

# IMPROVING GENETICS EDUCATION THROUGH METHODOLOGICAL SUPPORT

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**Abstract:** *This article substantiates the methodological support for improving the teaching of Genetics in higher education institutions. The study analyzes the impact of innovative pedagogical technologies, information and communication tools, and assessment systems on the effectiveness of genetics education.*

**Keywords:** *genetics, methodological support, innovative education, ICT, competency-based approach.*

## INTRODUCTION

In recent years, the rapid development of genetics as a scientific discipline has necessitated the continuous updating of both the content and methodology of its teaching. The integration of such fields as genomics, molecular genetics, and bioinformatics into the educational process has reduced the effectiveness of traditional approaches to teaching genetics. Consequently, improving the teaching of genetics and organising the learning process on the basis of modern pedagogical approaches has emerged as a pressing scientific and pedagogical challenge.

Within the higher education system, genetics plays a crucial role in the training of future biologists, medical professionals, and educators. Through this discipline, students acquire fundamental knowledge of the principles of heredity and variation, the mechanisms underlying genetic diseases, as well as the foundations of breeding and biotechnology. However, observational studies

indicate that the methodological support for teaching genetics remains insufficiently systematised.

The aim of this research is to develop methodological support aimed at improving the teaching of genetics and to determine its effectiveness through experimental validation. The research objectives include the selection of innovative teaching methods, the integration of information and communication technologies (ICT), and the improvement of the assessment system.

## MATERIALS AND METHODS

The study was conducted between 2023 and 2025 and involved third-year undergraduate students enrolled in the Biology programme at higher education institutions. A total of 120 students participated in the research and were divided into an experimental group (60 students) and a control group (60 students).

The research employed the following methods:

- ✓ analysis of scientific, pedagogical, and methodological literature;
- ✓ pedagogical observation;
- ✓ diagnostic testing;
- ✓ questionnaires and interviews;
- ✓ pedagogical experiment;
- ✓ mathematical and statistical analysis.

In the experimental group, the teaching of genetics incorporated interactive instructional methods, including problem-based learning, the project method, case studies, clustering techniques, and brainstorming. In addition, virtual laboratories, animated models, and software applications designed to simulate genetic processes were utilised.

In contrast, the control group was taught using traditional lecture-based instruction and conventional practical classes.

## RESULTS

At the conclusion of the experimental phase, students' levels of knowledge were assessed using diagnostic tests. The obtained data were subsequently analysed to evaluate the effectiveness of the implemented teaching methods.

**Table 1.**

*Comparative indicators of knowledge levels in the experimental and control groups*

<b>Group</b>	<b>High level (%)</b>	<b>Medium level (%)</b>	<b>Low level (%)</b>
Experimental group	48	42	10
Control group	25	50	25

As shown in Table 1, the proportion of students who achieved a high level of knowledge in the experimental group was 23% higher than that in the control group.

In addition, the results of assessing students' practical skills also demonstrated positive changes.

**Table 2.**

*Indicators of the effectiveness of practical classes*

<b>Indicators</b>	<b>Experimental group (%)</b>	<b>Control group (%)</b>
Independent problem-solving	82	58
Analysis of genetic processes	78	55

Performance of virtual experiments	85	40
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The obtained results confirm that improving methodological support in the teaching of genetics leads to a significant increase in educational effectiveness. The integration of innovative teaching methods and information and communication technologies (ICT) facilitated students' conscious acquisition of knowledge, as well as the development of independent thinking and decision-making skills in problem-solving situations.

The findings of this study are consistent with conclusions reported by other researchers and further confirm the advantages of the competency-based approach in genetics education.

#### CONCLUSION

Methodological support aimed at improving the teaching of genetics constitutes a key factor in enhancing the quality of education in higher education institutions. The results of the experimental study demonstrate that innovative teaching methods, virtual laboratories, and modern assessment systems are highly effective in developing students' knowledge and practical skills.

The findings of this research are recommended for use in the development of instructional and methodological resources aimed at improving genetics teaching methodology, as well as in pedagogical practice.

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