

SCIENCE
PROBLEMS.UZ

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Актуальные проблемы социальных и гуманитарных наук

Ijtimoiy-gumanitar fanlarning dolzarb muammolari

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2025

SCIENCEPROBLEMS.UZ

IJTIMOIIY-GUMANITAR FANLARNING DOLZARB MUAMMOLARI

№ 12 (5) – 2025

АКТУАЛЬНЫЕ ПРОБЛЕМЫ СОЦИАЛЬНО- ГУМАНИТАРНЫХ НАУК

ACTUAL PROBLEMS OF HUMANITIES AND SOCIAL SCIENCES

TOSHKENT-2025

BOSH MUHARRIR:

Isanova Feruza Tulqinovna

TAHRIR HAY'ATI:

07.00.00- TARIX FANLARI:

Yuldashev Anvar Ergashevich – tarix fanlari doktori, siyosiy fanlar nomzodi, professor;

Mavlanov Uktam Maxmasabirovich – tarix fanlari doktori, professor;

Xazratkulov Abror – tarix fanlari doktori, dotsent;

Tursunov Ravshan Normuratovich – tarix fanlari doktori;

Xolikulov Axmadjon Boymahmatovich – tarix fanlari doktori;

Gabrielyan Sofya Ivanovna – tarix fanlari doktori, dotsent;

Saidov Sarvar Atabullo o'g'li – katta ilmiy xodim, Imom Termiziy xalqaro ilmiy-tadqiqot markazi, ilmiy tadqiqotlar bo'limi.

08.00.00- IQTISODIYOT FANLARI:

Karlibayeva Raya Xojabayevna – iqtisodiyot fanlari doktori, professor;

Nasirxodjayeva Dilafruz Sabitxanovna – iqtisodiyot fanlari doktori, professor;

Ostonokulov Azamat Abdukarimovich – iqtisodiyot fanlari doktori, professor;

Arabov Nurali Uralovich – iqtisodiyot fanlari doktori, professor;

Xudoyqulov Sadirdin Karimovich – iqtisodiyot fanlari doktori, dotsent;

Azizov Sherzod O'ktamovich – iqtisodiyot fanlari doktori, dotsent;

Xojayev Azizxon Saidaloxonovich – iqtisodiyot fanlari doktori, dotsent

Xolov Aktam Xatamovich – iqtisodiyot fanlari bo'yicha falsafa doktori (PhD), dotsent;

Shadiyeva Dildora Xamidovna – iqtisodiyot fanlari bo'yicha falsafa doktori (PhD), dotsent v.b.;

Shakarov Qulmat Ashirovich – iqtisodiyot fanlari nomzodi, dotsent.;

Jabborova Charos Aminovna - iqtisodiyot fanlari bo'yicha falsafa doktori (PhD).

09.00.00- FALSAFA FANLARI:

Hakimov Nazar Hakimovich – falsafa fanlari doktori, professor;

Yaxshilikov Jo'raboy – falsafa fanlari doktori, professor;

G'aybullayev Otabek Muhammadiyevich – falsafa fanlari doktori, professor;

Saidova Kamola Uskanbayevna – falsafa fanlari doktori;

Hoshimxonov Mo'min – falsafa fanlari doktori, dotsent;

O'roqova Oysuluv Jamoliddinovna – falsafa fanlari doktori, dotsent;

Nosirxodjayeva Gulnora Abdukaxxarovna – falsafa fanlari nomzodi, dotsent;

Turdiyev Bexruz Sobirovich – falsafa fanlari doktori (DSc), Professor.

10.00.00- FILOLOGIYA FANLARI:

Axmedov Oybek Saporbayevich – filologiya fanlari doktori, professor;

Ko'chimov Shuxrat Norqizilovich – filologiya fanlari doktori, dotsent;

Hasanov Shavkat Ahadovich – filologiya fanlari doktori, professor;

Baxronova Dilrabo Keldiyorovna – filologiya fanlari doktori, professor;

Mirsanov G'aybullo Qulmurodovich – filologiya fanlari doktori, professor;

Salaxutdinova Musharraf Isamutdinovna – filologiya fanlari nomzodi, dotsent;

Kuchkarov Raxman Urmanovich – filologiya fanlari nomzodi, dotsent v/b;

Yunusov Mansur Abdullayevich – filologiya fanlari nomzodi;

Saidov Ulugbek Aripovich – filologiya fanlari nomzodi, dotsent;

Qodirova Muqaddas Tog'ayevna - filologiya fanlari nomzodi, dotsent.

