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TEACHING BIOLOGY BASED ON MODERN INFORMATION AND COMMUNICATION TECHNOLOGIES: IN THE DEVELOPMENT OF NEW UZBEKISTAN

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Abstract:
The modernization of the educational process in New Uzbekistan requires the active integration of information and communication technologies (ICT) into the teaching of natural sciences, particularly biology. Biology, as a subject that combines theory with experimentation and real-world application, benefits significantly from digital tools that enhance visualization, interactivity, and personalized learning. This article explores the methodological foundations of teaching biology using ICT in the context of educational reforms in Uzbekistan. It analyzes the benefits of digital simulations, virtual laboratories, multimedia platforms, and interactive software that improve student engagement and conceptual understanding. The research highlights the pedagogical transformation underway in pedagogical higher education institutions, focusing on equipping future biology teachers with the necessary digital competencies. Furthermore, it outlines challenges such as technical infrastructure limitations and lack of methodological training, offering recommendations for overcoming these obstacles. The article ultimately emphasizes that incorporating ICT into biology education not only aligns with global trends but also serves as a catalyst for educational quality and innovation in New Uzbekistan.

Keywords: Biology education, information and communication technologies, pedagogical universities, virtual laboratories, digital teaching tools, educational innovation.

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Introduction

BIOLOGIYA FANINI ZAMONAVIY AXBOROT-KOMMUNIKATSIYA TEXNOLOGIYALARI ASOSIDA O‘QITISH: YANGI O‘ZBEKISTON TARAQQIYOTIDA

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Annotatsiya:
Yangi O‘zbekistonda ta’lim jarayonini modernizatsiya qilish tabiiy fanlarni, xususan biologiyani o‘qitishda axborot-kommunikatsiya texnologiyalarini (AKT) faol integratsiya qilishni talab etadi. Nazariya, tajriba va real hayotiy amaliyotni o‘zida mujassamlashtirgan biologiya fani vizualizatsiya, interaktivlik hamda shaxsga yo‘naltirilgan o‘qitishni kuchaytiradigan raqamli vositalar orqali sezilarli darajada foyda ko‘radi. Ushbu maqolada O‘zbekistondagi ta’lim islohotlari kontekstida AKTdan foydalangan holda biologiya fanini o‘qitishning metodik asoslari tahlil qilinadi. Unda raqamli simulyatsiyalar, virtual laboratoriyalar, multimedia platformalari va interaktiv dasturlar yordamida talabalarni jalb qilish va tushunchalarni chuqur o‘zlashtirish imkoniyatlari yoritiladi. Tadqiqot pedagogik oliy ta’lim muassasalarida yuz berayotgan pedagogik transformatsiyani ta’kidlab, kelajakdagi biologiya o‘qituvchilarini zarur raqamli kompetensiyalar bilan ta’minlash muhimligini ko‘rsatadi. Shuningdek, maqolada texnik infratuzilmaning cheklanganligi va metodik tayyorgarlik yetishmasligi kabi muammolar ham ko‘rib chiqilib, ularni bartaraf etish bo‘yicha tavsiyalar beriladi. Yakunda maqola biologiya ta’limiga AKTni joriy etish global tendensiyalarga mos kelishini va Yangi O‘zbekiston ta’limida sifat va innovatsiyalar uchun kuchli turtki bo‘lib xizmat qilishini asoslaydi.

Kalit so‘zlar: biologiya ta’limi, axborot-kommunikatsiya texnologiyalari, pedagogik universitetlar, virtual laboratoriyalar, raqamli o‘qitish vositalari, ta’lim innovatsiyasi.

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Introduction

In recent years, Uzbekistan has undergone significant educational reforms aimed at aligning national teaching standards with international best practices. Within this process, the integration of information and communication technologies (ICT) into the curriculum has become a strategic priority. In particular, biology education—a field deeply rooted in experimentation, observation, and interaction with the natural world—has demonstrated a high potential for innovation through the use of modern digital tools. In the context of New Uzbekistan, where digitalization is influencing all spheres of public life, equipping future biology teachers with ICT skills is not just beneficial, but essential for preparing a new generation of students who are ready to meet global challenges.

