

THE DEVELOPMENT OF INTERDISCIPLINARY COMPETENCIES IN PHYSICS CLASSES TAUGHT IN TECHNICAL UNIVERSITIES –AS A MEANS OF SHAPING THE ABILITY OF STUDENTS TO THINK INDEPENDENTLY

Mirzayev Mirgolim Shayimardonovich

Senior Lecturer of the Department of Natural Sciences,
Karshi State Technical University

Abstract

This article analyzes modern pedagogical technologies used in physics classes and their role in shaping interdisciplinary competencies. The possibilities of fostering creative thinking, independent work, and professional skills among students through the integration of project-based research, information and communication technologies (ICT), and practical experience are demonstrated.

Keywords: Physics, interdisciplinary competencies, pedagogical technologies, creative independent thinking, project-based research, laboratory experiments, ICT.

Introduction

In the process of modern education, an interdisciplinary approach occupies a significant place. This approach is aimed at developing the skills and abilities of students to independently master critical and creative thinking, to independently master their knowledge and apply it in practice in everyday life. Physics is a science based on experience, it is possible to form interdisciplinary competencies of students by applying various pedagogical technologies in physics lessons.

Teaching physics is a pedagogical process, and in the guidance and management of a teacher, it makes it possible for learners to master the basics of physical science, that is, to learn nature, be able to apply their acquired knowledge in life, acquire the skills of a developed society to be able to communicate with techniques and technologies. As a result of training, students should be formed such as general polytechnic education, a correct scientific worldview, feelings of humanity. A skilled educator should not only be well versed in the basics of Science and firmly master the methods of teaching it, but also perfectly know the process of teaching, the Psychological Laws of students ' mastery of Science, the ways of generating and developing practical skills and qualifications, developing the ability to think independently, solving educational issues in the personality maturation in teaching. The teacher is also required to be able to consistently apply psychological patterns. skilled educator should not only be well versed in the basics of Science and firmly master the methods of teaching it, but also perfectly know the process of teaching, the Psychological Laws of students ' mastery of Science, the ways of generating and developing practical skills and qualifications, developing the ability to



think independently, solving educational issues in the personality maturation in teaching. The teacher is also required to be able to consistently apply psychological patterns. Social life experience is important in the development of students. Therefore, the teacher must also keep this important factor in mind.

Main part:

A technological approach to the educational process — in order to facilitate the student's acquisition of knowledge, it requires, first, the separation of educational material (information) into interconnected parts, fragments (educational elements), and then the sequential, step-by-step, consistent implementation of educational activities (actions, actions) to be carried out in order to achieve the intended result in education, This is one of the laws of pedagogy, and it is necessary to follow it in order to apply educational technology.

In order to improve the quality of education in the course of the lesson, the use of various new pedagogical technologies and didactic games is being introduced, and this method is paying off today. However, even better results can be achieved if the use of more modern and effective methods is applied to the educational process without stopping in one place.

An advantage of the lesson form, which is organized through interactive methods in relation to traditional education, is that for a short period of time, a large volume of information can be supplied with sufficient and understandable, based on the basic knowledge of the audience. In the traditional form of education, however, it is impossible to deliver large volumes of data on schedule using chalk alone. And in an interactive way, it is possible to organize an active lesson process with discussion and discussion, with the active participation of students and an interesting atmosphere of the audience. As an example, it can be said that rather than explaining the methods of connecting electrical equipment only by drawing, several different answers can be obtained if a discussion question is asked to students about their methods of connecting. This allows for discussion and study of several methods using time. When organizing practical classes, that is, problem solving classes, it is possible to consider several ways of working out the issue through a problematic educational method.s an example, it can be said that rather than explaining the methods of connect.

Unlike traditional lesson forms, which are usually organized, during classes organized in an interactive way, the skills of independent work are formed in students and increase the potential for obtaining new knowledge. The organization of classes through methods of improving technical abilities forms professional skills in students. In addition, issues that are difficult to solve in the course of the lesson can also be identified in different ways through the method of mental attack.

By international educational standards, a modern professional should have the ability to integrate various disciplines,eliminate complex problems and apply creative approaches,not limited to having knowledge only in his field.

Physics is the basis of natural and technical sciences, and physics lessons provide ample opportunities for the formation of interdisciplinary competencies.

The concept of modernizing the educational system of our country provides for the purpose of professional education – the training of a qualified, competency, responsible, professionally ready for self-improvement, able to work effectively and a competitive worker in the labor



market. On their basis lies an interdisciplinary approach, this approach is based on the idea that in technical universities the main thing is to teach creative independent thinking. This approach assumes that the student can not only master the system of knowledge, but also master the methods of universal (non-science) actions and independently receive information with them. The interdisciplinary approach develops the skills and competencies of students to apply their skills in various disciplines, eliminate complex problems and independently think creatively. For this in physics lessons, interdisciplinary approaches are used: the application of mathematical methods (modeling of physical processes); examples related to chemistry (physicochemical properties of substances); integration with Informatics (simulations, data analysis).

