Volume 3, Issue 4, April – 2025 **ISSN (E):** 2938-379X

THE CURRENT STATE OF WEB PLATFORMS IN ENHANCING THE PROFESSIONAL COMPETENCE OF FUTURE BIOLOGY TEACHERS

Raupova Mehrinigor Haydarovna
Associate Professor, Department of Biology,
Bukhara State Pedagogical Institute, PhD
E-mail: raupova_mehrinigor@buxdpi.uz
Tel: +998(97)3083588

Akramova Moxinabonu Mirg‘olibovna
2nd Year Master's Student, Bukhara State Pedagogical Institute

Abstract
This article analyzes the role and current state of WEB platforms in developing the professional competence of pre-service biology teachers amidst the growing importance of digital transformations in the 21st-century education system. A comparative analysis is conducted between the experience of developed countries (e.g., USA, Finland, South Korea) in using WEB platforms in education and the current situation in Uzbekistan. The level of WEB platform utilization in pedagogical higher education institutions in Uzbekistan, infrastructural capabilities, existing challenges, and ways to overcome them are examined, and the potential of these platforms in shaping subject-specific, methodological, and technological competencies is evaluated.

Keywords. pre-service biology teacher, professional competence, WEB platforms, digital education, developed countries, Uzbekistan, TPACK, educational technologies, pedagogical innovation.

Introduction

The modern world's education system is characterized by continuous changes and the widespread adoption of digital technologies. This process requires teachers not only to have a deep understanding of their subject but also to use information and communication technologies (ICT) effectively and apply innovative pedagogical approaches. Biology, with its complexity, numerous abstract concepts, and microscopic and submicroscopic objects, stands out, further increasing the need for visualization and interactivity in its teaching. It is at this point that WEB platforms become an important tool for shaping and developing the professional competence of future biology teachers. They provide an opportunity not only to deliver theoretical knowledge but also to develop practical skills in a virtual environment and encourage collaborative work and independent learning. While WEB platforms have already

become an integral part of teacher training systems in developed countries, it is important to objectively assess the current state, achievements, and shortcomings of this process in Uzbekistan, and to define future development directions by comparing them with international experience. This article is aimed at in-depth academic analysis of these issues.

Research Methodology

The professional competence of a future biology teacher is a multifaceted concept that includes deep and systematic knowledge of the subject (fundamental biology, ecology, genetics, molecular biology, etc.), pedagogical and psychological training, effective teaching methodologies (interactive methods, project-based learning, problem-based learning) [1], communication skills, and, based on modern requirements, digital literacy. In particular, the TPACK (Technological Pedagogical Content Knowledge) model proposed by P. Mishra and M.J. Koehler is of particular importance from the point of view of ICT integration into education. According to it, an effective teacher must not only know technology, pedagogy, and subject content separately, but also be able to use them in harmony, in accordance with educational goals [2].

WEB platforms refer to a set of software and resources that can be accessed via the Internet and serve educational purposes. These include Learning Management Systems (LMS - Moodle, Google Classroom, Canvas, Hemis in Uzbekistan), virtual and remote laboratories (PhET Simulations, Labster, VRLab), open educational resources (OER - Coursera, edX, Khan Academy), interactive content creation tools (H5P, Genially, Kahoot!), collaboration platforms (Google Workspace, Microsoft Teams), and others. Their main pedagogical advantages are the ease of access to educational materials, independence from time and space, individualization of the learning process, increased interactivity, and support for collaborative activities [3].

Integration of WEB platforms in developed countries. In developed countries (USA, Canada, Finland, Singapore, South Korea, Japan, etc.), the use of WEB platforms in education systems, particularly in teacher training programs, is widespread and continuously being improved [4].

LMS integration: The majority of university courses are hosted on LMS platforms, which are used not only for sharing lecture materials and assignments but also for organizing online discussions, video conferences, and group projects. Future teachers gain experience from their student days, both as active users of these platforms and as organizers of their own lessons in the future.

Virtual and remote laboratories: For sciences requiring practical exercises, such as biology, virtual (simulation-based) and remote (controlling real equipment via the internet) laboratories are widely used. Platforms (e.g., Labster, PhET) allow complex, expensive, or dangerous experiments (DNA manipulations, microscopic studies, ecosystem modeling) to be conducted in a safe and interactive environment. This deepens future teachers' practical skills and understanding of science [5].

Emphasis on digital content creation: Teacher training programs focus on teaching students not only how to use ready-made digital resources but also how to create their own interactive lesson materials, presentations, videos, and tests. Special programs and platforms (Articulate 360, Camtasia, H5P) are integrated into the learning process for this purpose.

Continuous professional development platforms: Online platforms and professional learning networks (PLNs) designed for teachers provide opportunities to share experiences [6], learn about new methodologies, and collaborate with colleagues.

The successful integration of WEB platforms in these countries is mainly due to a stable and high-speed internet infrastructure, adequate provision of educational institutions with computer equipment, a high level of digital literacy among faculty and students, and the existence of state support policies.

