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THE SPECIFICS AND SIGNIFICANCE OF COMPLETING INDEPENDENT PHYSICS ASSIGNMENTS COOPERATIVELY

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Abstract. This article discusses the form, types, and levels of independent education in physics, an "exemplary" form of organizing and implementing "creative research work," as well as effective and practical creative methods for students in completing assignments, as well as the nature and importance of cooperative work.

Key words: Independent learning, organization of independent work, cooperation, small group, creative research work, solidarity, cooperation, activity.

INTRODUCTION

Training highly qualified specialists is one of the most urgent tasks of today. It is often the case that classroom lessons alone are not sufficient to provide students with in-depth knowledge, and students face practical challenges in real-world environments. Addressing and overcoming these challenges is one of the key issues in modern education. Independent learning activities serve as a complementary and developmental component in solving these problems.

Independent learning is a form of educational activity aimed at consolidating theoretical and practical knowledge, skills, and competencies in memory, independently acquiring additional information or mastering previously acquired content, and completing tasks and practical assignments of varying difficulty both in and outside the classroom. This approach develops students' theoretical knowledge, practical skills, and competencies. In this process, students engage in a form of educational activity known as "independent work" to enhance their knowledge, skills, and competencies. Independent work is an active educational method based on the student's task fulfillment under the guidance and supervision of an instructor. It aims to organize and implement clearly defined student activities based on specific educational goals and objectives. A student's independent work is characterized by high levels of activity, creativity, analytical thinking, initiative, and the ability to complete all assignments on time with high quality.

Independent learning in physics should be based on the following general principles:

- The student's independent learning workload must be an integral part of the academic plan for mastering physics;

- Independent learning includes educational activities carried out independently by students, both in and outside the classroom, under the direct supervision of the instructor. This involves reading, understanding, analyzing, and mastering topics in physics;
- The types and forms of independent work must be determined based on natural and practical orientations and derived from physical phenomena and processes;
- Instructions and recommendations for completing independent assignments must be clearly and simply formulated so that students fully understand them;
- To increase the effectiveness of independent learning, it is advisable to organize educational seminars in the subject;
- Independent physics assignments should be variable in nature. Most tasks should be designed for individual completion or cooperative work in small groups (cooperativity).

Forms of organizing independent learning in physics:

1. Written – preparing a report (essay) on a given topic.
2. Electronic – preparing a presentation (slides) or a scientific article (or thesis) on a given topic.
3. Project – analyzing a specific or problematic topic, offering solutions, and presenting the student's thoughts, analysis, conclusions, and report.
4. Creative work – analyzing a relevant or complex issue, identifying the problem, suggesting a solution, and proposing its practical application.

Levels of independent learning assignments in physics:

1. Preparing a report or presentation – represents a basic level of independent learning. This requires the student to apply known solution methods to analogous situations in physics, helping them internalize various elements of independent work.
2. Preparing an article or thesis – represents an initial level of independent learning. It requires applying theoretical knowledge, analyzing phenomena, processes, and laws, developing critical thinking, increasing learning motivation, and forming analytical abilities.
3. Preparing scientific or technical projects – represents an advanced level of learning. It fosters students' creativity and innovation. Completing such assignments requires ongoing inquiry and helps systematize and generalize existing knowledge.
4. Creative research work – represents the highest level of educational tasks. For such assignments, students must have a solid grasp of relevant knowledge and solution methods, demonstrate skills and competencies, apply them in production or technical fields, independently discover new solutions, and adapt previous knowledge to new situations.

To develop students' practical thinking abilities and ensure the effectiveness of education, it is advisable to structure independent physics assignments—particularly in the form of "creative research work"—around cooperative (collaborative) group work among specific student cohorts.

Cooperativity in the context of independent learning refers to a collaborative and goal-oriented approach within a designated group of students. It involves students working together in small groups (typically 3–4 members), engaging in mutual discussions, providing assistance to each other, and thereby enhancing their theoretical and practical knowledge while filling in individual knowledge gaps.

Key characteristics of cooperativity in independent work include:

- Goal orientation – small student groups collaboratively work to complete specific tasks and achieve shared learning objectives;
- Solidarity and teamwork – each student is responsible for their contribution, aware of their knowledge level, and actively works to improve it; students support one another and prioritize group success over personal benefit.

Benefits of cooperativity in independent assignments for students:

- It fosters and strengthens an atmosphere of mutual trust within the group;
- It facilitates clearer and faster comprehension of the task content and increases the overall efficiency of task completion;
- It promotes mutual respect among students and helps reduce conflicts.

Key Aspects of Cooperative Completion of Independent Assignments by Students

Collective Thinking – In the process of completing (studying) a given topic, students express their opinions and engage in discussion with group members by analyzing both strengths and weaknesses.

Shared Responsibility – Each student, based on their own capabilities, undertakes responsibility for a specific part of the independent assignment and completes it on time.

Mutual Support and Assistance – In cases of confusion about the assignment, a group member who understands the topic helps others within the group.

Adherence to Rules and Time Management – Group members predefine each student's role in the assignment, exchange information during the process, analyze completed tasks, identify and resolve challenges. This reflects the culture of cooperativity.

When organizing and implementing "Creative Research Work" as a form of independent learning in physics, it is advisable to follow a model structure based on the following sequence. This process fosters the emergence and application of new ideas, adherence to strict procedures and methodologies, evidence-based reasoning, analytical thinking, the integration of theory and practice, and the development of both professional and life skills.

Organizational Foundations:

Topic Selection – based on scientific rationale and feasibility;

Significance of the Work – understanding how the creative project contributes to production or the field of physics;

Purpose and Objectives – defining the main aim of the work and outlining the tasks necessary to achieve it.

Theoretical Foundations:

Concept of the Creative Work – formulation of new ideas and scientific approaches;

Structure and Process of Execution – planning the sequence of steps involved in analyzing ideas and conducting creative research.

Practical Foundations:

Materials and Tools Required – identifying necessary resources, devices, and technical tools needed to complete the project.

Final Stage:

Process Description and Results – describing the implementation of the creative approaches and innovative ideas used in the project;

Analysis of Results – examining the outcomes of the creative work and analyzing them in relation to the initial goals.

CONCLUSION

Outcomes of the Creative Work – drawing conclusions about the practical significance of the results obtained;

Expected Impact – identifying potential areas of application (e.g., manufacturing, technology, quality control) based on the findings.

Recommendations and Suggestions:

Providing practical suggestions related to the field based on the outcomes of the creative project.

List of References Used

Based on the above, it can be concluded that completing independent assignments on the basis of cooperativity increases students' sense of responsibility toward the group, helping them grow into competent specialists who are cultured, active, and capable of contributing to team success. Through mutual discussion and analysis, students develop critical thinking skills, and their theoretical and practical knowledge is more deeply retained. This enhances the effectiveness of the educational process, boosts students' motivation for learning, and stimulates the generation of new ideas. In practice, this approach cultivates a sense of responsibility, self-confidence, and essential professional skills and competencies.

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