12.00.00- YURIDIK FANLAR:

Axmedshayeva Mavlyuda Axatovna – yuridik fanlar doktori, professor;

Muxitdinova Firyuza Abdurashidovna – yuridik fanlar doktori, professor;

Esanova Zamira Normurotovna – yuridik fanlar doktori, professor, O'zbekiston Respublikasida xizmat ko'rsatgan yurist;

Hamroqulov Bahodir Mamasharifovich – yuridik fanlar doktori, professor v.b.,;

Zulfiqorov Sherzod Xurramovich – yuridik fanlar doktori, professor;

Xayitov Xushvaqt Saparbayevich – yuridik fanlar doktori, professor;

Asadov Shavkat G'aybullayevich – yuridik fanlar doktori, dotsent;

Ergashev Ikrom Abdurasulovich – yuridik fanlari doktori, professor;

Utemuratov Maxmut Ajimuratovich – yuridik fanlar nomzodi, professor;

Saydullayev Shaxzod Alixanovich – yuridik fanlar nomzodi, professor;

Hakimov Komil Baxtiyarovich – yuridik fanlar doktori, dotsent;

Yusupov Sardorbek Baxodirovich – yuridik fanlar doktori, professor;

Amirov Zafar Aktamovich – yuridik fanlar doktori (PhD);

Jo'rayev Sherzod Yuldashevich – yuridik fanlar nomzodi, dotsent;

Babadjanov Atabek Davronbekovich – yuridik fanlar nomzodi, professor;

Normatov Bekzod Akrom o'g'li — yuridik fanlar bo'yicha falsafa doktori;

Rahmatov Elyor Jumaboyevich — yuridik fanlar nomzodi;

13.00.00- PEDAGOGIKA FANLARI:

Xashimova Dildarxon Urinboyevna – pedagogika fanlari doktori, professor;

Ibragimova Gulnora Xavazmatovna – pedagogika fanlari doktori, professor;

Zakirova Feruza Maxmudovna – pedagogika fanlari doktori;

Kayumova Nasiba Ashurovna – pedagogika fanlari doktori, professor;

Taylanova Shoxida Zayniyevna – pedagogika fanlari

doktori, dotsent;

Jumaniyozova Muhayyo Tojiyevna – pedagogika fanlari doktori, dotsent;

Ibraximov Sanjar Urunbayevich – pedagogika fanlari doktori;

Javliyeva Shaxnoza Baxodirovna – pedagogika fanlari bo'yicha falsafa doktori (PhD);

Bobomurotova Latofat Elmurodovna — pedagogika fanlari bo'yicha falsafa doktori (PhD).

19.00.00- PSIXOLOGIYA FANLARI:

Karimova Vasila Mamanosirovna – psixologiya fanlari doktori, professor, Nizomiy nomidagi Toshkent davlat pedagogika universiteti;

Hayitov Oybek Eshboyevich – Jismoniy tarbiya va sport bo'yicha mutaxassislarni qayta tayyorlash va malakasini oshirish instituti, psixologiya fanlari doktori, professor

Umarova Navbahor Shokirovna– psixologiya fanlari doktori, dotsent, Nizomiy nomidagi Toshkent davlat pedagogika universiteti, Amaliy psixologiyasi kafedrasini mudiri;

Atabayeva Nargis Batirovna – psixologiya fanlari doktori, dotsent;

Shamshetova Anjim Karamaddinovna – psixologiya fanlari doktori, dotsent;

Qodirov Obid Safarovich – psixologiya fanlari doktori (PhD).

