

PRACTICAL WORKS IN PRIMARY SCHOOL PHYSICS COURSE

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Summary

Practical works with detailed instructions meet the requirements of the activity approach and provide an opportunity for self-study in the conditions of mixed education. The value of practical work in physics lessons is that they contribute to the connection between theory and practice, form research skills, teach how to process measurement results and analyze experiments, thus contributing to all components of subject competence in physics. The article presents the structure of practical work, drawing attention to the need to use modern digital applications and computer programs for studying physics. Since the main task of this type of educational work is the formation of skills and abilities, their components should be various exercises: preparatory, trial, model, training, creative, practical, graphic, oral, written, graphic, etc. Practical work as a means of learning, can be used in lessons of various types and provide learning based on the student's requests: from simple to creative. They will differ in the detail of the instructions and the level of teacher consultation.

Key words: activity approach, competence, research study, self-study, instruction.

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1. Introduction

Modern education should move from the mechanical transfer of knowledge from the teacher to the pupil to solving problem-searching questions, solving prognostic problems, through which the formation of a competent personality will take place. Taking into account the structure of competence, which includes knowledge, activity and personal components, the search for those forms of work in the lesson that would stimulate the individual activity of the pupil and contribute to his development becomes of great importance.

According to the physics program – «The learning process is a two-way process that is based on the activities of both the teacher and the student. The main task of the teacher is to organize and manage the educational and cognitive activities of pupils, as well as teaching, which directs the teacher's work to find tasks that contribute to the development of his personality» (*Liashenko and other, 2017*). Practicing teachers and scientists all over the world are engaged in the search for such activities. In particular, many studies are devoted to problem-based, research-based learning with elements of interactive technologies. Accordingly, the chosen topic of research, which involves the study of practical works as a didactic unit and a means of forming subject physical competence, is relevant.

2. An active approach to teaching physics at school

The task of the school in today's high-tech world is to form a competent person who knows how to apply acquired competences, self-study and adapt to the changing conditions of the modern world. Therefore, modern education should move from the mechanical transfer of knowledge from the teacher to the student to solving problem-searching questions, solving prognostic problems. Important importance should be given to stimulating the individual activity of pupils.

According to the requirements of the State standard of basic and comprehensive general secondary education, one of the ways to implement the activity component of the content of education during physics education is the involvement of pupils in experimental activities, in particular through the performance of frontal experiments, laboratory works and short-term experiments, physical practicum, educational projects, extracurricular experiments and observations. The physical experiment, with its purpose and content, ensures the comprehensive achievement of the educational, educational and developmental goal of education, and the peculiarities of its organization and conduct are a holistic approach to the formation of a comprehensively developed personality and its stable outlook. The school physical experiment is characterized by an active approach, cooperation, practical activity, a conscious approach, justified mechanisms for the development of logical thinking, establishing cause-and-effect relationships, clarity of learning and education (*Pro deiaki pytannia derzhavnykh standartiv povnoi zahalnoi serednoi osvity*, 2020). Since modern education should create conditions for the development of the pupil's creative personality, it is important to teach children to work independently, at their own pace, following their own requests and interests. Learning can be successful if pupils are active in the learning process. At the same time, the learning process is a two-way process based on the activities of both the teacher and the student. The main task of the teacher is to organize and manage the educational and cognitive activities of pupils, as well as teaching. And the main task of the pupil is learning. The activity approach is based on the idea of individual active activity of the pupil, which directs the teacher's work to search for tasks that contribute to the development of his personality.

We agree with the opinion of psychologists that «activity is a specific form of the socio-historical existence of people, which consists in their purposeful transformation of natural and social reality» (*Davydov, 1996*). They defined the structure of activity – goal, task – means solution of the problem – transformation process – result.

Researchers of educational technologies say that «learning as research assumes that a feature of the student's educational and research activity is his subjective discovery of new knowledge based on the individual actualization of previously acquired knowledge and skills, their introduction into the personal cognitive space» (*Chaikovska, 2015*).

The implementation of an activity approach through the technology of learning as research is interesting for pupils. Research elements can be present at different stages of the lesson and during different types of lessons. The activity and independence of pupils increases if they are taught not only to hear, but also to understand the material, record it in the form of a plan, theses or synopsis, highlight the main points in the educational material, or focus on finding answers to questions. The greatest cognitive independence and activity of pupils is manifested when they independently formulate problems, define hypotheses, plan and organize the search for ways to solve educational problems, look for ways to solve and verify them, analyze the obtained results and draw conclusions.

