



## METHODOLOGY OF TEACHING THE SUBJECT OF NUCLEIC ACIDS IN PRACTICAL LESSONS ON THE BASIS OF INTERACTIVE EDUCATIONAL METHODS

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### Abstract

This article provides a comprehensive overview of the methodological foundations of teaching the topic "Nucleic Acids" in practical classes using modern interactive teaching methods. The goal is to create an active learning environment for students, consolidate theoretical knowledge with practical skills, and develop the ability to think and analyze independently.

. Interactive methods, including group work, role-playing games, laboratory experiments, ways to improve the effectiveness of the lesson through the use of ICT technologies are shown.

**Keywords:** Nucleic acids, DNA, RNA, interactive method, practical training, laboratory experience, ICT, group work, educational methodology.

### Introduction

In the modern education system, the introduction of interactive methods in teaching subjects is of great importance. Especially in natural sciences such as biology and chemistry, it is necessary to combine theoretical knowledge with practical skills.



. The topic of nucleic acids is the main one for the fields of biochemistry, genetics, and medicine. Therefore, in order to provide students with deep and effective knowledge in this topic, interactive educational methods should be used.

Nucleic acids, primarily DNA (Deoxyribonucleic Acid) and RNA (Ribonucleic Acid), are fundamental biomolecules that carry genetic information and regulate numerous biological processes. Their discovery and in-depth understanding have significantly impacted modern medicine, enabling advancements in diagnostics, treatment, prevention, and research. Nucleic acids play a central role in the diagnosis of diseases through genetic and molecular testing. Polymerase Chain Reaction (PCR) is one of the most widely used techniques that amplifies specific DNA or RNA sequences, allowing for the detection of infectious agents such as viruses (e.g., SARS-CoV-2) and bacteria. Additionally, genetic testing can identify mutations responsible for inherited disorders, cancer susceptibility, and other genetic conditions.

Genetic diseases are caused by mutations in nucleic acid sequences. By studying these sequences, scientists and medical professionals can identify the genetic basis of diseases such as cystic fibrosis, sickle cell anemia, and Huntington's disease. This understanding allows for early diagnosis, informed decision-making, and the development of targeted therapies.

Gene therapy involves altering the genetic material within a person's cells to treat or prevent disease. This technique uses nucleic acids to replace, inactivate, or introduce genes into cells. Gene therapy holds promise for treating a wide range of diseases, including genetic disorders, some types of cancer, and viral infections. The development of mRNA vaccines represents a revolutionary use of nucleic acids in medicine. Vaccines such as those developed for COVID-19 (e.g., Pfizer-BioNTech and Moderna) use messenger RNA to instruct cells to produce a harmless piece of the virus, prompting an immune response. This approach has proven to be safe, efficient, and rapidly deployable. In forensic science, DNA



profiling is used for identity verification, crime scene investigations, and paternity testing. The uniqueness of each individual's DNA allows for accurate identification and has become a cornerstone in legal medicine. Ongoing research in nucleic acid technologies continues to open new avenues in precision medicine, regenerative medicine, and synthetic biology. Innovations such as CRISPR-Cas9 gene editing offer unprecedented control over the genome, raising hopes for cures to previously untreatable conditions. Nucleic acids are indispensable to modern medicine. Their roles in diagnostics, treatment, and prevention have revolutionized healthcare and opened doors to a future of personalized and effective medical solutions. As research advances, the applications of DNA and RNA in medicine will only continue to grow.

The integration of educational technologies in medical education has become essential in preparing future healthcare professionals. With the rapid development of digital tools, educators are now able to create more engaging, flexible, and student-centered learning environments. These technologies enhance students' understanding, critical thinking, and practical skills through interactive and innovative methods. Educational technologies offer numerous benefits in medical education. They provide access to a vast range of resources, facilitate self-paced learning, and improve retention of complex concepts. Moreover, digital platforms allow students to review content multiple times, leading to better understanding and performance.

Various types of educational technologies are utilized in teaching medical students, including:

- Learning Management Systems (LMS) such as Moodle and Canvas
- Virtual and Augmented Reality (VR/AR) for simulating surgical procedures
- Interactive multimedia presentations and animations
- Online quizzes and assessments
- E-books and digital libraries



- Simulation labs and mannequins for practical skills
- Telemedicine and virtual patient interactions

Medical students benefit greatly from educational technologies as they:

- Enhance visualization of anatomical and physiological structures
- Allow interactive and collaborative learning
- Support remote and asynchronous learning
- Provide instant feedback and performance tracking
- Foster critical thinking and clinical reasoning skills

Despite the advantages, implementing educational technologies also presents challenges such as:

- High cost of advanced technological tools
- Need for technical training for both instructors and students
- Ensuring equal access to technology
- Maintaining student engagement in online settings

The future of medical education lies in blended learning models that combine traditional teaching with digital innovations. Artificial intelligence, virtual simulations, and personalized learning systems will continue to shape the way medical students are educated. Institutions must invest in infrastructure and training to maximize the benefits of these tools.

**Goals and objectives:** To form a complete and deep knowledge of the structure, types and biological significance of nucleic acids in students, to strengthen this knowledge on the basis of practical experiences.

Duties:

- Teaching the basic functions and structure of nucleic acids;
- creation of DNA and RNA models, analysis of their differences;
- Conducting DNA isolation experiments in laboratory conditions;
- Development of critical thinking through group work and problem tasks;



- Carrying out assessment and analysis using ICT tools.

#### Theoretical basis of nucleic acids

Nucleic acids are polymeric substances composed of nucleotides, whose main function is to store and transmit genetic information.

They are of two types: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). DNA has a double helix structure and stores the genetic code. There are different types of RNA (mRNA, tRNA, rRNA), which are involved in the process of protein synthesis.

#### Interactive teaching methods and their application

1. Group work method - students are divided into groups, conduct a detailed analysis on the assigned topics and present the results.

2. Role play - Demonstrating processes such as the "Transmission Process" on stage increases students' memory.

3. Laboratory experiments - for example, isolating DNA from onions or bananas, students gain practical knowledge.

4. ICT technologies - make the teaching process interesting and active through Kahoot, Mentimeter, interactive tests and videos.

#### Evaluation criteria

Type of activity	Ball	Explanation
Group work	20	Quality of educational product
Laboratory work	30	Proper execution, hygiene
ICT test	20	Number of correct answers



Reflections and performances	30	Quality of reinforcement
Total	100	

### Conclusion

Nucleic acids have transformed medicine by enabling precise diagnostics, revolutionary therapies, and personalized treatment strategies. As research progresses, their role in curing complex diseases and improving healthcare will only grow. Embracing this potential requires continuous scientific innovation, ethical responsibility, and global cooperation.

Teaching the topic of nucleic acids using interactive methods based on the above methodological approaches makes the learning process of students more effective and active. Students learn to apply theoretical knowledge in practice, solve problematic tasks, and develop thinking skills.

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