powers B., Vogeli C., Mullainathan S. Dissecting racial bias in an algorithm used to manage the health of populations // Science. 2019. Website: science.org.

11. Angwin J., Larson J., Mattu S., Kirchner L. Machine Bias // ProPublica. 2016, 23 May. Website: propublica.org.

12. Rudin C. Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead // Nature Machine Intelligence. 2019. Website: nature.com.

https://creativecommons.org/licenses/by/4.0/

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IMPROVING SPEAKING FLUENCY AMONG B2-LEVEL LEARNERS THROUGH COMMUNICATIVE LANGUAGE TEACHING:A FOCUS ON TIMED SPEAKING ACTIVITIES

Ergashova Shahina Maxsud qizi

Student of English philology faculty Uzbekistan State World Languages University

Madina Tukhtakhujayeva

Senior teacher Uzbekistan State World Languages University

ABSTRACT

Fluency is one of the most visible signs of speaking ability, yet many learners who have reached the B2 level still stop, restart, and search for words when they have to speak without preparation. Their grammar and vocabulary may be sufficient for the task, but the speed at which they can use this knowledge is not. This article proposes a communicative approach to developing speaking fluency among B2-level English learners through timed speaking activities. It presents an 80-minute lesson consisting of three stages: pre-communicative listening and noticing, communicative countdown rounds, and post-communicative reflection and feedback. In the main stage, learners repeat the same talk to different partners within shrinking time limits, so that the time pressure encourages them to speak more smoothly while the communicative purpose keeps the interaction meaningful. The article draws on research on fluency development and repetition-based speaking tasks to provide a theoretical basis for the proposed lesson.

Keywords

speaking fluency, B2 learners, timed speaking activities, 4/3/2 technique, Communicative Language Teaching.

1. Introduction

Imagine a B2 learner who knows the word she needs, can build the correct sentence, and understands the question perfectly. Yet when her partner looks at her and waits, she pauses, starts again, and finally says something shorter and simpler than she intended. The knowledge is there, but the clock is faster. This situation is

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very common in English classrooms, and it shows that being accurate on paper and being fluent in real conversation are two different skills.

Fluency matters because listeners judge speakers not only by what they say but also by how smoothly they say it. Long silences, frequent restarts, and unfinished sentences can make a speaker sound less confident, even when the ideas are good. As a result, learners may avoid speaking in class or give very short answers to stay safe.

Although B2 learners can generally take part in conversations on familiar and abstract topics, many of them still need to develop the speed and ease with which they produce language. One practical way to do this is to give learners speaking tasks with clear time limits. When time is limited, learners have less opportunity to plan every word and must rely on the language they already know.

The aim of this article is to propose a Communicative Language Teaching (CLT) lesson designed to improve speaking fluency among B2-level learners through timed speaking activities. The lesson consists of three stages: listening and noticing, countdown speaking rounds, and reflection with feedback.

2. Theoretical Background

2.1. Speaking Fluency and the B2 Learner

Fluency is not a single skill. Segalowitz (2010) distinguishes between the speaker's underlying cognitive ability to produce language efficiently, the observable features of speech such as speed, pauses, and repairs, and the impression that listeners form about the speaker. For classroom teaching, this means that fluency can be noticed, discussed, and practised, rather than treated as a natural talent that some learners have and others do not.

The Common European Framework of Reference for Languages (Council of Europe, 2020) describes B2 speakers as people who can interact with a degree of spontaneity and ease. This description suggests that B2 lessons should provide opportunities for learners to speak at length and respond without long preparation. Fluency practice should therefore be a regular part of the lesson rather than an occasional extra.

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It is also important to separate fluency from accuracy. During a fluency activity the main goal is to keep communication moving. If the teacher corrects every mistake immediately, learners may become cautious and start monitoring every word, which slows their speech even more. For this reason, error correction in fluency tasks is best delayed until the activity is over.

2.2. Timed Speaking and the 4/3/2 Technique

One well-known way of developing fluency is the 4/3/2 technique, first described by Maurice (1983). In this activity, learners speak on the same topic three times, each time to a new listener and each time with less time: four minutes, then three, and then two. Nation (1989) discussed this technique as a way of improving speaking fluency and reported that learners tended to speak faster and hesitate less in the repeated talks. The idea behind the technique is simple. In the first round, learners are busy deciding what to say. In the second round, the ideas are already familiar, so more attention can be given to choosing words and building sentences. By the third round, learners can deliver the same message in a shorter time, with fewer pauses. Arevart and Nation (1991) found that learners' fluency improved over a series of such activities, and De Jong and Perfetti (2011) reported that repeating the same speech helped learners use language more automatically.