22.00.00- SOTSIOLOGIYA FANLARI:

Latipova Nodira Muxtarjanovna – sotsiologiya fanlari doktori, professor, O'zbekiston milliy universiteti kafedra mudiri;

Seitov Azamat Po'latovich – sotsiologiya fanlari doktori, professor, O'zbekiston milliy universiteti;

Sodiqova Shohida Marxaboyevna – sotsiologiya fanlari doktori, professor, O'zbekiston xalqaro islom akademiyasi.

23.00.00- SIYOSIY FANLAR

Nazarov Nasriddin Ataqulovich –siyosiy fanlar doktori, falsafa fanlari doktori, professor, Toshkent arxitektura qurilish instituti;

Bo'tayev Usmonjon Xayrullayevich –siyosiy fanlar doktori, dotsent, O'zbekiston milliy universiteti kafedra mudiri.

OAK Ro'yxati

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MUNDARIJA

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PEDAGOGICAL STRATEGIES AND THE INTEGRATION OF ICT IN TEACHING FOOD PHYSIOLOGY: INNOVATIVE APPROACHES IN HIGHER EDUCATION

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Abstract. This review summarizes current data on the integration of information and communication technologies (ICT) and modern pedagogical strategies in teaching nutrition physiology in higher education institutions. We examine video learning and augmented reality tools, as well as their impact on learning outcomes, motivation, and behavioral change. Data indicate that digital methods of nutritional intervention and pedagogical approaches based on ICT can improve students' knowledge acquisition, engagement, and, in some cases, their behavior related to nutrition. Augmented reality tools are consistently viewed as effective supplements to traditional learning, improving conceptual understanding and active learning. Gamification increases motivation and engagement in various disciplines.

Keywords: nutrition physiology, ICT in education, virtual laboratories, gamification, higher education, digital interventions in nutrition.

PEDAGOGIK STRATEGIYALAR VA OVQATLANISH FIZIOLOGIYASINI O'QITISHDA AKT INTEGRATSIYASI: OLIY TA'LIMDA INNOVATSION YONDASHUVLAR

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Annotatsiya. Ushbu sharhda oliy ta'lim muassasalarida ovqatlanish fiziologiyasini o'qitishda axborot-kommunikatsiya texnologiyalari (AKT) va zamonaviy pedagogik strategiyalarni joriy etish bo'yicha zamonaviy ma'lumotlar umumlashtirilgan. Biz video ta'lim va kengaytirilgan reallik vositalarini ko'rib chiqamiz hamda ularning ta'lim natijalari, motivatsiya va xulq-atvor o'zgarishiga ta'sirini baholaymiz. Ma'lumotlar shuni ko'rsatadiki, ovqatlanish bo'yicha raqamli aralashuv usullari va AKTga asoslangan pedagogik yondashuvlar talabalarning bilimlarni o'zlashtirishini, ishtirokini va ba'zi hollarda ovqatlanish bilan bog'liq xatti-harakatlarini yaxshilashi mumkin. To'ldirilgan reallik vositalari doimo an'anaviy ta'limga samarali qo'shimcha sifatida qaraladi, bu esa kontseptual tushunish va faol o'rganishni yaxshilaydi. Geymifikatsiya turli fanlarga bo'lgan motivatsiya va qiziqishni oshiradi.

Kalit so'zlar: ovqatlanish fiziologiyasi, ta'limda AKT, virtual laboratoriyalar, geymifikatsiya, oliy ta'lim, ovqatlanishga raqamli aralashuvlar.

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1. Introduction

Nutrition physiology is a key component of food technology curricula. Understanding the processes of digestion, absorption, metabolism of macro- and micronutrients, and regulatory physiology is essential for future nutritionists and food production specialists. At the same time, higher education is undergoing a rapid digital transformation: learning management systems (LMS) are increasingly being used to teach complex technological concepts. The integration of ICT with evidence-based pedagogical strategies opens up potential for improving conceptual understanding, practical skills, and promoting healthy eating behavior among students. Recent systematic reviews and tests of digital learning in nutrition and physiology indicate measurable advantages in terms of knowledge and engagement.

Justification and purpose. The purpose of this article is to summarize current data (empirical research and pedagogical assessments) on ICT-based approaches to teaching nutrition physiology in higher education institutions, identify effective strategies, and offer practical recommendations for teachers and curriculum developers.

