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THE IMPORTANCE OF DESIGNING ACTIVITIES IN THE FORMATION OF CREATIVITY CHARACTERISTICS OF PHYSICS STUDENTS

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Abstract

The article shows how important a specialist with creativity today is. Socio-pedagogical factors in the formation and development of creativity in physics students of higher education are shown. In addition, this work shows the importance of designing activities in the development of creativity in physics students of higher education. The main concepts of designing activities are presented. Moreover, this work shows the types of designing activities that are the most effective at developing creativity in physics students.

Keywords: *technology, creativity, specialist, education, student, physics, project, information, pedagogical conditions, research, thought, issue*

Introduction

Now and in the future, the rapid development of scientific technologies leads to the emergence of new modern specialties. It is confirmed that one of the main factors for a person to adapt to such conditions and achieve new achievements by quickly mastering a new specialty is his creativity. Because a specialist with creative qualities will have the ability to think logically, have a rich imagination, fully demonstrate his creativity, speed of thinking, and the ability to put forward unique original ideas. Possession of this ability gives the capacity to make new decisions based on existing experience and knowledge (Stupnitskaya, M. A. *Novie pedagogicheskie tehnologii: organizatsiya i sodernjanie proektnoy deyatelnosti uchashixsya: lektsii/ M.A. Stupnitskaya. – M.: Izd-vo Mosk. ped. un-ta.2009. – 132 p).*

Therefore, as the main modern concept of the educational system, as well as the higher education system, it is an urgent task to develop creativity in pupils and students based on fundamental knowledge. Because, apart from the ones listed above, a specialist with creativity is distinguished by very quickly noticing the problems that may or have arisen in his field and related fields, the lack of available knowledge to solve them, and the conflicting situations within them. At the same time, such individuals have the ability to select the most optimal option from different solutions, quickly learn new knowledge, and quickly adapt to other fields.

The traditional form of education is no longer enough to educate a specialist with the above-mentioned qualities, because the traditional form of education was mainly based

on memorizing information and collecting facts.

Materials and Methods

In addition to many subjects, physics has become a formal education in higher educational institutions because the information, that is, knowledge, is mainly consolidated in practical exercises. Therefore, traditional education did not give a great impetus to the development of students' creativity. From the pedagogical-psychological point of view, the development of student's creativity is considered individual, but creativity develops rapidly and acquires a solid foundation in a specially organized environment. That is, the formation and development of creativity is influenced by socio-pedagogical factors.

In scientific research on the development of creativity and creativity in physics classes, students are mainly focused on working with different methods or non-standard problems, various laboratory exercises, (Kann, S. Yu. *Izuchenie vzaimosvyazi kreativnosti obsheniya i kreativnosti mishleniya studentov* Tekst. / S. Yu. Kann. Ryazan: RGPU, 1997.–22 p) and of course positive results have been achieved as a result of this. But such an approach to education does not lead to the formation of a student as a creative person in the literal sense, because the local situation requires the creation of necessary conditions for the manifestation of creativity formed in this case. That is, it is not ensured that creativity will be shown in solving physical problems and assignments given to students in higher education, entrance or graduation exams, and Olympiads. But creative thinking hardly becomes a daily necessity. In this case, the student certainly needs an external influence to make his creativity visible, because in the above situation, the student uses various methods to solve the given task and analyzes the result, that is, he shows creativity in some way. In order for creativity to become a daily need, it is essential that an expert has the ability to sensitively observe the processes happening around us, to be able to perceive a problem or opposition within it, to determine a problem and solve it based on this.

In the general and theoretical physics courses in higher education physics bachelor's degree, problems, physical assignments

or laboratory works are used mainly in textbooks. As we mentioned above, this form of education does not fully form the creativity of a person. It is known that objective and subjective psychological-pedagogical conditions must be created for personality formation. The main task of higher education institutions should be to create objective conditions, i.e. to gain self-confidence so that students can independently search for physics in the classroom and outside of it, and visualize the processes. If the development of the above features is carried out systematically in physics lessons, creativity will become a daily necessity. In this case, the main attention should be paid to student's independent research, because in this case, the student finds the problem himself, analyses the problem, finds a solution and analyzes the correctness of the solution. In traditional practical training, the student does not work independently, but solves a ready-made problem. In order to develop creativity to the required degree, it is necessary to systematically engage in a lot of time, but the hours of the allocated audience for practical training are very limited. Taking this into account, it is necessary to make effective use of the time allocated for independent education of students. According to the analysis and studies, the activity of designing, which is one of the types of student's activities, almost meets the above conditions.