Two features make this technique attractive for B2 learners. First, the repeated topic reduces the pressure of finding new ideas, so learners can concentrate on speaking smoothly. Second, a new partner in each round gives the speaker a real reason to repeat the message, which makes the repetition feel more natural than a drill.

2.3. Communicative Language Teaching and Time Pressure

Communicative Language Teaching is an approach that places meaningful communication at the centre of language learning. Learners use English to share information, give opinions, and respond to other people, rather than repeating sentences for their own sake.

Timed speaking activities fit well into this approach if the time limit is combined with a real communicative purpose. A countdown on its own can feel

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stressful, but a countdown that helps learners compete with their own earlier performance can be motivating. In the proposed lesson, learners therefore do not compete with each other. Their only task is to deliver the same message more smoothly each time.

3. Lesson Design

The proposed lesson is designed for B2-level English learners and lasts 80 minutes. Its main objective is to help learners speak with fewer long pauses and to keep talking even when they cannot remember a word.

By the end of the lesson, learners should be able to:

1. Recognize features of fluent and hesitant speech in short spoken extracts.
2. Use simple strategies, such as paraphrasing and linking phrases, to continue speaking when language is difficult.
3. Deliver the same talk to different partners in a shorter time and with fewer pauses.
4. Reflect on their own speaking and set a goal for further practice.

The lesson contains three stages: pre-communicative, communicative, and post-communicative practice.

3.1. Stage One: Listening and Noticing (15 Minutes)

Aim: To help learners notice what makes speech sound fluent and to prepare them for the main task.

The teacher begins by playing or reading two short answers to the same question, for example: “Describe a place where you like to spend free time.” In the first answer, the speaker hesitates, repeats words, and stops often. In the second, the speaker keeps going, uses linking phrases, and paraphrases when a word is missing. Learners listen twice and discuss which speaker sounded more confident and why.

The teacher then introduces a short list of “keep-going” phrases that learners can use instead of silence:

- “What I mean is…”
- “Let me put it another way…”

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- "The thing is…"

Learners are told that during the main activity pauses are natural, but long silences should be replaced with these phrases. This stage gives them useful language and a clear picture of the goal before they start speaking.

3.2. Stage Two: Countdown Rounds (45 Minutes)

Aim: To encourage learners to speak more smoothly through repeated, time-limited talks.

Activity A: Three-Two-One (20 minutes). Learners work in pairs. Each learner chooses one topic card, such as "A skill I would like to learn and why" or "The most useful thing I own." Learner A speaks for three minutes while Learner B listens and does not interrupt. Then the pairs change, and Learner A gives the same talk to a new partner in two minutes. Finally, the pairs change again, and the talk is given in one minute. After that, the roles are reversed, so that every learner has the chance to speak.

The teacher explains that the content should stay the same but the delivery should become tighter. Learners are encouraged to keep the best ideas and cut the less important details as the time becomes shorter.

Activity B: Speed-Chat Circle (15 minutes). Learners form an inner and an outer circle and face a partner. The teacher gives a question, for example "What would you change about your city?", and each learner has 45 seconds to answer. When the teacher says "Change!", the outer circle moves one place, and a new question is given. The quick change of partners and the short time limit keep learners alert and prevent them from over-preparing.

Activity C: Free Conversation (10 minutes). Learners return to their original partners and talk freely about one of the topics for ten minutes without a time limit per turn. The teacher notes how learners now manage longer turns.

During all three activities, the teacher monitors and makes notes of common problems, such as frequent restarts, but does not interrupt. Feedback is given afterwards, in Stage Three.

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This stage reflects the communicative principles of CLT because learners exchange real opinions and experiences with different partners. The time limit works as a tool that supports fluency, not as a test.

3.3. Stage Three: Reflection and Feedback (20 Minutes)

Aim: To help learners evaluate their fluency and set a personal goal.