2. Methods (narrative-overview approach)

The integration of information and communication technologies (ICT) into nutritional physiology education enhances the clinical focus of specialist training and improves understanding of complex biochemical and physiological processes through visualization and interactive simulations [1, 2]. The use of virtual laboratories and adaptive testing systems promotes the development of thinking and the formation of assessment skills [3]. A number of randomized trials have shown that digital educational platforms improve student performance and accelerate the development of competencies in dietetics and nutrition [4, 5]. Supplementing lecture material with multimedia modules and gamified cases (e.g., a "virtual display of food digestion") improves long-term knowledge retention and increases student engagement [6,8]. Moreover, the effectiveness of ICT increases when integrated with the principles of evidence-based medicine and interdisciplinary learning [9]. Research in the Russian-language educational space also confirms the high potential of online courses on nutritional physiology in medical universities [10, 11]. Considering the interdisciplinary literature, we conducted a targeted review, focusing on peer-reviewed systematic reviews, randomized trials, and empirical studies published between 2018 and 2025, covering: [12] virtual laboratories and online workshops in physiology; [13] the implementation of augmented reality in life sciences education; [14] gamification and game-based learning in higher education in the life sciences; [15] digital educational interventions in nutrition. The search was conducted in PubMed/PMC, Google Scholar, and publisher platforms using combinations of the keywords: "physiology education", "nutrition education", "gamification", "digital nutrition intervention", and "video nutrition education". Priority was given to high-quality recent reviews and representative RCTs; included articles are cited in the reference list.

3. Results - synthesis of evidence

3.1. Digital intervention in nutrition: impact on behavior and knowledge

Randomized studies show that digital intervention in nutrition can lead to a small but significant improvement in nutritional knowledge, and in some cases, to improved eating habits, such as increased consumption of fruits and vegetables or improved nutrient selection. More comprehensive systematic reviews demonstrate the effectiveness of digital interventions in short-term behavior and knowledge change. However, the magnitude and duration of the effect vary depending on the target group. [16]

3.2. Virtual laboratories and distance practical classes in physiology

Virtual physiology and anatomy laboratories can effectively support conceptual learning, especially when using interactive simulations and task templates. Virtual laboratories increase accessibility and allow for repeated practice; nevertheless, most authors recommend supplementing them rather than completely replacing face-to-face practical sessions due to limitations in the development of psychomotor skills and aspects of social and teamwork [17,18]. Modern research confirms that virtual laboratories are capable of effectively supporting conceptual learning, especially when using interactive simulation and structured tasks. Their advantages include wide accessibility, the ability to repeat experiments multiple times, and increased flexibility of the educational process. At the same time, most authors agree that such laboratories should be considered more as a supplement than a full-fledged alternative to traditional practical classes, as they are limited in the development of psychomotor skills, as well as in the formation of social and team competencies. An additional advantage of virtual laboratories is the availability of learning analytics tools that allow for detailed tracking of student actions and providing personalized feedback. For example, a systematic review of virtual physiological laboratories showed that in 90% of studies, virtual laboratories contribute to conceptual learning, especially in hybrid formats (blended learning), where virtual and face-to-face lessons are combined [19].

3.3. Gamification and game-based learning

Increasing data from physiology and related disciplines indicate that gamification increases students' motivation, engagement, and sometimes even knowledge retention. In physiology-related subjects, gamified tests, examples based on scripts and leader tables can help form complex judgments about nutrient metabolism and make decisions about healthy nutrition. Modern data indicate that gamification can enhance students' motivation, their engagement in the educational process, and in some cases, knowledge retention. In physiology-related subjects, the use of gamified tests, scenario tasks, and rating tables not only maintains interest in the studied material but also contributes to the formation of complex cognitive skills, including reasoning about nutrient metabolism and making decisions in the field of rational nutrition [20]. Thus, in an experiment on endocrine physiology among veterinary faculty students, it was shown that game elements and scenario-based learning increase academic performance compared to the traditional approach ($n = 106$) [21]. Other authors note that the development of the online eFlip game on key human physiology topics has significantly reduced the percentage of failed exams and improved understanding of systemic relationships [22]. Virtual laboratory simulations with game elements also demonstrated an increase in student learning motivation and results [23]. In the field of nutrition, gamification is used to promote healthy choices: for example [24], product game labels and the reward system (crowns) in online shopping improved the quality of food baskets in a randomized controlled study, and short-term gaming interventions among adolescents showed positive effects on fruit and vegetable consumption [25]. At the same time, systematic reviews emphasize that the greatest effectiveness is achieved when game elements are integrated into a holistic educational design, while the isolated application of individual mechanics (for example, badges without feedback) yields limited results [26].