In order for the learner to be able to refresh his knowledge and understand the information received, he must be taught to receive it on his own. Therefore, among the learning outcomes is «...learning to analyze the text of the textbook, to highlight the meaning of concepts, quantities, the formation of laws, the description of physical phenomena and their essential aspects, to divide the text into logical meaningful parts, to make a plan of what has been read» (*Fizyka: metodychni rekomendatsii MON, 2017*). Working with literature, the pupil must: analyze; to systematize what has been read; highlight the main thing; compare. And these are also elements of research activity. In our opinion, such skills are developed while filling in tables or compiling them. Such tasks give the work with the textbook a purposeful character, encourage students to look for answers to the questions, which contributes to the careful study of the text.

3. Formation of research abilities and skills by means of physics

Research skills are formed during laboratory work and solving experimental problems. Laboratory work contributes to the formation of skills in working with devices, processing and analyzing results.

One of the key concepts for physics teaching methodology is the concept of educational activity. Educational activity can be presented in the form of two different, but interrelated activities: subject and learning activity (*Chi, Feltovich, & Glaser, 1981*). The essence of the educational activity is that its result is the change of the pupil himself, the content of the educational activity consists in mastering generalized methods of action. Educational activity is characterized by: subjectivity; activity; objectivity; motivation; purposefulness; awareness; structure; meaningfulness.

The components of the external structure of educational activities include:

- educational motivation;
- learning goal;
- educational problem – a task proposed in the form of an educational task accepted by the student;
- solving an educational task based on educational actions and operations: substantive and auxiliary;
- control (control actions) that turn into self-control;
- evaluation (external evaluation actions), which pass into the evaluation itself (*Hrudynin, 2015*).

The implementation of these actions during the education of students leads to the achievement of both educational and developmental goals.

In psychology, according to the theory of the activity approach, activity is determined by a motive. The motives of the activity are different, but the motive of the educational activity should be knowledge and it should be a conscious choice of the pupil of education. A statement was put forward and proved experimentally; only if the student consciously sets cognitive goals for himself, then he is formed as a comprehensively developed and socially mature personality (*Posner, Strike, Hewson, Gertzog, 1982*). The psychologist introduced the concept of «purposeful educational activity», established its main features and structure. The theory of goal-directed activity requires that during the formation of mental actions, students are aimed at mastering «schemes of things», that is, general ways of acting. The basis of the organization of education should be the rule that students, on the basis of the principles and general schemes given to them, develop a system of guidelines for mastering actions. In order for students to be able to distinguish general methods, schemes of actions, they must consciously master

knowledge, therefore, the study of any question in physics must begin with an explanation of why it is specifically needed by the student, thus, it is of particular importance in the theory of educational activity motivation. Pupils work during physical experiments is carried out with the help of special educational tasks: conducting; research; analysis; independent study; modeling (*Waters, Schneider, 2010*). Solving these problems is theoretical in nature and helps to gain experience in scientific thinking. The purpose of the pedagogical activity of a physics teacher within the scope of this study can be defined as the formation of cognitive, activity and evaluation components of the content of education during the organization and conduct of an educational physical experiment. We choose experimental skills of students as the object of pedagogical activity. And the teacher and the student body are the subject of pedagogical activity. As means and technologies of pedagogical activity, we choose physical devices, digital physical laboratories, mobile technologies, and distance learning technologies. The formation of experimental skills of the pupil of education will be considered the result of pedagogical activity.

Therefore, it is in the process of educational activity, which can be different in its structure, that the transformation of the personality, the formation of the educational and cognitive components of its competence is carried out. Completing educational tasks requires additional knowledge, theoretical information from the textbook, from the teacher, which will be perceived more consciously and valuable, because they help to cope with the task, and the observed results of the work will be their own discovery, which is more understandable than the "general" knowledge presented in the textbook.

4. Methods of studying physics through practical work

When studying physics, one of the important types of educational activity is physical experiments. The material base of physical classrooms cannot always ensure the performance of all laboratory work or experimental work, and modern corrections are associated with the mass introduction of distance learning elements into the educational process. This forces the teacher to look for alternative methods of conducting experiments. In such experiments, you can use materials and useful things that are available at home with the use of safety rules. But not all experiments can be conducted using this method. Therefore, teachers are increasingly turning their attention to the use of experiment simulation laboratories, which make it possible to show complex experiments with safety rules.