First, learners use their phones to record a one-minute version of their talk. They listen to the recording and complete a short self-check card with three questions:

1. Did I keep speaking without long silences?
2. Did I use at least one "keep-going" phrase?
3. What is one thing I will try to do better next time?

Then learners share their answers with a partner. The teacher gives whole-class feedback based on the notes made during Stage Two. Three or four typical language errors are written on the board anonymously, and the class corrects them together. In this way, accuracy is not ignored, but it is addressed after the fluency work has been completed. The lesson ends with a short summary and a homework task: learners record a one-minute talk on a topic of their choice and try to speak without stopping. The recordings are used by learners for self-monitoring. They should not be treated as evidence of measurable improvement unless they are evaluated in a systematic way.

4. Expected Outcomes and Teaching Implications

The proposed lesson may help B2 learners speak with greater ease and become more comfortable with the pressure of real-time conversation. Because the same message is repeated, learners can notice how their speech becomes smoother from one round to the next. This visible progress may also increase their confidence and willingness to speak.

The lesson can be adapted to other levels and topics. Teachers may change the time limits, use different topic cards, or combine the rounds with other skills, such as note-taking or summarizing. However, the effectiveness of the lesson has to be tested in a real classroom, for example by comparing the number of words learners produce per minute and the number of long pauses before and after a series of lessons.

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5. Conclusion

Developing speaking fluency is important for B2-level learners who want to communicate confidently in English. Although learners at this level may have enough vocabulary and grammatical knowledge, they may still need regular practice in using this knowledge quickly and smoothly.

This article has proposed an 80-minute CLT-based lesson consisting of listening and noticing, countdown speaking rounds, and reflection with feedback. The activities are designed to help learners recognize what fluent speech sounds like and practise delivering the same message more smoothly within shorter time limits.

The proposed lesson connects timed practice with meaningful communication and encourages learners to reflect on their own progress. Although classroom implementation and further assessment are necessary to determine its effectiveness, the lesson provides a practical framework for developing speaking fluency among B2-level learners.

References

1. Arevart, S., & Nation, P. (1991). Fluency improvement in a second language. *RELC Journal*, *22*(1), 84–94.

2. Council of Europe. (2020). *Common European framework of reference for languages: Learning, teaching, assessment – Companion volume*. Council of Europe Publishing. https://www.coe.int/en/web/common-european-framework-reference-languages/cefr-companion-volume-and-its-language-versions

3. De Jong, N., & Perfetti, C. A. (2011). Fluency training in the ESL classroom: An experimental study of fluency development and proceduralization. *Language Learning, 61*(2), 533–568.

4. Maurice, K. (1983). The fluency workshop. *TESOL Newsletter*, *17*(4), 29.

5. Nation, P. (1989). Improving speaking fluency. *System, 17*(3), 377–384.

6. Segalowitz, N. (2010). *Cognitive bases of second language fluency*. Routledge.

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YOUTH ACHIEVEMENTS IN THE MODERN ERA: AN ANALYSIS BASED ON UNIBVERSITY STUDENTS

Sotvoldiyeva Mushtariybonu

Student of Andijan State Pedagogical Institute

Abstract

This article examines the achievements of young people in the modern era, focusing on university students and their academic, professional, social, and personal development. It analyzes the role of higher education, digital technologies, foreign language proficiency, leadership activities, and volunteer initiatives in enhancing students' knowledge and practical skills. The study also explores the challenges students face in achieving their goals, including unequal access to educational opportunities and the gap between theoretical knowledge and practical experience. The findings suggest that youth achievement depends not only on individual motivation but also on the quality of education, institutional support, and opportunities for active participation in society. The article emphasizes the importance of creating an inclusive educational environment that enables young people to develop their potential and contribute to social and economic progress.

Keywords

youth achievement, university students, higher education, digital skills, personal development, student leadership, academic performance, professional development, volunteer activities, Uzbekistan.