3.4. Learning Analysis and Assessment

Virtual platforms collect extensive data on interaction (transitions, task completion time, problem-solving attempts), which allows learning analytics to shape adaptive learning and timely warn students experiencing difficulties. Modern virtual platforms record a wide range of data on students' interaction with educational content, including the sequence of transitions between assignments, their completion time, the number of attempts to solve them, and the nature of errors made. Based on these data arrays, learning systems analysts form adaptive trajectories that allow personalization of the educational process, as well as provide the ability to identify students experiencing difficulties early on. This approach contributes to the teacher's timely intervention and increases the effectiveness of material assimilation. [27]

4. Discussion - On the path to a fact-based learning model

4.1. Generalization of the main results

The totality of evidence confirms the following points (each of which has been confirmed by recent reviews/tests):

1. Digital technologies can improve nutritional knowledge and short-term behavior patterns [28].
2. Virtual physiological laboratories and simulations improve conceptual learning and make it more accessible, and are especially valuable in combination with active pedagogical methods (inverted classroom, problem-oriented learning). They should complement, not completely replace, practical practice [29].
3. Virtual conductive laboratories and simulations improve conceptual learning and make it more accessible and especially valuable in combination with active pedagogical methods (problem-oriented learning). They should complement, not completely replace, practical practice [30].
4. Learning analytics provides teachers with practical knowledge but requires proven indicators and integration into course development [31].

4.2. Practical impementation (recommendations for course developers)

Based on the available data, we propose a pragmatic five-stage structure for integrating ICT into the teaching of nutrition physiology:

1. Clearly define learning outcomes - conceptual knowledge (e.g., nutrient assimilation mechanisms), applied skills (e.g., diet assessment), and setting/behavioral goals.
2. Select ICT corresponding to the results - virtual laboratories/for understanding space/processes; video and micro-modules for basic knowledge.
3. Implement active pedagogical methods - learning based on case analysis and project work based on digital tasks (for example, projects on diet analysis using applications) [32].
4. Use analytics to inform teachers - collect and act based on LMS/virtual laboratory data for targeted correction [33].
5. Thoroughly assess - combine preliminary and subsequent knowledge tests [34].

4.3. Limitations of Evidence

Many studies focus on immediate progress in learning or satisfaction but lack reliable behavioral endpoints or long-term retention data

4.4 Future Research Directions

Highly effective randomized controlled trials (HRCs) comparing ICT-based blended pedagogy and traditional learning with standardized outcomes (knowledge, skills, long-term behavior).

- Analysis of the economic efficiency of virtual laboratories.
- Research on equal access and strategies to minimize digital inequality.
- Standardized learning analytics metrics related to confirmed results.

5. Conclusion

The integration of ICT with scientifically grounded pedagogical strategies opens up significant opportunities for improving teaching and learning in the field of nutritional physiology. Virtual laboratories, gamification, and digital methods of nutritional intervention have unique advantages and, with pedagogical consistency, can improve conceptual understanding, engagement, and short-term behavioral changes. Teachers should use these tools within the framework of mixed, active teaching methods, monitor results through reliable assessment, and prioritize equal access. Video modules and interactive mobile tools allow for the effective integration of nutrition physiology concepts with real decision-making regarding nutrition in courses. Use virtual laboratories to visualize digestion, nutrient transport, metabolic pathways, and conduct simulated experiments (e.g., enzyme kinetics, absorption scenarios) - in conjunction with synchronous classroom discussions. Game-based formative assessments and clinical nutrition modeling can be integrated into modules to maintain engagement and provide immediate feedback.

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