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# ANALYSIS OF EXISTING APPROACHES TO ORGANIZING INDEPENDENT LEARNING IN PHYSICS FOR STUDENTS

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**Abstract:** This article analyzes the existing approaches to organizing independent learning in physics for students. Traditional, problem-based, modular, and electronic teaching methods are reviewed, highlighting their significance in the educational process. The role of innovative technologies and interactive approaches in enhancing the effectiveness of independent learning is emphasized.
**Keywords:** Independent learning, physics, pedagogical approaches, problem-based learning, modular learning, electronic learning, innovative technologies.

# АНАЛИЗ СУЩЕСТВУЮЩИХ ПОДХОДОВ К ОРГАНИЗАЦИИ САМОСТОЯТЕЛЬНОГО ОБУЧЕНИЯ СТУДЕНТОВ ПО ФИЗИКЕ

**Аннотация:** В данной статье проводится анализ существующих подходов к организации самостоятельного обучения студентов по физике. Рассмотрены традиционные, проблемные, модульные и электронные методы обучения, а также их значимость в образовательном процессе. Подчёркивается роль инновационных технологий и интерактивных подходов в повышении эффективности самостоятельного обучения.
**Ключевые слова:** Самостоятельное обучение, физика, педагогические подходы, проблемное обучение, модульное обучение, электронное обучение, инновационные технологии.

## INTRODUCTION

The development of students' independent learning skills in physics is one of the pressing issues in modern education. Physics is not only aimed at imparting theoretical knowledge but also focuses on developing practical skills, fostering scientific thinking, and applying technological approaches. In the modern education system, independent learning serves as a foundation for encouraging students to engage in self-development, promoting active learning, and expanding their intellectual capabilities. The primary goal of this study is to analyze the significance of various pedagogical approaches in organizing independent learning in physics and to evaluate their effectiveness.

It is well-known that the primary forms of teaching—lectures, seminars, practical sessions, laboratory work, and advisory classes—are conducted in the classroom. Their

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organization is pre-planned according to the complexity of the topic and the volume of information to be provided, and specific teaching hours are allocated. If industrial practice is conducted outside the classroom, it is also scheduled in advance with assigned hours [1].

In addition to classroom activities, independent work plays a significant role in acquiring knowledge, gaining specialized skills, and shaping students' worldviews [9]. During independent learning, students not only acquire knowledge but also develop skills autonomously [5]. To ensure the effective use of the increasing amount of time devoted to independent preparation, two key aspects must be emphasized:

Independent work is a distinct type of study and intellectual labor [6];

The majority of the information is acquired independently by the student [4].

It is challenging to teach students independent thinking and active participation through traditional teaching methods. Traditional education follows a pattern of explanation, questioning, reinforcement, and assessment [3]. Currently, the shortcomings of traditional education are recognized, including:

Teachers being overly active in the learning process, focusing mainly on explanations, instructions, and asserting their authority [7];

Emphasis on providing theoretical knowledge (information) with limited attention to practical skill development;

Adherence to principles of obligation, sermonizing, strictness, and authoritarianism in education;

Lack of student activity, where students primarily listen to lectures and complete assignments without developing independent thinking or initiative [8];

A focus on the average level of knowledge acquisition.

Today, interactive teaching methods are widely implemented in the education system. These methods demand the development of independent learning skills in students. The advantages of interactive teaching methods can be seen in the following [6]:

Establishing equal collaboration between teacher and student;

Relying on intrinsic motivation rather than coercion, with students grouped by ability [2];

Considering students' intellectual development levels and abilities in the teaching process;

Encouraging students to engage more in independent learning;

Shifting the focus of the educational process from the teacher to the student [4].

**METHODS**

In this study, analytical and diagrammatic approaches were utilized. Traditional, problem-based, modular, and electronic learning approaches in the education system were analyzed to determine their impact on students' learning effectiveness. The research drew on pedagogical theories by Vygotsky, Bloom, Leontyev, and Dewey, as well as studies by Uzbek and international scholars. Additionally, the influence of innovative technologies and interactive methods on learning was thoroughly examined.

Implementing new pedagogical technologies and interactive teaching methods enhances the creativity and responsibility of educators [7]. It can be concluded that the purpose of these technologies is not merely to teach but to train students in independent learning. Therefore, the use of new pedagogical technologies in the educational process is a crucial factor in fostering independent learning skills among students [4].