Young people today achieve results across education, digital innovation, entrepreneurship, volunteering, research, and civic participation. Yet achievement is not simply a matter of individual talent: it also depends on access to resources, supportive institutions, practical experience, and the ability to turn knowledge into action. This article examines contemporary youth achievements through the example of university students, with particular attention to the opportunities and constraints experienced in Uzbekistan and comparable contexts. The study uses a qualitative review of selected international reports and academic literature rather than a new

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survey; therefore, it does not claim to measure the performance of a specific student population. The analysis identifies five connected areas of achievement: academic development, digital and language skills, leadership and community engagement, early career preparation, and personal initiative. It also considers persistent barriers, including unequal access to technology, the mismatch between education and labour-market needs, limited practical experience, and the risk of valuing certificates more than demonstrated competence. The article argues that student success should be assessed through both outcomes and the process by which students develop useful skills, responsibility, and social contribution. Universities can strengthen these outcomes by linking classroom learning with projects, mentoring, research, volunteering, and employer engagement. Young people are often described as the generation that will shape the future. This description is meaningful only when young people have opportunities to learn, participate, experiment, and contribute to society. In the modern era, student achievement extends beyond examination marks. It may include conducting a small research project, learning a foreign language, building a digital portfolio, coordinating a campus event, volunteering in the community, developing a business idea, or helping solve a local problem. These activities can develop confidence and practical competence, especially when they complement formal study. The conditions for youth achievement have changed considerably. Digital platforms allow students to access lectures, open educational resources, professional communities, and international competitions without always leaving their home region. At the same time, the abundance of information makes it necessary to evaluate sources, manage time, communicate clearly, and use technology responsibly. Research reviewed by the OECD cautions that technology by itself does not guarantee better learning; outcomes depend on how digital tools are integrated into teaching and learning practices [1]. Therefore, the question is not whether students use technology, but whether they use it to think more critically, create something valuable, and deepen their understanding.

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Higher education has also become increasingly connected to employment. The International Labour Organization (ILO) reports that young people continue to face challenges in obtaining secure and decent work, even as educational participation has expanded. Its 2024 analysis highlights the importance of skills, training, and the quality of employment, rather than treating education credentials as a guarantee of success [2]. This is especially relevant for university students, who must often combine theoretical learning with internships, teamwork, communication, and problem-solving.

Uzbekistan provides a useful context for this discussion. The World Bank's study of youth employment in Uzbekistan identifies a gap between the skills young people acquire and those employers need, including technical and socio-emotional skills [3]. This does not mean that students are failing. Rather, it suggests that educational achievement becomes more meaningful when institutions help students connect academic knowledge with real tasks. Student clubs, research groups, volunteer projects, internships, and leadership roles can provide opportunities to practise these skills in a supportive environment.

This article has three objectives: to identify the main forms of achievement visible among contemporary university students; (2) to analyse the conditions that help or hinder those achievements; and (3) to suggest ways universities can make student development more inclusive and practical. The central argument is that student achievement should be understood as a combination of knowledge, applied skills, initiative, and contribution to others—not merely as a list of awards or certificates. The article applies a qualitative, desk-based review of research and institutional reports on youth employment, digital learning, student participation, and higher education. Sources were selected for their relevance to university-age youth, their institutional or scholarly credibility, and their contribution to understanding both opportunities and barriers. The main materials include reports from the ILO, the World Bank, UNESCO, and the OECD, alongside established scholarship on student engagement and educational outcomes.

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The analysis followed three steps. First, recurring themes were identified across the literature: academic learning, digital competence, leadership and civic engagement, career preparation, and unequal access to opportunities. Second, these themes were compared to identify links between student activities and the skills they may develop. Third, the findings were interpreted in relation to the student experience, using illustrative examples such as coordinating a campus event, preparing a research presentation, participating in a volunteer initiative, or completing an internship. These examples are analytical illustrations, not interview quotations or observations collected from a named university.

Because the study relies on secondary sources, it does not present original survey results, experimental findings, or a statistically representative account of students in Uzbekistan. Its purpose is interpretive: to organise existing evidence and explain how different forms of student achievement may contribute to personal development and social participation. The selection of sources is purposive rather than exhaustive, and international findings cannot automatically be generalised to every institution or student group. Future research could test the themes through interviews, student portfolios, or a survey covering universities in different regions.

For clarity, the term “achievement” is used broadly. It refers to a demonstrable outcome or meaningful progress-for example, completing a project, improving a skill, contributing to a team, or addressing a community need. Recognition, prizes, and certificates can provide evidence of achievement, but they are not the only indicators. The process of learning, reflecting, receiving feedback, and improving is also important.