In order to implement the competency-based approach in teaching physics and develop the key competencies of pupils, it is necessary to consider practically oriented tasks. Tasks, the individual components of which are directly related to reality, consolidate the knowledge and skills acquired in the learning process. In order to prepare students for research work, to form their practical and skills with the help of virtual laboratories, the teacher needs to change the approach to conducting classical laboratory work. In the modern realities of Ukrainian education, it is not always possible to control the student of education. Increasingly, teachers are forced to provide instructions or video materials with the help of which the learner gets the opportunity to complete the tasks set before him independently, without the support of a teacher. That is why it is necessary to make a transition from an informational and explanatory approach in education to a practical (active) one, aimed at forming the ability to learn in students of education. A great help in the implementation of such an approach in physics lessons is provided by practical work. It is this type of work that provides effective practical learning of the material. The step-by-step execution of tasks and then their consolidation with similar

exercises allow to teach the pupil to independence, the ability to formulate conclusions using the acquired knowledge.

The value of practical works lies in the fact that they contribute to the connection of theory with practice, form the skills of research activity, teach how to process the results of measurements and make an analysis of the experiment (*Merzlykin, 2015*).

Properly organized practical work has an important educational and practical value (implements the didactic principle of linking theory with practice) and is aimed at solving the following tasks (*Chaikovska, 2015*).

- deepening, consolidation and concretization of knowledge obtained at lectures and in the process of independent work;
- formation of practical abilities and skills necessary for future professional activity;
- development of the ability to observe and explain the studied phenomena;
- development of independence, etc.

Carrying out practical work requires creative initiative, independence in decision-making, deep knowledge and understanding of the educational material from the learner, provides opportunities to become a «discoverer of truth», has a positive effect on the development of cognitive interests and abilities. The combination of theory and practice, which takes place in specially equipped equipment or with the use of virtual laboratories, the content and appearance of which should activate the cognitive activity of the student of education, gives a concrete character to what is learned in lessons and during independent work, contributes to detailed and deeper assimilation of educational information.

For practical work, a course of work is drawn up, which the student of education should familiarize himself with individually. The teacher monitors the performance of the work and, if necessary, gives advice. Such work ends with a written report of each pupil.

Practical works have an important educational and cognitive value, contribute to the formation of skills and abilities necessary for future life and self-education. Carrying out such works helps to concretize knowledge, develops the ability to observe and explain the phenomena being studied.

5. Structure and components of practical work

Practical class (lat. praktikos – active) – is a form of educational class, during which a scientific and pedagogical worker organizes for pupils the analysis of individual theoretical provisions of the academic discipline and forms the skills and abilities of their practical application, through the individual performance of appropriately formulated tasks.

The main tasks of practical classes (*Turkot, 2018*):

- deepening and clarification of knowledge acquired in lessons and in the process of independent work;
- formation of intellectual skills and abilities of planning, analysis and generalization, mastering skills of organization of professional activity;
- accumulation of primary experience in production organization, working with equipment and managing it;
- mastery of initial leadership, management and self-management skills.

In the process of conducting practical classes, various teaching methods are used. Since the main task of this type of educational work is the formation of skills and abilities, the main ones should be various exercises (preparatory, trial, modeled, training, creative, practical, graphic, oral, written, professional, technical, etc.).

In today's digital world, we believe that a significant amount should be occupied by practical work using a computer. This is due to the fact that physics does not exist without computer programs in further education and employment. It is necessary to acquire practical skills in modern physics, to be able to use the material explained by the teacher in a modern way.

Practical classes must meet the following requirements:

- understanding on the part of those seeking education of the need to possess basic theoretical knowledge;
- awareness of the need to develop competence-oriented skills and abilities;
- provision of optimal conditions for the formation of skills and abilities (sanitary and hygienic, didactic, educational);
- training of education seekers in rational methods of mastering skills and abilities;
- ensuring the independent activity of each student of education;
- observance of systematicity and logical sequence in the formation of skills and abilities of education seekers;
- development of tasks for practical classes with a clear competence focus;
- wide inclusion in the system of practical classes of creative tasks;
- systematic control over the performance of practical tasks;
- constant encouragement of the practical educational activities of world seekers.

Structure of practical work:

1. short theoretical material;
2. description of the practical task;
 - a) step-by-step actions for performing an experiment or observing a phenomenon;
 - b) a description of the results to be obtained during the execution of the actions;
 - c) fixing the experiment, repeating it, but with other input data or properties;
3. analysis of the obtained results;
4. conclusions, answers to additional questions.

6. Conclusions

The main emphasis of the conducted research was focused on the development of independent learning of knowledge, which can be organized through such a means of learning as practical work. The use of practical works in the conditions of mixed learning strengthens the ability to self-study and forms metasubject experimental skills. Practical work with step-by-step instructions, theoretical material, problematic questions allows you to thoroughly learn the educational material, using the main advantages of the activity approach.

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