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**SCIENTIFIC GOALS AND
PURPOSES IN XXI CENTURY**



SEATTLE, USA

7-8.10.2021



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Kalenyk Mykhailo

candidate of pedagogical sciences, associate professor, associate professor
of the department of physics and methods of teaching physics Sumy state
pedagogical university named after AS Makarenko, Ukraine

**ORGANIZATION OF STUDENTS 'PROJECT' ACTIVITIES
IN PHYSICS LESSONS**

***Abstract.** The article shows that in the design process students are required not only to identify but also to substantiate certain essential features of the content component of the school course of physics. Therefore, forming a holistic view of the components, you can limit yourself to a system of questions that play the role of cognitive tasks, solving which in small groups, students get one or more essential features of the component. The most rational ways of formation and use in the course of training of the generalized systems of independent works of the pupils directed on development of their creative activity, independence, thinking are specified.*

***Keywords:** project activity, mini-project, cycle, educational process, component, integrative model, educational task, cognitive tasks.*

The integrative model of the learning process, which is aimed at its humanization, intellectualization, to raise the role of the student's personality in this process, determines the essence of communication between teacher and students.

Communication between the subjects of the educational process involves:

- 1) providing all students with equal opportunities for their learning and development;
- 2) creating conditions for successful learning of each student;
- 3) taking into account the individual capabilities of students, differentiation of requirements for knowledge and skills of students;
- 4) respect for the personalities of students;
- 5) exclusion of coercive teaching methods, focus on learning without coercion;
- 6) giving students freedom in organizing their educational activities, choosing tasks, self-assessment of their capabilities;

7) emancipation of pedagogical relations, change of their essence, exit from the system of subjugation and opposition to the system of cooperation;

8) in the relationship between teacher and students should be trust and responsibility for the organization of the educational process, its results;

9) the distribution of functions in the management of the educational process between teacher and students;

10) the creation of micro groups in the classroom, which are based on mutual assistance, mutual control, self-government.

Fulfillment of these requirements to the learning process allows to create during training such an emotional atmosphere, which contributes to the effective assimilation of program material and the formation of cognitive and practical skills.

Work in small groups at different stages of the educational project and for different purposes is used.

The use of small groups of students in the learning process aims to:

1) taking into account with the help of students themselves their individual capabilities;

2) giving them freedom in organizing their educational activities, choosing tasks, setting reporting deadlines;

3) organization of students' activities on each issue of the school program and control over its results;

4) reducing the shortage of study time.

Small groups consist of four students, whose workplaces are at adjacent student desks. The members of the groups elect their leader each time. If the number of students in the class is not a multiple of four, the group may consist of two, three or five students.

Small group leaders report to group members on the results of their work.

One of the conditions for the effective completion of the educational process is the high intellectual activity of students.

Activity in learning exists if students have a positive attitude to the subject of activity and their participation in the collective or independent implementation of educational activities at all stages of the educational process.

One of the goals of the first stage of project-based learning is to stimulate the intellectual activity of students. It is necessary to consider the motives of activity that students are aware of this age group of students.

For students in grades 7-8, such motives are related to cognitive interests. Therefore, putting forward a learning problem, you need to create a situation that arouses students' interest in the results of subsequent activities. Otherwise, students need to be convinced of the practical importance of the problem.

In the senior classes, the broader social motives that relate to the orientation to the future profession, the desire to get better results in learning and others become aware. Therefore, the very formulation of the educational problem, which is perceived by them as a typical task (the method of its solution is similar for a whole class of practical problems), motivates them to work. Of course, at this age, cognitive interests play an important role, but the interest is due not so much to the curiosity of the situation, as its practical significance for students and the activity itself.

Intellectual activity is excited, but it is not enough. Students need to know: what to learn, what to learn to do to solve the problem. Without this, students will be forced to "blindly" follow the reasoning, instructions, requirements of the teacher, which will lead to a rapid decline of intellectual activity of students, which arose at the previous stage of the project. The purpose of planning the next activity has this purpose.