The first area of achievement is academic development. Students demonstrate progress not only by passing examinations but also by asking better questions, comparing sources, presenting arguments, and applying concepts to real situations. A student who prepares a research poster, reviews literature for a course project, or explains a complex idea to classmates is practising skills that are valuable beyond the classroom. Such work encourages intellectual independence and helps students

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recognise the difference between repeating information and understanding it. The literature also suggests that educational participation is not equally distributed. UNESCO's work on education and student participation stresses that young people should be treated as active contributors to educational decisions, rather than only as recipients of instruction [4]. In practical terms, student councils, peer-learning groups, and course feedback mechanisms can give students a role in improving the learning environment. However, participation becomes meaningful only when students' contributions are considered and institutions explain how decisions are made. Digital competence is now a central part of student achievement. Students may use online learning platforms, collaborative documents, data tools, design applications, and digital libraries to create presentations, conduct basic analysis, or share project outcomes. Yet the ability to open an application is not the same as digital literacy. Students also need to judge the reliability of information, protect personal data, acknowledge sources, and use artificial intelligence transparently and critically. The OECD review finds that educational technologies can support learning, but their impact varies according to teaching design and implementation. Foreign-language learning can widen access to academic literature, exchange programmes, and international professional communities. Communication skills are equally important: a student may have strong knowledge but struggle to explain it clearly, work through disagreement, or present an idea to a mixed audience. Activities such as debate, academic writing, student conferences, and team presentations provide low-risk settings in which these skills can be developed. The strongest results occur when digital and language skills are used for a real purpose rather than collected as separate credentials. A third area is leadership and community engagement. University students often coordinate events, organise peer support, participate in environmental activities, assist younger learners, or contribute to cultural and educational initiatives. These experiences can develop planning, accountability, negotiation, teamwork, and empathy. Astin's influential student-involvement theory argues that student development is related to the energy and effort students invest in their educational

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experience [5]. This perspective helps explain why active participation may complement classroom learning.

Leadership should not be reduced to holding a formal title. A student who divides tasks fairly, listens to team members, resolves a scheduling problem, and evaluates an event afterwards may demonstrate leadership even without an official position. Similarly, volunteering is most educational when it responds to a genuine need and includes reflection on what worked, who benefited, and what should change. Kuh's work on high-impact educational practices highlights the value of learning experiences that require sustained effort, interaction, and reflection [6]. At the same time, universities should avoid treating extracurricular activity as an obligation that every student can meet equally. Students may have paid work, family responsibilities, transport difficulties, or limited access to campus facilities. A fair approach offers flexible roles and recognises different forms of contribution, including remote participation and small, consistent acts of service. Internships, part-time work, student enterprise projects, and collaboration with local organisations help students test their knowledge in real settings. They also expose students to professional expectations such as punctuality, clear communication, ethical conduct, and completing tasks to an agreed standard. The ILO's analysis of youth employment emphasises that expanding education alone is not enough when the labour market does not provide sufficient quality jobs or when qualifications do not match available work.

For students in Uzbekistan, the World Bank's findings on skills mismatch reinforce the importance of combining subject knowledge with practical and socio-emotional skills. A student studying education, for example, might strengthen their preparation by designing a lesson, observing classroom practice, or developing accessible learning materials. A student in law or public administration might analyse a public policy issue, practise formal writing, or participate in a supervised civic education project. These examples show how achievement can be discipline-specific while still requiring shared competencies. Entrepreneurship is another possible route,

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but it should not be presented as a universal solution to youth employment. A student business idea may build initiative and financial understanding even if it does not become a profitable enterprise. Universities can support experimentation through mentoring, project showcases, and small-scale innovation challenges while being realistic about risk, resources, and the value of learning from unsuccessful attempts. The findings point to a broad conclusion: contemporary student achievement is multidimensional. Academic results provide evidence of subject knowledge, but they do not fully reveal a student's ability to collaborate, communicate, lead, or respond to unfamiliar problems. Conversely, a long list of extracurricular activities does not automatically demonstrate deep learning. A balanced assessment should therefore consider what a student has learned, what they have produced, how they worked with others, and whether their work made a useful contribution. The first tension is between access and opportunity. Digital tools and online courses can reduce some geographical barriers, but access to a reliable connection, suitable equipment, quiet study space, and guidance remains unequal. UNESCO's work on technology in education warns against assuming that technological availability alone improves educational outcomes [7]. Institutions should therefore pair digital resources with teacher support, accessible materials, and opportunities for students to practise using them. The second tension is between credentials and competence. Certificates may document participation, but their value depends on what students can actually do. Employers and universities can help by asking students to explain a project, demonstrate a skill, describe a challenge, or reflect on feedback. A portfolio containing a research summary, a presentation, a volunteer project, and evidence of revision may provide a fuller picture than a certificate list alone. The World Economic Forum's discussion of changing job skills similarly underlines the importance of analytical thinking, resilience, flexibility, and collaboration alongside technical competence [8].

