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OPPORTUNITIES FOR USING INNOVATIVE SOFTWARE TOOLS IN DEVELOPING METHODOLOGICAL COMPETENCE OF FUTURE BIOLOGY TEACHERS

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Abstract
This article analyzes the role of innovative software educational tools in the formation and development of methodological competence of future biology teachers, their capabilities, advantages and effectiveness. It also highlights the role of modern web platforms and interactive resources in the educational process.

Keywords: Methodological competence, innovative software tools, biology education, digital platforms, teacher training.

Introduction

The modern education system demands not only deep subject knowledge from pedagogical personnel but also the application of contemporary and innovative teaching approaches. This is especially significant in natural sciences such as biology, where visual, interactive, and simulation-based learning tools play a crucial role. Therefore, integrating innovative software tools into the training of future biology teachers has become a pressing issue.

Today, platforms such as Moodle, Google Classroom, PhET, Edmodo, and BioMan Biology offer opportunities for virtual modeling of biological processes and simulation of laboratory activities. These tools not only deliver knowledge but also enhance students' analytical, problem-solving, and creative thinking skills. This article explores the role and potential of these platforms in developing methodological competence.

Methodological competence refers to a teacher's professional capacity to organize the learning process effectively, utilize modern pedagogical and information technologies, manage student activity, and evaluate outcomes. A biology teacher's methodological competence includes:

- Implementing interdisciplinary integration;
- Proper organization of biological experiments;

• Engaging students in observation and analytical activities;
• Delivering educational materials interactively.

Moodle (Modular Object-Oriented Dynamic Learning Environment) is an open-source learning management system that allows teachers to create courses, upload materials, conduct assessments, and monitor student progress. Through Moodle, teachers can systematically present course content, develop students' independent learning skills, and foster self-assessment—ultimately enhancing their own methodological competence.

Google Classroom is a free web-based platform that enables teachers and students to manage and organize the learning process. Teachers can assign tasks, share materials, provide feedback, and assess student performance. The platform facilitates the use of modern pedagogical techniques, contributing to the development of teachers' methodological skills.

Edmodo is a learning platform styled as a social network, designed for interaction between teachers and students, sharing materials, and managing assignments. Established in 2008, it enables interactive teaching, tracking student engagement, and assessing academic performance. Teachers can create courses, set schedules, and upload assignments. Unlike other platforms, Edmodo allows communication through messages and posts within a closed and safe environment. It also integrates with Google Drive and Microsoft OneDrive, supports sharing of PDF, Word, and PowerPoint files, and includes gamification features such as badges and rewards to increase student motivation. While designed primarily for school-level education, it is also applicable in higher education, especially in small groups and beginner-level online courses. Although simpler than large-scale LMS systems like Moodle or Google Classroom, it serves as a strong option for foundational instruction.

PhET (Physics Education Technology) offers a collection of interactive simulations used not only in biology but also in subjects like chemistry and physics. These simulations help teachers visually explain complex biological processes and aid students in deeper comprehension.

BioMan Biology is a platform featuring interactive games and exercises specifically for biology education. It increases student interest and strengthens their subject knowledge. Teachers can conduct engaging and interactive lessons using this platform, enhancing student participation. Unlike other platforms, BioMan Biology emphasizes gamification elements that actively engage learners.

Electronic web platforms contribute to the development of teachers' methodological competence in several key areas:

1. Interactivity – Engaging students and increasing motivation through interactive content.
2. Flexibility – Allowing educators to plan and adapt lessons dynamically, enriching methodological strategies.
3. Resource Richness – Providing access to a variety of teaching materials, simulations, and exercises that expand instructional capacity.
4. Assessment Tools – Offering effective means of evaluating student knowledge and skills, thereby improving learning outcomes.
5. Collaboration – Facilitating communication and collaboration between teachers and students, supporting the development of communicative competence.

These platforms are essential tools in the modern educational process, making lessons more engaging, effective, and professionally enriching. Therefore, biology teachers should actively integrate such tools into their pedagogical practice.

In teaching biology, electronic web platforms play a critical role. Moodle and Google Classroom provide capabilities for organizing and managing instruction; Edmodo strengthens teacher-student communication; PhET and BioMan Biology enable the interactive exploration of theoretical knowledge. Collectively, these platforms serve as effective tools in developing students' methodological competence.

Research findings demonstrate that using innovative software tools is an effective means for shaping the methodological competence of future biology teachers. These tools develop not only digital literacy but also interdisciplinary thinking. Furthermore, students acquire critical thinking, problem-solving, teamwork, and personal learning planning skills.

However, challenges remain, such as technical limitations, language barriers, and insufficient digital literacy among educators. This highlights the need for specialized training programs to equip teachers with skills for effective use of digital tools. Methodological competence remains one of the core professional qualities of a biology teacher. In the current educational landscape, teachers are not only knowledge transmitters but also facilitators who guide students in research, critical thinking, and independent learning. Thus, continual development of biology teachers' methodological competence, along with adaptation to new pedagogical technologies and international best practices, remains a vital objective.

Both internal and external factors influence the development of methodological competence. Personal interest, professional experience, and creativity play key roles in effective teaching. At the same time, government policy, technological advancement, and professional development opportunities are crucial. Global trends show that advanced educational systems emphasize independent inquiry, interactive methods, and student engagement in hands-on activities. Uzbekistan's education system has also developed programs aimed at enhancing methodological competence, significantly contributing to teachers' professional growth.

Innovative software tools designed to develop methodological competence among future biology teachers encourage a creative approach to mastering pedagogical forms and techniques necessary for professional advancement.

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