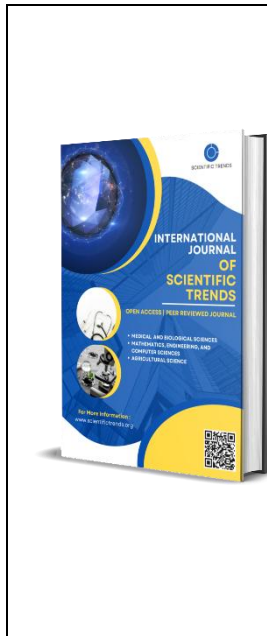


Qualimetric Assessment of Professional Methodological Competencies of Students in Biology Lessons in Advanced International Practices

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Abstract

This article analyzes advanced international practices in qualimetric assessment of students' professional methodological competencies in biology lessons. Approaches in the education systems of Finland, Singapore, and the USA are comparatively studied. Focus is placed on aspects such as the development of practical skills, technological competencies, and project-based learning. The essence and importance of qualimetric assessment, along with its various forms, are elucidated. Common and distinct features of international practices are analyzed, and the possibilities of adapting them to the Uzbekistan education system are considered. The article provides practical recommendations for developing students' professional methodological competencies.

Keywords: Biology education, professional methodological competencies, qualimetric assessment, Finnish experience, Singaporean experience, US experience, education quality, ICT tools, pedagogical technologies, innovations in education.

Introduction

In the modern education system, the development and assessment of students' professional methodological competencies are of paramount importance. Especially in subjects like biology, there is a need to integrate theoretical knowledge with practice, apply modern technologies, and consider the individual characteristics of students. In international practice, qualimetric assessment methods are used as effective tools for identifying and developing students' professional competencies. This article analyzes advanced international practices in the development and assessment of professional methodological competencies in biology lessons.

Professional methodological competencies encompass both theoretical and practical aspects of pedagogical activity. In biology lessons, these competencies are developed in the following areas [1]:

- a) Theoretical knowledge: Deep understanding of the basic concepts, laws, and theories of biology.
- b) Practical skills: Performing laboratory work, conducting experiments, and analyzing results.
- c) Technological literacy: Using modern information and communication technologies.
- d) Reflection and assessment: Analyzing one's own activities and fairly assessing the level of students' knowledge.
- e) Personal development: Adhering to pedagogical ethics and communication culture.

Developing these competencies in biology lessons not only enhances students' professional preparedness [2] but also ensures the effectiveness of the educational process.

Qualimetric assessment is a method of quantifying qualitative indicators, allowing for a precise and systematic evaluation of students' professional competencies. The main advantages of this method are:

- Precision: Assessing competencies based on quantitative indicators.
- Objectivity: Minimizing subjective approaches.
- Analytical approach: Identifying a student's strengths and weaknesses.

In biology lessons, qualimetric assessment is applied in the following areas:

1. Assessing theoretical knowledge: Through tests, question-and-answer sessions, and written assignments.
2. Assessing practical skills: Analyzing the quality and results of laboratory work [3].
3. Assessing technological competencies: Determining the level of ICT tool usage.
4. Reflection and self-assessment: Studying the student's ability to analyze their own activities.

Research Methodology

Several countries have implemented effective systems for developing and qualimetrically assessing students' professional methodological competencies. The experience of these countries plays a significant role in improving the quality of pedagogical education. Below, the advanced practices of Finland, Singapore, and the USA are analyzed in detail.

Finnish Experience

1. Focus on developing practical skills: The Finnish education system is recognized as one of the most effective in the world. In biology education, significant emphasis is placed on developing students' practical skills. During lessons, theoretical knowledge is reinforced with practical exercises [4].

- Laboratory work: Considerable time is allocated to laboratory work in the curriculum. Students develop skills such as working with microscopes and analyzing biological objects.

- Nature observations: Through outdoor excursions and nature observations, students learn about ecological problems in practice.

2. Application of qualimetric assessment: In Finland, qualimetric assessment methods allow for an objective evaluation of students' knowledge and skills.

- Automated assessment systems: Using specialized software, the results of laboratory work are automatically assessed. This system reduces the subjectivity of the human factor [5].

– Electronic portfolios: Electronic portfolios have been introduced, compiling all of the students' work. This allows for monitoring the dynamics of their development.

3. Reflection and self-assessment:

– Self-assessment journals: Students have the opportunity to analyze their completed work and give themselves an assessment. This develops their reflective thinking skills.