Physics has great potential for the formation of professionally significant qualities of students, namely, Educational-Research, emotional-psychological, social, organizational-activity and creative abilities. This is facilitated by the diverse educational and research activities of students in the lesson, the multidisciplinary orientation of educational materials, the extensive application of acquired knowledge, skills and qualifications in practice in everyday life. In the process of studying physics, the student is involved in all stages of scientific knowledge (observation → hypothesis → experiment → analysis and generalization of results), which serves to develop scientifically independent thinking and creative abilities [1, 19].

In the context of an informed society, the education of students adapted to the environment of digital technologies, knowledgeable, capable of thinking independently cannot be carried out without the application of information and communication technologies in the educational process.

The application of Project Research Technology in higher education practice, which encourages students to creative activities, gives positive results. When forming a project topic, it will be advisable to take into account the specific interests and capabilities of students. Students will have to carry out projects such as "types of heat transfer", "internal combustion engine". The subsequent implementation of presentations created for projects into training will give good results. The development of presentations contributes to the development of students' activities to work independently, giving creative, problematic descriptions to teaching. It brings positive results when working with students who have good training in Project research technologies. If the projects are carried out in groups, in this case, students will have the opportunity to process a large amount of information. In the process of collaborative activities, students discuss search options and the sequence of placement of information in this creative project.

Research work of students is one of the directions for the formation of professional competencies of students in higher educational institutions. In higher education, the student scientific society is established, and students can engage in research activities from the 1st year onwards. When choosing the topic of research work, it is carried out taking into account the future specialization of students. A 1st year student studying in the specialty "mechanical engineering technology" can carry out a research work on the topic "the effectiveness of laser technologies in Mechanical Engineering".

Physics is a science based on experience, it is always taught by demonstration experiments. When conducting experiments, students' skills for conducting experiments, conducting



observations, drawing schemes, working with numerical values, reporting on the work performed, scientific discussion are improved. Such types of activities in physics lessons closely help students develop interdisciplinary competencies such as: creative thinking, the formation of the desire and ability to improve oneself.

Laboratory work helps to form the experimental skills and qualifications of students. Students, being in the role of researchers, not only determine the stages of the implementation of the purpose of the experiment, but also plan its stages, and independently draw conclusions, calculate the errors of measurements.

The development of measuring skills and competencies of students is one of the important conditions for the formation of professional competencies. In any area: in industry, science, medicine or transport – a person faces the need for measurement. Thus, in physics lessons, we lay the foundation of professional competence, which ensures the use of a high level of knowledge, techniques and technologies in professional labor and the possibility of professional growth of a specialist.

The next form of organizing the teaching and formation of general and professional competencies is laboratory work, which ensures that the student performs an experimental task using an experimental installation or through a virtual physics laboratory. In the curriculum and syllabuses prepared for each educational direction in physics, the number and names of laboratory works are kellogged.

Since physics belongs to specialized educational disciplines, the content of the educational material is focused on the specialty of students. To this end, in each laboratory work, specific questions are identified that allow you to connect interdisciplinary courses that carry out the educational material of physics and the educational material of the types of professional activities.

When conducting laboratory practice, the communicative skills of students develop: they learn to listen and understand others, express their opinions, talk about the report of the work performed, come to an agreement, cooperate among themselves within the group. Communicative competence, which is formed in practical lessons, is a guarantee of the success of a young specialist in professional activities. In the field of professional activity, much depends on the ability to manifest itself through communication.

In the study of any topic in physics lessons, the presentation of theoretical material should include physical experiments and demonstrations, the performance of laboratory work can be recorded on video and shown in classes.

One of the common forms of development of professional competencies in physics lessons is problem solving. There are a lot of high-quality physics problems and such problems with production content, their use at all stages of the lesson is minkin: when explaining a new topic, combining the material under study, checking and accounting for knowledge. Such tasks bring the theory under study closer to the surrounding life, develop interest in the topic and help create logical conclusions based on physical laws. Solving situational problems with production content involves modeling the technological process in general or part of it during a theoretical study lesson.

Despite the fact that basic concepts are formed in training, extracurricular activities also play an important role. In the modern world, the process of education and upbringing is so complex



and diverse that the teacher cannot fully and effectively perform it only in classes. Carrying out extracurricular activities will help the teacher to better know his students, their individual abilities, identify among them those interested in physics and develop this interest and apply the acquired knowledge in their future professions.

Conclusion:

Thus, the constant connection of teaching physics in higher education with production not only arouses interest in the study of physics, but also helps to develop professional skills and skills, solve professional problems and solve typical professional problems that arise in real situations of professional activity.

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