

ZOOLOGY AND ITS TEACHING IN 2000-2025

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ANNOTATION: This article analyzes the scientific works and articles of our country and world scientists on zoology education in 2000-2025. It can be seen that scientific and methodological research on the organization and provision of zoology education is gradually developing in the direction of innovative, cognitive and information and communication technologies. At the same time, it is observed that in the existing literature a holistic model of the methodology for the formation of research competencies in students based on cognitive activity has not been fully developed.

KEYWORDS: Zoology, zoological education, pedagogical technologies, inquiry-based learning, integration, project, modeling, developmental learning.

INTRODUCTION: Biology education teaches the entire younger generation not only to appreciate the beauty of nature, but also to protect and preserve it, to create and increase natural resources with their own hands [1]. It has been proven that in the modern educational process it is necessary to use innovative technologies, not limited to traditional organizational methods of teaching biology [2]. Zoology classes and extracurricular activities allow students to develop their scientific outlook, guide them in choosing a career and prepare them for practical life [3]. Modern methods and technologies for teaching zoology [4] and advanced international experience increase the scientific potential of students and develop their practical skills [5]. To enhance student creativity, creative assignments in zoology are designed for an interactive approach, and a rich resource of such assignments has accumulated in modern pedagogy [6]. A number of studies on zoology and its teaching have been conducted by foreign and domestic scientists and young researchers.

MATERIALS AND METHODOLOGY:

Zoology is taught in zoology classes and as extracurricular activities. Zoology classes can also be divided into in-class and extracurricular (Table 1).

Teaching Methods:

Table 1

Zoology lessons.	1. Classroom activities	1. Lessons with discussions and stories. 2. Laboratory work. 3. Didactic games under the teacher's guidance.
	2. Extracurricular activities	Activities 1. Field trips to nature, zoos, museums, and livestock farms. 2. Observations in the school corner and on the experimental plot under the guidance of a teacher.
Extracurricular activities	1. Work in the classroom and in the biology room.	1. Work in the zoological corner. 2. Work in the zoological club. 3. Biology Olympiads. 4. Zoological evenings.
	2. Extracurricular activities.	1. Work on the school experimental plot. 2. Observing animals in the wild.



		<ol style="list-style-type: none"> 3. Making visual aids. 4. Collecting collections. 5. Working with a locator. 6. Independent work with a book.
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In teaching zoology, methods of storytelling, conversation, problem-based research, practical, demonstration, motivational, independent work, logical and others are used. O. Movlonov in his textbook "Methodology and Technology of Teaching Zoology" [7] examined the use of modular learning, didactic games, problem-based learning, collaborative learning, traditional learning and other pedagogical technologies in teaching biology and its sections. Students of the teacher N.Zh. Toshmonov [8] and S.M. Nadzhimova [9] developed a system for creating educational and methodological support that allows for the effective organization of laboratory classes in zoology, programming and management of educational activities. There are also articles by Russian researchers devoted to improving the pedagogical technologies used in teaching zoology.

Enhancing the quality of zoology education by providing interactive software for integrating technology-based learning tools[10]. It is recommended to explore the potential of developmental educational technologies and actively identify ways to use them in organizing and managing students' cognitive activities[11]. This includes studying the theoretical and practical issues of teaching zoology, improving teaching methods from a scientific and theoretical point of view through the use of presentations, multimedia and video lessons, as well as modern editorial technologies in the teaching of zoology.[12] Virtual and blended learning methods enhance the effectiveness of education through modern technologies. Through virtual laboratories, online courses and simulations, students interactively explore the animal world.[13]

Let's consider the pedagogical perspectives of researchers from the CIS. Developing students' professional competencies in teaching invertebrate zoology can be accomplished in each lesson of the "Invertebrate Zoology" course by reinforcing theoretical knowledge and organizing research projects. Professional competence can be viewed as the ability to perform work based on experience, skills, and problem-solving abilities [14], as noted by our colleagues from Kyrgyzstan. How to develop research skills in zoology students, how to involve biology students in research work, using the advantages of applied zoology. Expert assessments of the development of students' research skills are proposed, such as a rating system, portfolio, and methods for evaluating research results [15]. A model for the development of a methodology for developing research competence has been developed, which provides for the management of project activities of biology students in the educational process by organizing systematic professionally oriented research activities [16]. In addition, of particular scientific and methodological significance is the development of scientific research in zoology based on the use of multimedia and Internet technologies [17], improving the quality of students' knowledge with the use of electronic modules [18], and organizing independent local history work [19]. In the study of V.A. Krishtop [20], the issue of using visual aids in teaching the "Animals" section of biology is scientifically substantiated. The author believes that the use of visual aids not only facilitates the effective acquisition of educational material but also develops students' intellectual abilities, including observation, analytical thinking, and independent thought. A.V. Teremov's study [21] examined the use of symbolic means in teaching biology. The author analyzed their significance in students' perception and acquisition of knowledge and scientifically substantiated that visual and symbolic expressiveness contributes to a deeper understanding of educational material.

We will review the research work of foreign scientists on the teaching of zoology.



Directions for improving the scientific process have been developed by integrating project-based activities into the teaching of vertebrate zoology [22], modeling its integration with other biological sciences [23], strengthening research strategies in the study of invertebrates [24], and identifying problems and solutions for students and teachers [25].

RESULTS:

According to the literature review, scientific and methodological research on the organization and provision of zoology education from 2000 to 2025 has consistently shifted toward innovative, cognitive, and information and communication technologies. During these years (e.g., A.V. Teremov, 2000), scientific research was conducted on the creation of software for knowledge acquisition through symbolic and visual representation in biology education. Modular technologies (S.M. Nadzhimova, 2008), multimedia, and information (N.V. Musinova, 2007) are analyzed as sustainable management of the educational process, interactive, independent, and cognitive methods of educational activity. Recent scientific research (M.T. Khonnazarov, A. Ishanov, G. Anapana, 2025) develops a systematic modern methodological base for the use of innovative and developing pedagogical technologies in teaching, the integration of digital software, and the development of educational processes.

CONCLUSION: Overall, the reviewed sources provide extensive coverage of the scientific and theoretical foundations for improving the effectiveness of laboratory classes in zoology education, the use of innovative teaching technologies, the development of professional research competencies, interdisciplinary integration, and a research-based approach to teaching. However, it is noted that the existing literature does not fully develop a comprehensive model for the methodology for developing students' research competencies based on cognitive activity.

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