Biology is a science that requires learners to develop abstract thinking, analyze complex systems, and apply theoretical knowledge in practical settings. Traditional methods of teaching, while still relevant in certain contexts, often fail to provide the necessary engagement and clarity needed to understand biological processes at micro and macro levels. The use of animations, interactive models, virtual laboratories, and simulation-based learning platforms addresses these challenges effectively. Such tools offer dynamic representations of biological concepts that static images and textbook explanations cannot convey.

In pedagogical universities, where the foundation for future teaching professionals is laid, the adoption of ICT in the biology curriculum is of particular importance. By integrating these technologies into teacher training programs, future educators can gain both theoretical knowledge and hands-on experience in using digital resources for instruction. This dual approach fosters the development of digital pedagogical competence, which encompasses the ability to select, adapt, and apply technological tools to meet the needs of diverse learners.

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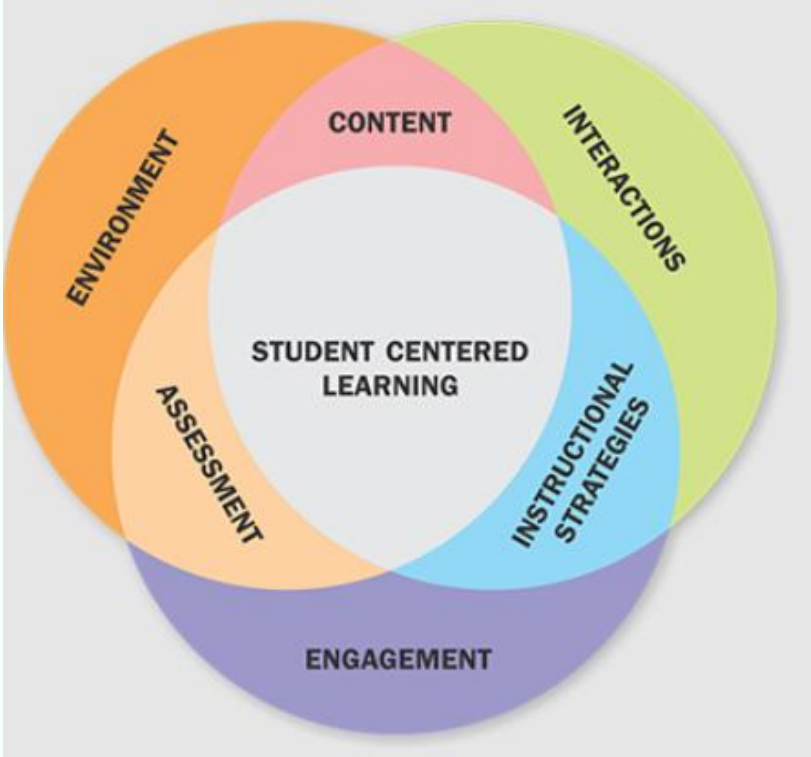

The relevance of this topic is further emphasized by the growing demand for digital literacy among educators. As the education system in Uzbekistan continues to modernize, teachers are expected not only to understand subject content but also to deliver it in formats that resonate with a generation of students accustomed to multimedia environments. The ability to use ICT tools such as video tutorials, 3D anatomy applications, augmented reality (AR), and online quizzes enhances both the teaching process and student motivation. Moreover, the COVID-19 pandemic revealed the urgency of digital preparedness in education, making ICT integration no longer optional but a fundamental requirement.

This article aims to explore the theoretical and practical aspects of using information and communication technologies in teaching biology at pedagogical universities in Uzbekistan. It examines the current state of digital implementation in biology education, outlines the benefits and limitations of ICT use, and proposes methodological recommendations for educators and policymakers. In doing so, the study contributes to the ongoing discourse on educational innovation in New Uzbekistan and offers a framework for creating a more engaging, effective, and future-oriented biology curriculum.

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Main Part

The application of information and communication technologies (ICT) in biology education brings transformative opportunities for both students and teachers. In pedagogical universities of Uzbekistan, ICT has increasingly become a central component of curriculum design, particularly in the training of future biology teachers. The integration of these technologies enhances traditional teaching methods by making biological concepts more vivid, interactive, and accessible. It also fosters a student-centered learning environment where learners are actively engaged in knowledge construction rather than passive recipients of information.