In addition, students learn to work together in a group, to prove the correctness of their opinion, and to find a solution to conflicting situations that arise in thinking.

In addition, we can use the definition of creativity given below to develop students' creativity through design activities. "Creativity is, first of all, when a person finds non-standard solution to a given problem without going beyond the generally accepted methods and ways to project various ideas" (Stepanova E. V. *Proektnoe obuchenie – sposob povisheniya motivatsii studentov.* / Nauka i obrazovanie: opit, problemi, perspektivi razvitiya.– Krasnoyarsk: Krasnoyarskiy GAU, 2020.–164 p.)

It is known that to conduct all pedagogical experiments, we need to create some necessary conditions. Accordingly, the necessary and sufficient psychological and pedagogical

conditions created for the further development of creativity in students with the help of designing are of great importance. What is the help of designing in determining the psychological-pedagogical conditions necessary to be created for students, and what kind of projects are more effective in physics courses we believe that it is necessary to find a comprehensive answer to the question.

The main concepts of designing activity. According to the references, designing is a plan, idea, and imagination embodied in the form of a description, and a drawing revealing their essence – graphs, substantiating calculations and creating an opportunity to obtain practical or theoretical results. The activity of making students perform a project is a form of active learning and is one of the active creative processes aimed at achieving the intended result.

Projects are divided into several types depending on the work to be done and the result to be obtained. In order to choose a particular project to use in physics classes, it is necessary to take into account the specifics of physics and the purpose for which a specialist is being trained in higher education institutions.

Results

It is known that physics can be considered as an “exact science” in the complex of natural sciences, because the system of rules and proofs formed in physics develops the student’s ability to justify his personal view in a clear logical sequence. By analyzing and comparing certain physical quantities in tables, graphs, drawings, and text, data processing finds a way to solve a problem and proves it correct.

According to the type of activity listed above, it is appropriate for students to use “research” and “informational activities” types of designing in the field of physics.

1. An informational project is a project whose purpose is to collect information on scientific and interdisciplinary topics and draw some conclusions by analyzing them.

2. A research project is a project aimed at proving the correctness of some hypothesis or showing that it is incorrect, studying a little-studied aspect of a physical process, showing the interconnection of the physical

parameters that describe it analytically, numerically or with the help of graphs, and revealing its essence, which also acquires practical significance. Possible

It is recommended to work on informational projects first, and then on research projects, based on the content of the projects, in order to form skills such as designing and project execution. One of the main reasons for this is that in any research project, first of all, the existing data, ie scientific articles, monographs and scientific articles, are analyzed. The main part of a scientific project is to be able to find a problem and put the right question based on it (Paxomova, N. Yu. Metod uchebnogo proekta v obrazovatelnom uchrenii: posobie dlya uchiteley i studentov pedagogicheskix vuzov / N. Yu. Paxomova. – Moskva: ARKTI, 2005. – 112 p).

In order to find a scientific problem within a certain topic, as we mentioned above, scientific articles published in various scientific magazines and literature related to this topic are collected and the collected data are analyzed, that is, an informational project is carried out.

At the initial stage, when groups are formed for project implementation, one or two students who know science well and think divergently should be attached to each group, because such students have the ability to solve a problem or issue in several ways.

It is necessary to create necessary and sufficient pedagogical conditions that will lead students to carry out effective project activities and further develop their creativity during this process. When creating these conditions, attention should be paid to the uniqueness of physics projects. Unlike creative or socio-social projects, in order to carry out informational or research projects from physics, the student must have and be able to apply physical knowledge, describe a problem and its solution in a logical sequence in scientific language, perform calculations using complex mathematical equipment. must have the skills to go. To prepare for this situation, it is necessary to carry out the following activities with students.

