



DIVERSITY OF THE ANIMAL WORLD BASED ON THE COMPARATIVE METHOD IN ZOOLOGY LESSONS

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ABSTRACT

(English). This thesis examines the methods of teaching the diversity of the animal world in zoology lessons based on the comparative method. The relevance of applying the comparative approach, which allows students to identify similarities and differences among various groups of animals, is substantiated. The study develops a sequence of comparative tasks applied at different stages of the lesson. A comparative analysis was conducted with lessons taught through traditional methods. The obtained results demonstrate that the comparative method significantly increases students' cognitive activity and long-term retention of knowledge. As a scientific novelty, a system of comparative tables and tasks adapted to the zoology curriculum is proposed.

Introduction

Relevance. Zoology is a science that studies the diversity of the animal world, which includes a huge number of species belonging to various systematic groups. Teaching this diversity is an important but complex task, since students often memorize the characteristic features of animals mechanically without understanding the deep relationships between them. The comparative (comparative-analytical) method allows overcoming this problem: it enables students to identify general and specific features, similarities and differences among different taxonomic groups of animals in the course of their joint analysis. This method substantiates the unity of origin of the animal world and develops logical and analytical thinking of students. At the same time, the issues of the rational use of the comparative method in zoology lessons have not yet been sufficiently studied, which determines the relevance of the present research.

Research object is the process of teaching the diversity of the animal world in zoology lessons at general secondary schools.

Research subject is the methodology of teaching the diversity of the animal world on the basis of the comparative method.

The aim of the research is to develop and substantiate the methodology of using the comparative method for teaching the diversity of the animal world in zoology lessons.

The objectives of the research are:

- 1.to substantiate the didactic essence and significance of the comparative method;
- 2.to analyze the possibilities of its application in the topics devoted to the diversity of the animal world;
- 3.to develop a system of comparative tables and tasks;
- 4.to evaluate the effectiveness of the elaborated methodology through experimental testing.

Literature review

The comparative method, being one of the historically formed methods of cognition, was actively applied in pedagogy and biology teaching as early as the works of the founders of scientific zoology. The methodological foundations of its application in biology education were laid by such scholars as K. D. Ushinskiy, who pointed out the special significance of comparison for the development of thinking in the process of cognition of nature [1].

Among foreign researchers, the effectiveness of the comparative approach in natural science education was studied by N. M. Verzilin, who substantiated the necessity of comparing objects and phenomena in teaching biology [2]. L. V. Zankov revealed the interrelation between comparison and the cognitive development of students [3].

National scholars, including R. Mavlonova and O. To'rayeva, in their works on the methodology of teaching biology, examined the use of comparative analysis in practical and laboratory lessons [4]. N. N. Azizxo'jayeva studied the activation of the learning process through various pedagogical technologies [5].

Unlike the above-mentioned studies, the originality of the present work lies in the fact that it develops a complete system of comparative tables and tasks specially adapted to the topics of the zoology curriculum, which are applied at various stages of the lesson — from the explanation of new material to its generalization. Such a systematic approach to the application of the comparative method in teaching the diversity of the animal world has not been previously presented in the studied sources.

Research methodology

In the course of the research, a set of theoretical and empirical methods was applied.

The **comparative analysis method** was used as the central methodological tool. Through this method, the characteristic features of different systematic groups of animals (classes, orders, families) were compared with each other, and common and distinguishing features were revealed. On this basis the comparative tables and tasks were developed and introduced into the lesson process.

In addition, the **theoretical analysis method** was used to study and systematize the pedagogical and methodological literature on the issue. The **observation method** allowed monitoring the cognitive activity of students during zoology lessons. At the final stage, the elaborated methodology was tested through **experimental work**, and its results were compared with the results obtained in the control group where traditional teaching methods were used.

Analysis and results

The basis of the comparative method in teaching zoology is the systematic comparison of the structural features, life processes and modes of existence of animals belonging to different systematic groups. Such a comparison allows students to see both characteristic (specific) features of each group and common features proving the unity of origin of the animal world.

The analysis of the zoology curriculum demonstrated that the comparative method is most effectively applied within such topics as "Mammals," "Birds," "Reptiles," "Amphibians" and "Fish." For example, comparing the structure of the circulatory or respiratory systems of fish,

amphibians and mammals allows students to understand the process of evolution and the complication of the organization of animals.

On the basis of the conducted analysis, a system of comparative tasks was developed for the main topics of the zoology curriculum. The essence of this system is presented in Table 1.

Table 1. Comparative tasks in zoology lessons and their educational purpose

Comparison object	Comparative task	Developed skill
Vertebrate classes	Compare the structure of the circulatory system of fish, amphibians and mammals	Revealing evolutionary complication
Mammals and birds	Compare adaptations to the environment and modes of movement	Revealing adaptations (adaptivity)
Invertebrate groups	Compare the structure of arthropods and mollusks	Revealing common and specific features
Domestic and wild animals	Compare the features of life activity and significance for humans	Developing analytical thinking

The developed methodology was experimentally tested during one academic quarter in 7th-grade zoology lessons of a secondary school. The experimental group (25 students) was taught with the systematic application of the comparative method, while the control group (25 students) studied the same topics in a traditional way. The results of the students' knowledge acquisition are presented in Table 2.

Table 2. Indicators of knowledge acquisition in the experimental and control groups (%)

Indicators	Experimental group	Control group	Difference (%)
Assimilation of theoretical knowledge	84.2	69.8	+14.4
Revealing similarities and differences between groups	81.5	55.3	+26.2
Long-term retention of knowledge (after 1 month)	80.1	54.7	+25.4
Independent generalization and drawing conclusions	78.9	51.2	+27.7

The comparative analysis of the data given in the table shows that the students of the experimental group achieved significantly higher results in all indicators than the students of the control group. The most noticeable difference (+27.7%) was observed in the indicator "independent generalization and drawing conclusions." This convincingly proves that the systematic application of the comparative method contributes not only to a deeper assimilation of knowledge about the diversity of the animal world, but also to the development of students' independent analytical and logical thinking.

In the course of the analysis, the following **problems** hindering the effective application of the comparative method were identified:

- 1.the absence of ready-made comparative tables and didactic materials adapted to the updated curriculum;
- 2.the insufficient methodological preparation of teachers for the systematic organization of comparative work in lessons;
- 3.the lack of additional methodological time for conducting extended comparisons in conditions of limited lesson hours.

Conclusion and recommendations

Conclusion. On the basis of the conducted analysis and the outcomes of the experimental work, the following conclusions were drawn:

1.The comparative (comparative-analytical) method is an effective means of teaching the diversity of the animal world in zoology lessons, since it allows students to reveal both the specific features of each systematic group and the common features testifying to the unity of origin of animals.

2.The systematic application of the comparative method significantly increases the level of assimilation and the long-term retention of knowledge. The experimental results showed an increase in the indicator of long-term retention of knowledge by 25.4% in comparison with traditional teaching.

3.The highest effectiveness is achieved when comparison is applied at all stages of the lesson — from the explanation of the new material up to its generalization and the drawing of conclusions by the students themselves.

Recommendations. In order to eliminate the identified problems, the following recommendations are proposed:

- 1.to develop and introduce a methodological bank of **comparative tables and tasks** for all main topics of the zoology curriculum;
- 2.to organize **methodological seminars and training courses** for teachers on the effective use of the comparative method in zoology lessons;
- to include the application of the comparative method in the **technological map of each lesson** for the rational use of study time.

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