One of the most effective uses of ICT in biology education is the implementation of virtual laboratories. These platforms allow students to conduct simulated experiments, manipulate variables, and observe outcomes without the constraints of physical lab equipment. This is especially valuable in institutions that lack access to well-equipped biological laboratories. With virtual labs, students can repeat experiments multiple times, correct errors instantly, and receive immediate feedback, thus reinforcing the learning process through active engagement.

Multimedia resources also play a key role in improving biology education. Animated videos, interactive 3D models, and augmented reality applications help students visualize abstract biological phenomena such as cell division, molecular interactions, and ecological cycles. For example, platforms like BioDigital Human or 3D Cell Viewer provide high-resolution simulations of human anatomy and cellular structures, enabling deeper comprehension than traditional textbook illustrations. These tools make it easier for students to retain complex information and link theoretical knowledge with practical understanding.

Online assessment tools further contribute to the effective teaching of biology. Automated quizzes, adaptive learning platforms, and digital progress tracking systems allow teachers to monitor student performance in real-time and adjust instruction accordingly. This data-driven approach enhances the personalization of education and supports differentiated instruction strategies, which are crucial in heterogeneous classrooms.

In addition to content delivery, ICT supports collaborative learning and project-based instruction. Digital platforms such as Google Classroom, Edmodo, and Microsoft Teams enable students to participate in group projects, share research findings, and engage in discussions beyond the classroom. These platforms foster critical thinking, teamwork, and communication skills—competencies essential

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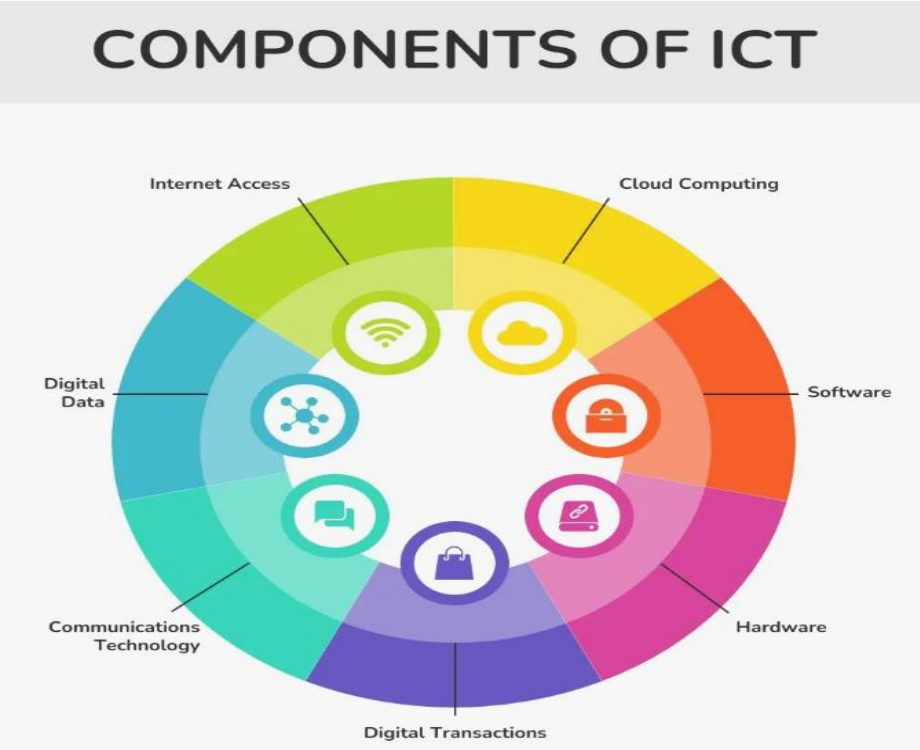
for future educators. Moreover, the integration of ICT encourages students to conduct independent research, make presentations using digital tools, and access international scientific databases and journals, thus expanding their academic horizons.

Despite these advantages, the use of ICT in biology education also faces several challenges. Limited access to high-speed internet, lack of sufficient digital infrastructure, and insufficient training of educators remain significant barriers, especially in rural areas. Many teachers are not adequately prepared to integrate technology into their lessons due to a lack of professional development opportunities in digital pedagogy. Furthermore, there is a need for localized digital content in the Uzbek language that aligns with the national curriculum and cultural context.