In practical lessons in physics, i.e., problem solving lessons, great attention should be paid to creating a mathematical model of a physical process, using differential and

integral calculus, approximate calculation formulas and series. Because during the performance of such actions, students' ability to apply mathematical apparatus to physics develops even more. For this, it is necessary to use Internet information and a set of different problems when choosing problems for practical training. In our opinion, it would be appropriate to use the collection of issues published under the editorship of A. Chertov as a basis for use (Chertov A. G., Vorobev A. A. Fizikadan masalalar to'plami. Toshkent. "O'zbekiston". 1997.–218 p).

In the problems worked on at this stage, the problem is clear and the solution corresponding to the given answer is found using various methods, but at this stage, students do not develop the skills of posing a problem and analyzing whether the solution is correct or incorrect. In order to build and develop such skills, students are encouraged to use more physical assignments and assessment questions in practical training. For example, when using tasks such as "Determine the coefficient of air resistance" or "Estimate the electric capacity of a person", the student first creates a problem, and during the creation of the problem, he learns to use a model of a physical process and the quantities describing it.

In addition, in order to be sure of the correctness of the obtained solution, he either compares the problem with the quantities obtained by another method, or learns to analyze it by comparing the information obtained from the Internet with the information found in the search.

Currently, the use of IT technologies is of great importance in order to achieve high efficiency in scientific research and project implementation. In addition, when working on a problem in a traditional way, students are mainly required to find the value of a physical process at a certain moment of time or a limited number of physical quantities. Based on this found value, no more accurate conclusions can be drawn about the physical phenomenon that may occur or the actual graph of some connections (Dubrovina, O. S. Ispolzovanie proektnix texnologiy v formirovaniy obshix i professionalnix kompetentsiy obuchayushixsya. Problemi i perspektivi razvitiya obrazovaniya (II): materiali mejdunar.

zaoch. nauch. konf. (g. Perm', may 2012 g.) /O. S. Dubrovina – Perm': Merkuriy, 2012.– P. 124–126).

A physical process takes place in a certain time interval, and a change in some physical parameter causes a change in the other parameters, but obtaining a graph of a real change of a quantity over time requires long and complex calculations. It is much more convenient to use computer programs to perform such calculations.

It is known that when any project is completed, a written report is submitted, and for this, the student must have the skills to express his thoughts in a clear logical sequence. It is necessary to pay great attention to the formation of these skills by giving assignments to students in the form of abstracts and course work, and receiving them in the form of presentations.

In order to make students exchange ideas and carry out scientific communication, a topic selected for a course work or report is given to 2 or 3 groups as an assignment at the same time, and students are required to use different information sources while completing the given assignment. As a result, students of the group have the opportunity to conduct a scientific discussion during the presentation (Bolotov, V. A. Kompetentnostnaya model: ot idei k obrazovatelnoy programme. V. A. Bolotov, V. V. Serikov // Pedagogika. 2003 – № 10.– P. 8–14).

Discussion

Given that physics is both a theoretical and an experimental science, students must have the skills to perform physical experiments and laboratory work to perform experimentally oriented projects. Institutions of higher education are provided with a ready-made algorithm for laboratory work in physics, but to implement a project, the student must search for the procedure for performing experiments, the necessary equipment and analytical expressions used for calculations. Taking this into account, based on the afford of higher education institutions and students, it is appropriate for students to independently perform physical tasks aimed at determining a certain physical quantity.

As we mentioned above, groups of 3–4 students are formed for each project, and it is

required to complete the project within a certain period of time. This requires efficient use of time while properly organizing the work.

It is necessary to plan to focus on the formation and development of such skills in the final stage of the design activities, as students will develop concepts about the distribution of labor and time during the analysis of the project carried out by other scientific groups and the implementation of several projects by themselves.

In our opinion, the pedagogical conditions listed above can be considered as necessary conditions for students to carry out designing activities, to develop creativity in solving the problem set in the project in independent and non-standard ways, but we will present the confirmation of their adequacy by the results of the pedagogical experiment carried out in the articles following.

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