The third tension concerns the distribution of recognition. Highly visible achievements-international awards, public speaking, or competitive internships-often

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receive attention, while quieter forms of progress may go unnoticed. Students who improve their grades after difficulties, support peers, or complete demanding responsibilities alongside study may also be achieving meaningful results. A developmental approach recognises improvement and effort without abandoning standards of quality. These conclusions align with research on student engagement. Astin's theory emphasises investment in the educational experience, while Kuh's work draws attention to practices that combine active learning, collaboration, and reflection. Together, these perspectives suggest that universities should create structured opportunities for participation rather than expecting students to discover every opportunity independently. Mentoring, project-based learning, student-led research, volunteering, and internships can make the relationship between knowledge and action more visible.

For Uzbekistan, the policy implication is not simply to encourage students to collect more certificates. It is to build stronger links among universities, employers, civil society, and local communities. Institutions can provide transparent information about internships, make research opportunities available to students outside elite programmes, and ensure that leadership opportunities are accessible to students with different financial and personal circumstances. Career services should also help students identify transferable skills and explain them clearly in applications and interviews. A limitation of the present article is that it synthesises existing literature and does not test a causal relationship between participation and later success. Students who join clubs or internships may already have more time, confidence, or support than their peers. Therefore, participation should not automatically be interpreted as the cause of better outcomes. Further research could compare students' self-reported skills with portfolios, academic progress, and graduate employment, while accounting for socioeconomic background and field of study. Such research would provide a stronger basis for evaluating which programmes work, for whom, and under what conditions. Young people are achieving results in many areas, from academic learning and digital competence to leadership, volunteering, and career

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preparation. University students are especially well placed to connect these areas because higher education offers both specialised knowledge and opportunities to participate in wider communities. The analysis shows, however, that achievement depends on more than individual motivation. It is shaped by access to resources, the quality of teaching, practical experience, institutional support, and the availability of decent work.

Universities should recognise achievement as a process as well as an outcome. This means giving students opportunities to apply knowledge, work in teams, receive feedback, reflect on mistakes, and contribute to society. It also means ensuring that participation is inclusive and that certificates do not replace evidence of real competence. In the Uzbek context, closer cooperation between higher education institutions, employers, and community organisations could help students turn their learning into practical value. Ultimately, the most meaningful student achievement is not only personal success, but the ability to use knowledge and skills responsibly for the benefit of others.

REFERENCES

1. International Labour Organization. (2024). Global employment trends for youth 2024: Decent work, brighter futures. ILO. https://doi.org/10.54394 ZUUI5430

2. Honorati, M., & Marguerie, A. (2021). Youth employment in Uzbekistan: Opportunities and challenges. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail 235891634705237783

3. UNESCO. (2026). Global Education Monitoring Report 2026: Youth report-Lead with youth. UNESCO and United Nations Youth Office. https://www.unesco.org/gem-report/en/publication

4. Astin, A. W. (1984). Student involvement: A developmental theory for higher education. Journal of College Student Personnel, 25(4), 297-308.

https://creativecommons.org/licenses/by/4.0/

ISSN: 2690-2265
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PUBLISHED: 31.10.2026

5. Kuh, G. D. (2008). High-impact educational practices: What they are, who has access to them, and why they matter. Association of American Colleges and Universities.

6. UNESCO. (2023). Global Education Monitoring Report 2023: Technology in education-A tool on whose terms? UNESCO. https://www.unesco.org/gem-report/en/technology

7. World Economic Forum. (2025). The future of jobs report 2025. World Economic Forum. https://www.weforum.org/publications/the-future-of-jobs-report-2025

8. OECD. (2019). OECD skills outlook 2019: Thriving in a digital world. OECD Publishing. https://doi.org/10.1787/df80bc12-en

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