– Dialogue-based approach: Communication between the teacher and student is open and constructive, contributing to the student's personal development.

4. Results:

– Effective education: Through these approaches, Finnish students achieve high scores in international olympiads and tests.

– Professional readiness: Students enter higher education institutions well-prepared and succeed in their professional careers.

Singaporean experience

Development of technological competencies: The level of technology use in the Singaporean education system is very high. ICT tools are widely implemented in biology lessons [6].

– Virtual laboratories: Virtual laboratory platforms have been created for students, allowing them to conduct experiments online.

– Interactive textbooks: Electronic textbooks and applications help students gain a deeper understanding of the subject matter.

Assessing ICT tool usage through qualimetric assessment:

– Digital footprint monitoring: Students' activities using ICT tools, such as participation in online tests and the extent of resource utilization, are monitored and assessed [7].

– Integrated assessment system: Theoretical knowledge and practical skills are integrated into a single assessment system. This allows for a comprehensive evaluation of students' overall preparedness.

Innovative teaching approaches:

– Flipped Classroom: Students familiarize themselves with theoretical materials independently, while class time is dedicated to practical exercises and discussions.

– Collaborative Learning: Group work-based approaches develop students' communication and teamwork skills.

Results:

– High ICT literacy: Singaporean students are leaders in technology use.

– Global competitiveness: Students' technological and scientific knowledge ensures their international competitiveness.

USA experience

Project-based learning: Project-based learning is widely used in biology lessons in the US education system. This approach serves to develop students' creativity and practical skills [8].

– Practical projects: Students work on projects related to environmental issues, genetic research, or biological systems.

– Multidisciplinary approach: Integration with other subjects, such as mathematics and computer science, is ensured during the project.

Assessing the project process in qualimetric assessment:

– Process and product evaluation: The student's work process on the project (process) and the final presentation or report (product) are assessed separately.

– Assessment criteria: Clear and transparent assessment criteria are developed, taking into account problem-solving skills, communication skills, and creativity [9].

Focus on creativity and innovative approaches:

– STEM education: Science, technology, engineering, and mathematics are taught in an integrated manner in biology education.

– Entrepreneurship education: Students are equipped with skills to transform their scientific ideas into business plans.

Results:

– Practical approach: Students acquire knowledge and skills geared towards solving real-life problems.

– Innovative thinking: Encouraging creativity and innovation leads to new discoveries and inventions [10].

Based on the information presented in this table, it is possible to draw conclusions about the unique approaches of each country and their respective outcomes.

Table 1 Comparison table of international experiences

Feature	Finland	Singapore	USA
Common Features			
Importance of Qualimetric Assessment	Relies on qualimetric assessment methods to identify and develop students' professional competencies.	Relies on qualimetric assessment methods to identify and develop students' professional competencies.	Relies on qualimetric assessment methods to identify and develop students' professional competencies.
Emphasis on Practical Skills	Gives significant importance to practical exercises in biology education. Laboratory work, nature observations.	Gives significant importance to practical exercises in biology education. Virtual laboratories, interactive textbooks.	Gives significant importance to practical exercises in biology education. Practical projects, multidisciplinary approach.
Distinguishing Features			
Main Focus	Reflection and self-assessment	Technological competencies and ICT	Creativity and innovative thinking
Applied Methods	Self-assessment journals, teacher-student dialogue	Digital footprint monitoring, integrated assessment system	Project-based learning, STEM, entrepreneurship
Results	High academic results, professional readiness	High ICT literacy, global competitiveness	Practice-oriented knowledge and skills, innovative thinking

To effectively implement qualimetric assessment in biology lessons within the Uzbekistan education system, the following recommendations can be implemented:

- Develop specific assessment criteria: Clear criteria should be established for assessing students' theoretical knowledge, practical skills, and technological literacy.
- Utilize ICT tools: Introduce electronic tests, automated assessment systems for laboratory work, and distance learning platforms.
- Develop reflection and self-assessment: Implement special programs that provide students with opportunities to analyze and evaluate their own activities.
- Study and adapt international experiences: Improve the quality of education by adapting the experiences of Finland, Singapore, and the USA to local conditions.

Conclusion

Qualimetric assessment of students' professional methodological competencies in biology lessons is a crucial aspect of the modern education system. International experience demonstrates that qualimetric assessment methods are effective tools for determining students' theoretical knowledge, practical skills, and technological literacy. By implementing these methods in the Uzbekistan education system, it is possible to enhance the quality of biology lessons and elevate students' professional preparedness to a new level.

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