The state of WEB platform usage in Uzbekistan. In recent years, Uzbekistan has also taken certain steps to digitize the education system, including the introduction of WEB platforms in higher education. Many universities have transitioned to LMS platforms such as Moodle and Hemis, and elements of distance learning have begun to be used. The pandemic, in particular, significantly accelerated this process. However, when analyzing the state of WEB platform usage from the perspective of enhancing the professional competence of future biology teachers, a number of systemic problems and opportunities for development are evident:

Infrastructure and technical support: Compared to developed countries, problems with internet speed and stability in Uzbekistan, especially in the regions, and the unequal provision of all students and teachers with modern computer equipment hinder the full use of WEB platforms. This creates a digital divide [7].

Digital literacy and pedagogical training: The digital skills of many faculty and students are limited to using the basic functions of the platforms. There is a need for systematic methodological training and continuous professional development to use platforms not just as a means of transmitting information, but as pedagogical tools that promote interactivity, collaboration, and critical thinking. The level of TPACK model implementation remains low.

Content quality and availability: There is a shortage of high-quality, interactive digital educational resources in Uzbek (especially virtual laboratories, simulations, video lessons related to biology) adapted to national education standards and curricula. Most of the existing resources are taken from foreign platforms or translated, requiring pedagogical and cultural adaptation.

Shallow pedagogical integration: In many cases, LMS platforms are mainly used to post lecture notes, presentations, and tests. The level of deep pedagogical integration, such as project-based learning, solving problem situations through the platform, and collaborative virtual research, is low. The use of virtual laboratories or specialized simulation programs (including free platforms like PhET) for teaching biology is not yet widespread.

Systematic approach and support: It is necessary to improve a systematic approach to promoting the introduction and effective use of WEB platforms, and mechanisms for continuous methodological and technical support for faculty.

Comparative Analysis and Discussion

The difference in the level and effectiveness of WEB platform usage between Uzbekistan and developed countries is mainly explained by the infrastructural, content-related, human resource, and systemic approach differences mentioned above. In developed countries, WEB

Web of Teachers: Inderscience Research
webofjournals.com/index.php/1

platforms have become a natural and integral part of the learning process, while in Uzbekistan they are viewed more as an additional or auxiliary tool.

This difference directly affects the professional competence of future biology teachers. While their peers in developed countries acquire practical skills in using modern digital tools, creating interactive lessons, and conducting virtual experiments, the preparation of future teachers in Uzbekistan may not be sufficient in this regard. This could negatively affect the quality of biology education in schools and students' interest in the subject in the future.

At the same time, there are positive trends in Uzbekistan. Interest in digital technologies is growing, state support measures are being taken, and young people are quickly mastering technology. By eliminating existing problems and creatively applying international experience, there is an opportunity to dramatically increase the effectiveness of WEB platform usage. The key is not just to introduce technology, but to subordinate it to pedagogical goals, and to deeply integrate it with teaching content and methods.

Conclusion and Recommendations

In conclusion, WEB platforms are an important tool in ensuring the professional competence of future biology teachers – deepening their scientific knowledge, improving their methodological skills, improving their digital literacy, and adapting to modern educational requirements. While Uzbekistan has achieved certain successes in the use of these platforms, there is still much work to be done compared to the experience of developed countries.

To accelerate development in this area, it is advisable to carry out systematic work in the following areas:

Reduce the digital divide by improving internet infrastructure and increasing the level of provision of modern computer equipment in educational institutions, especially in the regions.

Establish a continuous professional development system for future teachers and faculty on the effective use of WEB platforms for pedagogical purposes, and the practical application of TPACK principles.

Provide state support for the creation and localization of high-quality, interactive digital educational resources in Uzbek, adapted to national curricula, including virtual laboratories and simulations related to biology.

Encourage and provide methodological support for the active use of WEB platforms in higher education, not just as a means of delivering content, but for organizing project-based, problem-based, and collaborative learning.

Expand international cooperation, study and adapt advanced foreign experience to local conditions, and establish contacts with platform providers.

Continue scientific and pedagogical research on assessing the impact of WEB platforms on the effectiveness of the learning process and the competence of future teachers.

The implementation of these measures will contribute to the formation of the professional competence of future biology teachers in Uzbekistan that meets modern requirements, and ultimately improve the quality of biology education in schools.

References

1. Zimnyaya, I. A. (2003). Key competencies—a new paradigm of educational outcomes. *Higher Education Today*, *(5)*, 34–42.
2. Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017–1054.
3. Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. John Wiley & Sons.
4. Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. Palgrave Macmillan.
5. Prensky, M. (2001). Digital natives, digital immigrants Part 1. *On the Horizon*, *9*(5), 1–6.
6. Nebel, S., Schneider, S., & Rey, G. D. (2016). Mining learning and crafting scientific experiments: A literature review on the use of Minecraft in education and research. *Journal of Educational Technology & Society*, *19*(2), 355–366.
7. Callaghan, N. (2016). Investigating the Role of Minecraft in Educational Learning Environments. *Educational Media International*, *53*(4), 244–260.

Web of Teachers: Inderscience Research
webofjournals.com/index.php/1