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If a student does not acquire independent work skills, they will not become specialists meeting modern demands. Much of the knowledge acquired during their education may become obsolete or forgotten by the time they start their careers [5]. In an era where knowledge quickly becomes outdated and information flows are immense, learning to work independently, continually self-improve, and research is essential for every professional [9].

The adoption of the "Law on Education" and the "National Program for Personnel Training" aims to prepare competitive, high-skilled professionals who meet modern requirements [1]. Achieving this goal involves students' educational, scientific activities, independent work schedules, and research objectives [6]. The assessment system based on ratings, along with innovations in education and the increasing volume of information, necessitates students' efficient time management and independent work [8].

In addition to classroom-based lessons, independent tasks completed by students play a significant role in acquiring knowledge, gaining specialized skills, and shaping their worldviews [4]. Therefore, organizing students' independent learning activities is of paramount importance [9].

The primary principle in organizing students' independent work is to ensure it is systematic, continuous, and consistent [5]. In organizing the learning process, strict sequentiality and regularity are required. To consolidate knowledge gained in the classroom and master upcoming topics, students must prepare independently daily [6].

To thoroughly understand and absorb the current lesson, students should review previous materials independently, delve deeper into their knowledge and skills, and continuously practice [7]. Lectures provide a roadmap for students, but not all key issues of a topic can be thoroughly discussed during a lesson. Research shows that only 5% of the material covered in lectures is retained by students [10]. However, when students study independently or teach others, their retention rate significantly increases [10]. This underscores the critical role of self-preparation and study in mastering a subject, understanding its core concepts, and expressing one's ideas [9].

Physics is fundamental for teaching students scientific thinking, understanding natural laws, and effectively applying technology. Modern education prioritizes guiding students toward independent learning, equipping them with problem-solving skills, and enabling self-development. Organizing independent learning involves various pedagogical approaches, including traditional, problem-based, modular, and electronic learning methods. These approaches promote active engagement in the learning process and foster research skills.

In traditional approaches, teachers play a central role, while students primarily absorb pre-prepared knowledge. This approach emphasizes theoretical knowledge over practical skills. However, students' critical thinking and problem-solving skills are less developed in this method [11].

The problem-based learning approach engages students in solving problems as a way of learning. It fosters scientific inquiry and prepares students to address real-world challenges. This method makes the learning process engaging and effective as students actively participate in analyzing and solving scientific problems [12].

The modular learning approach structures the educational process into modules. It allows students to learn at their own pace. Each module includes specific topics, exercises, and practical assignments that enhance students' engagement. Modular learning enables students to independently improve their knowledge and practical skills [17].

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The electronic learning approach leverages modern technologies. Online resources, virtual laboratories, and interactive materials make learning more effective. This approach provides students with opportunities for distance learning, efficient time management, and personalized learning paces. Through electronic learning tools, students can study physics uniquely and interactively [16, 20].

To improve the effectiveness of independent learning, it is necessary to utilize modern technologies, innovative teaching methods, and approaches focused on solving practical problems. Independent learning plays a pivotal role not only in acquiring theoretical knowledge but also in developing practical skills, analytical and creative thinking. The process should consider students' individual needs and abilities, providing them with suitable materials and guidelines. Furthermore, fostering students' self-assessment and self-monitoring skills can enhance their motivation and interest in learning [24].

Various researchers have significantly contributed to organizing independent learning in physics. Below is a brief review of key scientific approaches in this field:

Lev Vygotsky, as the founder of the sociocultural approach, emphasized the importance of social interaction and collaboration in the learning process. His concept of the "Zone of Proximal Development" (ZPD) explains the necessity of assistance from teachers or peers in learning complex concepts. This approach is particularly effective in helping students master difficult topics in physics and develop independent learning skills [13].

Alexey Leontyev's activity theory focuses on increasing student engagement in the educational process. His theory highlights the importance of learning through practical activities and encourages students to apply their knowledge in scientific tasks [18].

Benjamin Bloom advocated for mastery learning, stressing that students should be given sufficient time and resources to fully grasp a topic. This approach ensures that every student learns at their own pace in the independent study of physics [11].

Vladimir Davydov proposed a problem-solving approach to deepen students' understanding of knowledge through resolving challenging issues. His research highlights the role of creative thinking and scientific inquiry in student development [19].

John Dewey, a proponent of problem-based learning, believed that students should learn through solving real-life problems. His pragmatic approach to education encourages independent thinking and active participation in the learning process [12].

