PEDAGOGICAL FOUNDATIONS OF DEVELOPING ATTENTION AND MEMORY IN FUTURE BIOLOGY TEACHERS BASED ON NEURODIDACTIC APPROACHES

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Abstract. This article analyzes the pedagogical foundations of developing attention and memory among future biology teachers based on neurodidactic approaches. In modern education, effective biology teaching depends not only on professional knowledge but also on cognitive activity, attention management, and memory efficiency. The study highlights the role of neurodidactics in biology education, the influence of brain-based learning processes, and the importance of innovative pedagogical technologies in improving attention and memory. The research also examines the effectiveness of interactive methods, visual tools, and emotionally engaging educational activities in increasing learning outcomes and strengthening professional competencies among future biology teachers.

Keywords: neurodidactics, biology education, attention, memory, future teacher, cognitive activity, pedagogical technologies, interactive methods, neuroeducation, innovative learning.

Introduction. Modern educational reforms require improving the professional competence of future teachers according to contemporary pedagogical demands. In particular, biology education requires innovative approaches that activate students' cognitive activity, increase motivation, and create effective learning environments. In this context, neurodidactic approaches are considered one of the promising directions

for improving biology education.

Neurodidactics is an interdisciplinary field integrating pedagogy, psychology, and neuroscience to organize teaching according to the functioning principles of the human brain. This approach focuses on cognitive processes such as attention, memory, emotional state, and motivation during learning activities. Applying neurodidactic methods in biology education contributes to effective knowledge acquisition, long-term memory formation, and increased interest in scientific learning.

Attention and memory are among the most important psychological components in the professional preparation of future biology teachers. Teaching biological processes, organizing laboratory activities, using visual materials, and explaining complex scientific concepts require high levels of cognitive activity and concentration. Therefore, developing attention management and memory efficiency among future teachers has become an important pedagogical task.

Modern pedagogical research emphasizes that visual, kinesthetic, and emotionally rich teaching methods significantly improve attention and memory processes. In biology education, the use of animations, diagrams, laboratory experiments, role-playing activities, and problem-based tasks stimulates brain activity and strengthens knowledge retention. Such approaches not only improve academic achievement but also contribute to the development of professional creativity and communication skills among future teachers.

The purpose of this article is to analyze the pedagogical foundations of developing attention and memory among future biology teachers through neurodidactic approaches.

Materials and Methods. The research was conducted through theoretical and qualitative analysis of scientific literature related to neurodidactics, pedagogy, psychology, and biology education. Modern pedagogical methods aimed at developing attention and memory were comparatively analyzed.

Descriptive, analytical, and comparative methods were applied during the study. The influence of interactive teaching methods, visual technologies, and emotionally engaging educational activities on cognitive development was examined within the context of biology education.

Pedagogical observation and scientific generalization methods were also used to determine the effectiveness of neurodidactic approaches in the preparation of future biology teachers.

Results and Discussion. The analysis demonstrated that neurodidactic approaches significantly improve the effectiveness of biology education. The human brain processes and retains information more effectively when learning materials include visual and emotional components. Therefore, using colorful illustrations, diagrams, videos, and laboratory experiments in biology lessons contributes to stronger concentration and long-term memory formation.

Interactive methods were found to be especially effective in developing attention among future biology teachers. Problem-based learning, biological simulations, group discussions, and role-playing activities increased students' active participation during lessons. Such methods help maintain attention for longer periods and encourage deeper analysis of biological concepts.

The research also confirmed the effectiveness of associative methods and visual coding technologies in memory development. Teaching biological terminology through diagrams, tables, and visual schemes improved long-term retention of educational material. Emotionally engaging content also positively influenced memory processes because students remembered information more effectively when it was connected with practical and emotional experiences.

Neurodidactic approaches increased students' motivation and cognitive activity during educational activities. Future biology teachers demonstrated higher levels of interest and participation when biological topics were connected with practical tasks

and visual experiences. Laboratory activities and work with real biological objects significantly improved attention and memory indicators among students.

The findings also showed that neurodidactic approaches contribute not only to academic achievement but also to the development of professional competencies, creative thinking, and communication skills. Future teachers became more active in collaborative learning environments and demonstrated stronger analytical and reflective abilities during educational activities.

Another important result of the study is that emotionally supportive and interactive educational environments positively influence cognitive development. Students who participated in visually rich and collaborative activities showed better concentration, reduced anxiety, and stronger motivation toward professional learning. This confirms the importance of brain-based teaching methods in preparing modern biology teachers.

The research indicates that integrating neurodidactic principles into teacher education creates favorable conditions for improving the quality of biology teaching. Innovative educational technologies and interactive methods stimulate intellectual activity and help future teachers adapt to modern educational challenges more effectively.

Conclusion. The research demonstrated that neurodidactic approaches are effective tools for developing attention and memory in biology education. Educational activities based on visual, emotional, and interactive methods improve knowledge acquisition and support long-term memory formation.

The study also confirmed that neurodidactic methods contribute to the professional development of future biology teachers by strengthening creativity, communication skills, and innovative pedagogical competencies. Such approaches create favorable conditions for improving cognitive activity and preparing future teachers for effective professional performance.

Therefore, higher educational institutions should widely implement neurodidactic approaches in biology teacher training programs and develop pedagogical methods corresponding to brain-based learning principles. This will contribute to improving the quality of education and preparing competitive specialists capable of meeting modern educational demands.

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