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A METHODOLOGY OF TEACHING THEORETICAL PHYSICS USING INNOVATIVE METHODS

Author: **Sherali Xusan ugli Ergashev**

Tashkent State Technical University, Department of Physics

Abstract: This thesis examines modern innovative methods of teaching theoretical physics and their impact on the effectiveness of the educational process. The focus is on developing students' creative and logical thinking, as well as the use of digital technologies to facilitate the understanding of complex theoretical concepts. The results of the study demonstrate that innovative methods increase student motivation and contribute to the development of a scientific worldview.

Keywords: theoretical physics, innovative methods, digital technologies, learning effectiveness, scientific thinking.

Introduction

In today's educational environment, traditional methods of teaching theoretical physics are losing their effectiveness. Modern technologies, digital platforms, and interactive tools make learning more visual and engaging. Furthermore, a competency-based approach to education requires students not only to master theoretical knowledge but also to apply it to solve practical and research problems.

A distinctive feature of theoretical physics is that it develops a high level of abstract and logical thinking in students. Therefore, the introduction of innovative teaching methods is essential to improving the quality of training for future specialists.

Main Part

Innovative teaching methods in theoretical physics are applied in several areas:

1. Problem-based learning – students are confronted with problems that require independent solution search, which develops investigative thinking and creativity.
2. Multimedia and visualization – the use of animations, 3D models, and simulation programs (PhET Simulation, COMSOL Multiphysics) helps clearly demonstrate complex processes.
3. Project-based activities – students complete small scientific projects, which allows them to apply theoretical knowledge in practice and develop research skills.
4. Distance learning platforms such as Moodle, Google Classroom, and Edmodo facilitate interactive learning and increase student engagement.

The role of the teacher changes: they become not only a source of knowledge but also a mentor, moderator of discussions, and organizer of research activities. This allows students to independently formulate and justify their scientific ideas.

The use of digital laboratories and virtual experiments is particularly effective, as students can observe processes that cannot be reproduced in a real laboratory. Such methods not only help students absorb knowledge but also develop scientific thinking.

An interdisciplinary approach is also important, as theoretical physics is closely linked to mathematics, computer science, and engineering. It fosters a holistic scientific worldview and the ability to integrate knowledge from different fields.

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Conclusion

Teaching theoretical physics using innovative methods promotes the development of students' research thinking, creativity, and analytical skills. The integration of traditional methods with digital technologies and project-based activities makes the learning process more effective and engaging. Thus, the methodology for teaching theoretical physics must be continually improved, taking into account modern educational standards and technological capabilities, thereby ensuring the training of competent and creative specialists.

References

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