The division of the studied content into logically complete parts allows to begin the study of each of them with the formulation of the purpose of the activity, which is determined by the cognitive task. When performing these tasks, you should try to make sure that everything that students can do, even with a little help from the teacher, is done by students.

The method of projects is based on the development of cognitive, creative skills of students, the ability to independently construct their own knowledge, the ability to navigate in the information space, the development of critical thinking.

The project method is focused on the independent activities of students - individual, pair, group, which students perform over a period.

The project method involves the solution of some problem, which involves, on the one hand, the use of different methods, on the other - the integration of knowledge, skills from different fields of science, technology, technology, creative areas. Project work involves not only the presence and understanding of a problem, but also the process of its disclosure, a solution that includes clear action planning, the presence of a plan or hypothesis to solve this problem, a clear distribution of roles (if you mean group work), ie tasks for each participant in close cooperation. The results of completed projects must be substantive, ie, if it is a theoretical problem, then its specific solution, if practical, a specific practical result, ready for use [2].

In the 60s of the 20th centuries, teachers' attention was drawn to the ideas of problem-based learning, the purpose of which is to develop students' creative abilities by performing actions in non-standard situations.

The structure of the activity process in this case consists of stages:

- 1) creating a problem situation and formulating the problem;
- 2) hypothesis formation;
- 3) hypothesis testing and analysis of the obtained information.

Problems in learning activities are determined by the specified "phases" of problem solving and the peculiarity of thinking. A characteristic feature of the latter is the search for the idea of the solution and its concretization.

An idea is a new direction of thinking, the designation of the field in which the solution lies. A thought, called a hypothesis, is a prediction that explains a problem situation in a way previously unknown to the subject. There are various ways to bring students to the hypothesis: first we consider the analogy or metaphor that will lead to the hypothesis; proves the conditions under which the process or phenomenon is reversed by what should be reflected in the hypothesis, on the basis of which the assumption is made about the conditions of the process associated with the problem situation; students put forward various proposals for solving the problem ("brainstorming"), one of them is chosen, which becomes a hypothesis; a previously known fact is considered, but which relates to another subject, by transferring the known to a new situation, a hypothesis is formulated; research facts are systematized, which becomes the basis for the hypothesis; reasoning by

deduction is performed and the hypothesis arises as a result of applying the general to the specific [1].

The clarity of the design organization is determined by the clarity and specificity of goal setting, the allocation of planned results, the statement of the initial data. The most effective is the use of small guidelines or instructions, which indicate the necessary and additional literature for self-education, teacher requirements for project quality, forms and methods of quantitative and qualitative evaluation of results. Sometimes it becomes possible to identify so-called design algorithms or other phased distribution of activities.

The choice of project topics in different situations may be different. On the one hand, it can be determined by the teacher considering the educational situation, professional interests, interests and capabilities of students. On the other hand, the topics of the projects can be suggested by the students themselves, who focus on their own interests, not only purely cognitive, but also creative, applied.

The topics of the projects may relate to some theoretical issue of the school curriculum in order to deepen the knowledge of individual students on this issue, to differentiate the learning process. As a rule, project topics relate to some practical issue relevant to practical life and at the same time, one that requires the involvement of students' knowledge not in one subject, but in different areas, their creative thinking, research skills. Thus, a fairly natural integration of knowledge is achieved.

Students during the project have their own specific difficulties and overcoming them is one of the main pedagogical goals of the project method. The basis of design is the assimilation of new information, but this process is carried out in the field of uncertainty, and it must be organized, modeled, so that it is difficult for students to: plan the main and auxiliary goals and objectives; look for ways to solve them, choosing the best if there is an alternative; make and justify the choice; anticipate the consequences of the choice; act independently (without prompts); compare the result with the real one; objectively evaluate the process (the activity itself) and the result of the design.

The teacher needs to consider possible options for problems that are important to explore within the planned topics. The problems themselves are put forward by

students with the help of the teacher (auxiliary questions, situations that help to identify problems, demonstrations, etc.). Brainstorming followed by a collective discussion will be appropriate.

Distribution of tasks by groups, discussion of possible research methods, information retrieval, creative solutions.