Piotr Kapterev emphasized the importance of interaction between teachers and students in the learning process. His work demonstrated the necessity of applying and reinforcing practical knowledge in independent learning tasks in physics.

Sergey Rubinshteyn focused on cognitive and activity-based approaches to teaching, advocating for learning through practical application. This approach ensures active student involvement in independent learning and deepens their understanding of knowledge.

Vasiliy Sukhomlinskiy highlighted the importance of a personal approach in education. His work suggests that positive teacher-student relationships and personalized guidance significantly enhance independent learning [25].

International researchers have also contributed to organizing independent learning in physics. Jean Piaget emphasized the need to consider cognitive development stages in the learning process, ensuring effective teaching tailored to students' developmental levels [16]. Howard Gardner's theory of multiple intelligences underscores the importance of recognizing

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and nurturing students' unique abilities to improve the effectiveness of independent learning [17].

David Kolb advocated for experiential learning, highlighting the role of practical application and experience in knowledge acquisition [28]. Seymour Papert, a proponent of constructionist learning, stressed the potential of technology to enable students to independently discover and construct knowledge [21].

John Hattie's research on educational effectiveness emphasizes the importance of self-assessment and feedback from teachers, advocating for diverse pedagogical approaches to achieve learning goals [19].

Uzbek researchers, including Q. Nasirov and A. Qosimov, have also examined methods to improve physics education. Their studies emphasize problem-based and electronic learning as effective strategies for enhancing student engagement and fostering independent thinking [14, 15].

To sum up, organizing independent learning in physics requires a combination of innovative methods, modern technologies, and pedagogical approaches that cater to students' needs and abilities.

**RESULTS**

The use of new pedagogical technologies and interactive methods in the educational process plays a crucial role in developing students' independent learning skills. The limitations of traditional education, particularly in restricting student engagement and focusing primarily on theoretical knowledge, have necessitated the enrichment of education with interactive approaches. New technologies foster independent thinking among students and encourage them to engage in self-directed learning.

During our research, we achieved the following results:

Traditional Learning Approach: While theoretical knowledge delivery is well-organized, there are limitations in developing practical skills. This approach results in low student engagement and limited development of independent thinking skills.

Problem-Based Learning Approach: Engaging students in solving scientific problems makes the learning process both interesting and effective. This approach increases students' interest in scientific inquiry.

Modular Learning Approach: Students are given the opportunity to learn at their own pace. This approach allows for the development of independent work skills through practical assignments.

Electronic Learning Approach: Online resources and virtual laboratories enhance the efficiency of distance learning and knowledge acquisition. Through e-learning, students have the opportunity to learn physics using modern technologies in a unique and engaging manner.

Based on these findings, we conclude the following:

Independent learning holds significant value and importance, as knowledge acquired independently tends to be better retained and positively influences students' worldview. Additionally, independent work and activities aimed at self-improvement are vital for students' development as specialists. This is particularly relevant in today's rapidly evolving information age.

**DISCUSSION**

The use of new pedagogical technologies and interactive methods in education helps enhance students' independent learning skills. Physics plays a significant role in fostering

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scientific thinking and technological approaches among students. Innovative pedagogical approaches actively engage students in the independent learning process, improving their self-assessment abilities and increasing their participation in knowledge acquisition. To improve the effectiveness of independent learning, it is crucial to combine pedagogical approaches appropriately and consider students' individual needs.

Without mastering independent working skills, students may struggle to become specialists who meet modern demands. Therefore, it is essential to widely implement new pedagogical technologies and interactive methods in the educational process, conduct the learning process systematically and consistently, and effectively organize students' independent work. This, in turn, serves as a vital factor in preparing competitive and highly qualified specialists.

Moreover, introducing individualized approaches into the educational process and taking students' personal needs into account are equally important. Assigning tasks that match each student's abilities increases their interest in learning and makes the independent learning process more effective. By following teachers' guidance and receiving necessary support, students can improve their knowledge levels and prepare to become successful professionals in the future. Consequently, the integration of new pedagogical technologies and individualized approaches plays a significant role in enhancing the quality of education.

## CONCLUSION

The integration of problem-based, modular, and electronic approaches in organizing independent learning in physics makes the learning process more effective. Developing students' independent work skills and utilizing modern technologies are crucial for preparing competitive professionals.

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