To address these issues, pedagogical universities must prioritize capacity building programs aimed at enhancing the digital competence of future biology teachers. This includes not only technical training but also methodological support on how to integrate ICT into lesson planning, assessment, and classroom management. Government initiatives and partnerships with educational technology providers can also play a role in equipping institutions with necessary resources and training materials.



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Ultimately, the use of ICT in teaching biology is not merely a technical enhancement but a strategic component of educational reform in New Uzbekistan. It represents a shift towards more dynamic, inclusive, and effective teaching practices that reflect the demands of the 21st century. By embedding digital literacy into biology education, Uzbekistan is laying the foundation for a scientifically literate society capable of innovation and informed decision-making.

Conclusion

The integration of information and communication technologies into biology education marks a critical step in the modernization of the pedagogical system in Uzbekistan. As the nation advances toward becoming a digitally empowered society, the role of ICT in enhancing the quality and accessibility of education cannot be overstated. In the context of biology—a subject that demands both theoretical understanding and practical engagement—ICT provides essential tools for visualization, simulation, and interactive learning that traditional methods alone cannot fully achieve.

The research presented in this article highlights the numerous benefits that ICT offers to biology education. These include improved conceptual clarity through digital animations and models, increased student engagement via virtual laboratories and multimedia content, and enhanced assessment opportunities through online testing platforms. Moreover, ICT fosters an environment that encourages self-directed learning, collaboration, and the development of digital competencies among students—skills that are increasingly valuable in the modern educational and professional landscape.

However, to realize the full potential of ICT in biology education, it is essential to address the existing barriers. These include insufficient digital infrastructure in some institutions, a lack of teacher training in digital pedagogy, and the absence of localized educational content that meets national standards. Overcoming these challenges requires coordinated efforts from government bodies, academic institutions, and technology providers. Investment in teacher training programs, the development of digital resources in the Uzbek language, and the expansion of internet access are crucial steps toward creating an equitable and effective digital learning environment.

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In conclusion, teaching biology through ICT is not only a response to technological progress but also a necessary evolution in educational methodology. It aligns with the goals of New Uzbekistan to build a future-ready education system that cultivates scientific thinking, creativity, and innovation. By equipping future teachers with the tools and knowledge to integrate ICT into biology education, pedagogical universities are shaping a generation of educators who can inspire and guide students in a rapidly changing world. The continued advancement of ICT in biology education holds great promise for the development of a scientifically informed, digitally literate, and globally competitive society in Uzbekistan.

References:

1. Xaitboyev, Q. O. O. G. L., & Izatullayeva, O. R. S. Q. (2022). BIOMATEMATIKA FANINING ILMIY-NAZARIY ASOSLARI VA FANLAR KESIMIDA TUTGAN O ‘RNI. Academic research in educational sciences, 3(5), 872-876.
2. Askarovich, A. B., & Oripjon o'g'li, X. Q. METHODOLOGY OF TEACHING INFORMATICS IN HIGHER EDUCATION.
3. UNESCO. (2020). ICT in Education: A Critical Analysis of the Integration Process. Paris: UNESCO Publishing.
4. Kozma, R. (2011). Transforming Education: The Power of ICT Policies. Washington, DC: Intel Education.
5. Ministry of Public Education of the Republic of Uzbekistan. (2022). Strategiya raqamli ta’limni rivojlantirish bo‘yicha yo‘l xaritasi. Tashkent.
6. Bahromov, B. (2023). “Biologiya fanini o‘qitishda raqamli texnologiyalardan foydalanish imkoniyatlari.” Ta’lim innovatsiyalari jurnali, 4(2), 55–63.
7. Sadikova, D., & Usmanova, N. (2021). “Pedagogik ta’limda AKT kompetensiyalarini shakllantirish yo‘llari.” Oliy ta’limda zamonaviy metodlar, 3(1), 21–27.
8. Tojiboyeva, G. R. (2022). Development of the skill of calligraphic writing as a professional competence in a future primary school teacher. Galaxy International Interdisciplinary Research Journal, 10(12), 830-835.
9. Rifovna, T. G. (2022). The specificity of the school" rivoge"(development) in the development of the professional competence of the future primary education teacher. Conferencea, 478-480.