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WAYS TO IMPROVE 4C SKILLS IN FUTURE BIOLOGY TEACHERS

Komilova Baxmal Odilovna
Associate Professor, PhD in Biology Department of Biology
Bukhara State Pedagogical Institute

Murodova Iqbol Komilovna
2nd Year Master's Student Methods of Teaching Exact and Natural Sciences (Biology) Bukhara State Pedagogical Institute
Phone number: +998905103803

Abstract
This article focuses on ways to improve 4K skills in future biology teachers, such as problem solving, critical thinking, collaboration, and creativity. How to train teachers and encourage their professional development through modern pedagogical methods and innovative technologies will be considered. Strategies are developed so that teachers can apply their knowledge in practice and teach students more effectively. The article is also enriched with successful experiences and examples.

Keywords: Future biology teachers, 4K skills, pedagogical methods, innovative technologies, critical thinking, collaboration, creativity, professional development, educational strategies, successful experiences.

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Introduction

Developing 4C skills in future biology teachers is a key requirement of the modern education system. These skills—critical thinking, creativity, collaboration, and problem-solving—enhance teachers' effectiveness in the learning process. The use of innovative teaching methods and modern technologies makes teacher training even more significant. Today, continually improving teachers' skills based on current educational demands is of great importance. This article discusses how to ensure the professional development of future biology teachers and the ways in which their 4C skills can be enhanced.

Literature review and methods

There are numerous studies on developing critical thinking skills. For example, Paul and Elder (2006) describe methodologies for examining the critical thinking process, which help learners improve their questioning and analytical abilities.

To improve communication skills, modern technologies such as online platforms and video conferencing (Bennett, 2012) have been shown to be effective instructional tools. Through these methods, students develop the ability to express their ideas clearly and to be receptive to others' perspectives.

Collaboration skills are fostered by team-based tasks and projects (Johnson & Johnson, 1999). Such activities encourage students to work together and learn from one another.

To foster creativity, focusing on problem-solving and innovative thinking is crucial. Robinson (2011) suggests incorporating game elements into the learning process to stimulate creative thinking.

Research Methodology

Allowing students to generate new ideas in biology and find creative solutions through the use of digital technologies increases their creative thinking skills. In order to enhance these skills, teachers should update their teaching methods, use innovative technologies, and consistently seek opportunities for professional development. These references are useful for learning 4C skills and exploring modern educational methodologies.

Developing 4C skills in future biology teachers makes the teaching process more effective and engaging. These skills are essential for success not only in biology, but in all fields. In turn, teachers play a vital role in preparing future generations by applying modern teaching approaches and continually updating their knowledge.

The following methods can be used to improve 4C skills in future biology teachers:

Analysis and synthesis method for critical thinking-in biology research and teaching, the analysis and synthesis method is especially effective. It involves analyzing biological phenomena by breaking them down into distinct parts and subsequently integrating these parts to form new ideas and concepts.

Interdisciplinary method for creative thinking- in biology, an interdisciplinary approach is crucial for generating new ideas and innovative solutions. Combining biology with other disciplines—such as art, engineering, or psychology—helps foster creative thinking, which can lead to new discoveries and solutions.

Collaborative approach with research partnerships-research partnerships are vital for achieving productive results in collaborative work. This method encourages cooperation between different laboratories and institutions, allowing for shared resources and the generation of new ideas. Strengthening collaboration in biology leads to fresh discoveries and innovations.

Communicative approach through Q&A sessions- Q&A sessions promote active communication and interaction among students. By asking and answering questions, students gain deeper insights into biological concepts. This method effectively applies communication-focused instruction in biology classes, enhancing interaction and engagement among students.

Analysis and results

The 4C skills—critical thinking, creativity, collaboration, and communication—are among the main pillars of the modern education system. By developing these skills, teachers can not only impart knowledge to students but also prepare them for real-life challenges, molding them into well-rounded individuals who meet the demands of the 21st century.

Critical Thinking-Helps students analyze information, assess its reliability, draw logical conclusions, and make independent decisions. In real life, this skill enables them to solve

problems, choose the right course of action in complex situations, and support their own viewpoints. For biology teachers, critical thinking is especially valuable because it helps students understand scientific research, analyze different theories, and draw their own conclusions.

Creativity-encourages innovation and searching for unique ideas. Students learn to present original concepts, find nonstandard solutions, and create new products using their imaginations. In biology, creativity plays a crucial role in making new scientific discoveries, modeling biological processes, and proposing innovative solutions.

Collaboration-teaches students how to work in teams, communicate effectively, exchange ideas, and work together toward a common goal. Collaboration fosters social relationships, respect for different opinions, and mutual support. Biology teachers can use group projects, research, and presentations to promote collaboration among students.

Communication-develops the skills of clearly expressing one's thoughts, listening to others, understanding their perspectives, and effectively engaging with various audiences. Biology teachers help students hone communication skills by having them create scientific presentations, participate in debates, and write academic papers.

Modern pedagogical approaches—such as problem-based learning, game-based learning, and project-based learning—serve as effective tools for developing 4C skills. The use of innovative technologies makes lessons more engaging and interactive, increases students' motivation, and encourages independent inquiry. As a result, students who acquire 4C skills gain not only in-depth subject knowledge but also the tools they need to succeed in diverse fields.

Conclusion

Enhancing 4C skills in future biology teachers is a critical factor in ensuring the success of the teaching process. Critical thinking, communication, collaboration, and creativity help students succeed not only in biology but also in broader life contexts. These skills give students the ability to think independently, communicate effectively, work in teams, and develop innovative ideas.

Applying modern teaching strategies and methods helps teachers update their knowledge and increase students' interest. In turn, teachers should continuously refine their pedagogical approaches to ensure that students attain competencies that meet contemporary requirements.

In the end, developing 4C skills not only raises the professional level of biology teachers but also expands opportunities for students to apply their knowledge in practice and achieve future success. Sharing ideas, experiences, and insights is vital for effective collaboration between teachers and students. By fostering 4C skills, teachers create a more efficient learning environment that prepares students to meet the challenges of the future.

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