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APPLYING THE CASE STUDY METHOD IN TEACHING GENETICS AS A FACTOR IN ENHANCING PROFESSIONAL COMPETENCE

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Abstract

This scientific paper analyzes the significance of applying the case study method in the process of teaching the subject Genetics in higher education institutions for the formation of students' professional competence. It is scientifically substantiated that the use of the case study method contributes to the development of students' analytical thinking, decision-making skills in problem situations, and the ability to integrate theoretical knowledge with practical application. The results of the pedagogical experiment demonstrate that an educational process based on the case study method significantly increases the effectiveness of students' professional training.

Keywords: *genetics, case study method, professional competence, innovative education, problem-based learning.*

INTRODUCTION

In the global education system, orienting the content of higher education toward a competence-based approach is recognized as one of the priority tasks. Particularly in teaching natural sciences, including genetics, it is essential not only to provide students with theoretical knowledge but also to develop their ability to apply this knowledge in practice, analyze problem situations, and make scientifically grounded decisions.

Genetics is a discipline based on complex concepts, abstract models, and calculations. Therefore, its full mastery through traditional lecture-based and reproductive teaching methods often causes certain difficulties for students. For this reason, there is an increasing need to introduce innovative pedagogical technologies into the educational process, including the case study method.

The case study method is aimed at teaching students through real or near-real problem situations and serves to develop analytical thinking, creative approaches, and professional competence. Applying this method in teaching genetics makes it possible to increase students' interest in the subject, enhance independent learning activity, and improve the quality of professional training.

MAIN PART

One of the main tasks facing the higher education system today is to train competitive specialists who are capable of independent thinking and possess well-developed professional competencies. In this process, teaching genetics occupies an important place, as this discipline forms students' skills in understanding, analyzing, and applying hereditary processes in practice.

Traditional teaching methods are not always effective in ensuring deep mastery of the complex concepts of genetics. Therefore, the introduction of innovative pedagogical technologies, including the case study method, into the educational process is considered highly relevant. The case study method is organized on the basis of real or close-to-real problem situations and transforms students into active participants in the learning process.

The use of the case study method in teaching genetics contributes to the development of the following components of professional competence:

- competence in identifying and analyzing problems;
- skills of making scientifically grounded decisions;
- abilities to interpret genetic data and draw conclusions;
- teamwork and communication competence.

The results of the conducted pedagogical experiment showed that in groups where the case study method was applied, students demonstrated a higher level of interest in the subject, increased independent learning activity, and a higher degree of professional preparedness compared to groups taught using traditional methods.

MATERIALS AND RESEARCH METHODS

This study was aimed at determining the effectiveness of applying the case study method in teaching the subject *Genetics* in higher education institutions for the formation of students' professional competence.

The research was organized in the form of a pedagogical experiment and included control and experimental groups. In the control group, the educational process was conducted using traditional teaching methods, while in the experimental group, instruction was based on the case study method.

The following research methods were applied:

- **Pedagogical observation** – to identify students' activity during classes, communication level, and independent thinking skills;
- **Interviews and questionnaires** – to assess students' interest in the subject and their attitudes toward teaching methods;
- **Testing** – to determine the level of theoretical knowledge;
- **Practical tasks and case analysis** – to evaluate students' ability to make decisions in problem situations and analyze genetic data;

- **Statistical analysis** – to conduct a comparative analysis of the obtained results using percentage indicators.

Evaluation Criteria

The level of students' professional competence was assessed based on the following indicators:

- level of knowledge acquisition (high, medium, low);
- formation of practical skills;
- analytical thinking and independent decision-making ability;
- teamwork and communication culture.

RESULTS

During the study, the impact of using the case study method in teaching genetics on students' knowledge level and professional competence formation was examined. The pedagogical experiment was conducted in both experimental and control groups.

At the initial stage of the experiment, the level of theoretical knowledge in both groups was almost the same, with a relatively low proportion of students demonstrating a high level of achievement. At the final stage, a significant increase in the number of students with a high level of knowledge was observed in the experimental group.

Table 1

Level of students' theoretical knowledge in experimental and control groups (%)

Groups	High (%)	Medium (%)	Low (%)
Experimental group (initial)	30	42	28
Experimental group (final)	58	32	10
Control group (initial)	28	44	28
Control group (final)	36	40	24

Note: The table shows that the proportion of students with a high level of knowledge significantly increased in the experimental group where the case study method was applied.

In the experimental group:

- ✓ the proportion of students with a high level of knowledge increased from 28–32% to 55–60%;
- ✓ the indicators of the medium level remained relatively stable;
- ✓ the proportion of students with a low level of knowledge decreased significantly.

In the control group, although a certain increase in the level of knowledge was observed, it was not statistically significant.

Table 2

Level of practical skills development among students (%)

Groups	Problem solving (%)	Data analysis (%)	Virtual experiments (%)
Experimental group (initial)	35	32	28
Experimental group (final)	65	62	58
Control group (initial)	34	33	30
Control group (final)	45	42	38

Note: Classes organized on the basis of the case study method enhanced students' practical activity and skills in performing virtual experiments.

In assessing practical skills, students':

- ✓ abilities in solving genetic problems;
- ✓ analyzing data;
- ✓ performing virtual experiments were taken into account.

In the experimental group taught using the case study method, students demonstrated a high level of practical activity, actively participating in independent decision-making in problem situations and drawing scientifically grounded conclusions.

In contrast, in the control group, practical skills remained predominantly reproductive in nature.

Table 3

Comparative results of professional competence formation (%)

Indicators	Experimental group	Control group
Analytical thinking	68	44
Problem-based decision making	64	41
Application of theory in practice	66	43
Teamwork skills	70	48

Note: The obtained results indicate a significant increase in students' knowledge level and practical skills in the experimental group through the application of the case study method.

CONCLUSION

The research results show that in groups where the case study method was applied, professional competence was formed at a higher level in the following areas:

- analytical thinking;
- scientific problem solving;

- teamwork and communication;
- integration of theoretical knowledge with practical application.

The results, analyzed through tables and diagrams, confirm the importance of the case study method in increasing the effectiveness of the educational process.

In conclusion, the application of the case study method in teaching genetics is an effective factor in the formation of professional competence. This method develops students' ability to integrate theoretical knowledge with practice, analyze problem situations, and find scientifically grounded solutions. The widespread implementation of the case study method in the educational process contributes to improving the effectiveness of teaching genetics.

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