During the project (according to the structure of the learning process cycle) the study of new material is a consistent introduction of the essential features of the component of educational content, which is carried out by performing systems of cognitive tasks.

When planning the study of new material, it is important not only to establish a logical sequence of cognitive tasks, but also to determine the logical structure of their implementation, the search for common systems of actions that make up the activities related to the analysis of similar essential features.

Thus, during the study of physical phenomena, their external features are determined at the stage of the educational problem and planning the next activity. When studying physical quantities at this stage of the lesson, a property is determined that must be described by a physical quantity. Some essential features of the component may be the result of applying the study to specific situations.

In the design process, students are required not only to clarify, but also to substantiate certain essential features. Therefore, forming a holistic view of the component, we can limit ourselves to a system of questions that play the role of cognitive tasks, solving which in small groups, students receive one or more essential features of the component.

For example, questions related to the concept of electric field strength may be as follows:

1. What property of the electric field characterizes its intensity?
2. Define the electric field strength.
3. In what units is it measured?
4. How to calculate the electric field strength created by a point electric charge?
5. What is the principle of superposition of fields?
6. What is the line of electric field strength?

7. What are the rules of graphic representation of electric fields?

According to each of these questions, the teacher formulates in advance several (according to the number of small groups) cognitive tasks. Each group chooses a task and works on it.

Cognitive tasks can include: working with the textbook, conducting experiments (experiments), observations, analysis of information from various sources (including the Internet), etc.

During the planning of the experiment: the purpose and tasks of the experiment are determined with the presentation of the main hypotheses that need to be tested; the object of research is selected, its parameters are studied; the technique of experiment both on the equipment, and system of the operations which are carried out in the course of work is defined; the sequence of experiments in the experiment is determined; methods of processing of results of measurements and ways of check on this basis of the put forward hypotheses are chosen.

These features allow us to highlight the generalized plan of activities of teachers and students, associated with the formation of students' experimental skills.

I. Formulation and mastering of experimental tasks

1. Find out what physical phenomenon, process, property of bodies should be studied.

2. Understand what needs to be clarified, give a generalized description of the phenomenon through experiments; graphically depict the process; establish a relationship between physical quantities, etc.

II. Experiment planning

1. Select the object of study.

2. To define a technique of carrying out experiments: to make the basic scheme of experimental installation, to specify the necessary devices and materials, to make the plan of performance of actions.

III. Execution of the plan

1. Select the necessary devices and determine their basic parameters.

2. Assemble the test setup.

3. Carry out observations and measurements.

4. Record the results obtained.

IV. Analysis of the obtained results

1. In accordance with the set purpose to process the received data.

2. Draw conclusions.

3. Make a report.

All these actions can be performed by students collectively or individually.

From this plan of activity it is possible to allocate separate actions of pupils which bring the contribution to formation of ability to conduct experiment independently: oral or written description of the observed phenomenon; graphic representation of a process or phenomenon; drawing up a scheme of the experiment, using the instructions; analysis of the principle of operation of devices; reading scales of measuring instruments; finding common ground in the observed phenomena; prediction of experimental results; processing of measurement results and other actions. Different combinations of these actions of students are possible. Based on these systems of actions various independent works of schoolboys which are carried out at various stages of educational process are planned.

Similar generalized ways of activity exist for other types of independent work of students.

The final stages of studying the content of the component are the generalization and systematization of the results, the application of the studied to standard and non-standard situations.

Thus, if we consider the organization of group work in project activities (mini-projects) in the cycles of the educational process, during which students learn and master a certain component of the content of the school physics course, it integrates all the positive qualities of different ways of organizing classes. related to: formation of students' knowledge and skills; development of their creative activity, independence, thinking; optimizing the management of educational activities of students.

The content and structure of the cycles of the learning process create conditions for the implementation of these positive qualities that ensure the effectiveness of physics lessons in the real learning process.

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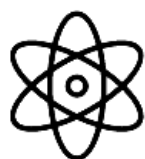
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Scientific Publishing Center «InterConf»
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