INTEGRATED PROCESSES IN IMPROVING THE PHYSICAL EXPERIMENT

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ABSTRACT

The article describes the main aspects of the implementation of interdisciplinary integration in a pedagogical university, principles of professional competency development through integrated courses (on the example of general physics).

Keywords: competence, competence approach, interdisciplinary integration.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Integration in education is not a mechanical connection of parts, not their sum, and organic interpenetration, which gives a qualitatively new result, new systemic and holistic education. Integration (lat. integration - recovery, inflammation) means a state of connectedness of separate differentiated parts into a whole, as well as the process leading to this state.

Integration as an inter-scientific phenomenon has its own evolution, development history, accumulated scientific experience, reflected in the works of the 80s and 90s of the XX century, when the concept of "interdisciplinary communication" gave way to the concept of "integration" and acquired the meaning of interdisciplinary term, reflecting the general scientific pattern.

Synergetics makes an important contribution to the study of integration processes, the focus of which is "joint action", the emergence of a new birth and restructuring of self-organization formation. Synergetics as a direction of interdisciplinary research makes it possible to substantiate the pattern of integrative approach. For our research, the principle of forming a whole from parts, new way to build a complex structure of simpler formations. The whole is not equal to the sum of the parts, of which it is composed. The whole is qualitatively different, it affects the elements and changes them. There is a transformation of all components by their coordination, there is a correlation between the elements. In synergy, this view takes the form of the principle of unity through diversity. The synergistic pattern is that the whole develops faster than its component parts, because it develops more productively together.

Thus, integration in education ensures the compatibility of scientific knowledge from different systems thanks to a common methodology, universal method of modern systems thinking. The integration of knowledge implements the idea of complementarity and comparativeness in the selection of ideas, concepts, theories. Teaching activity requires the teacher to integrate subject, psychological, pedagogical and methodical knowledge, which in the learning process exists separately, broken, remotely from the ultimate meaning of their applications. Therefore, productive integration of pedagogical and methodical knowledge with subject knowledge is necessary.

Updating the content of a physical experiment should be subordinated to the achievement of the main goal - the development of the student's personality.

It is necessary to analyze not only what content of knowledge is learned, but how it was learned, what kind of cognitive activity was ensured at the same time, and under what pedagogical conditions most clearly manifested. If by assimilation we mean not the spontaneous process of mastering knowledge and skills, but their purposeful formation in the course of specially organized cognitive activity, it should be recognized that managing this process means skillfully influencing the mental characteristics of students. Therefore, speaking of the effectiveness of training, special attention should be paid to identifying those intellectual actions that are assimilated. Most often, the main criterion of effectiveness in studying a particular topic or section of a course is the overall effectiveness of learning, expressed in assessments of the knowledge and skills of students, although objectively the same result of learning, even with its high final productivity, can be achieved through various cognitive activities of students.

Having mastered the methods of cognitive activity under the guidance of a teacher and realizing their integrative role, the student can then independently apply them in conditions, not specified by training, rebuild on their own initiative, find new tricks, use them in self-study. All this increases the interest in learning, makes it more fun, leads to productive results, which undoubtedly affects the formation of the student’s personality: the qualities of his mind, the need for possession of knowledge, the desire for their practical use [1].

The function of educational cognitive activity is not limited only to the mastery of theoretical knowledge. Equally, it is designed to ensure the formation of practical skills in students, which is especially important when studying physics as an experimental science. Moreover, without a broad reliance on practical actions, and, consequently, on appropriate teaching aids, theoretical knowledge itself cannot be properly learned and used. Integration processes require such an organization of a physical experiment, so that its process proceeds from ascending from concrete perception to abstract thinking, at the same time the formation of mental skills should be carried out consistently and diversely [2].

The possibilities of a physical experiment are such that it can make a significant contribution to the cognitive and psychosocial development of the student, at the same time, it is necessary to modernize the physical experiment in such a way that it contributes both to the development of the student’s intellect and to its psychosocial development.

The complex process of scientific knowledge of the world begins with the direct or indirect sensory knowledge, but it acquires a truly scientific character only when the researcher, based on the results of sensory cognition, creates a model of the phenomenon being studied, finds its properties and patterns, and obtains logical consequences from them. If the experiment confirms the presence of the obtained conclusions, this means that the constructed model is sufficiently accurate, correct, and it can be used for further research, if some consequences are not confirmed in practice, this means that it is necessary to clarify, correct this model or replace it with another [3].

At present, models are widely used in science, technology, production, in teaching various subjects, or for the purpose of replacing the object in question in a real or imaginary process.

Traditionally, drawing is considered the most illustrative figurative model. It contributes to the creation of bright, colorful ideas about the object being studied, reproduces, retaining the features of a visual picture, the most stable, essential in the subject as a typical representative of a whole class of homogeneous objects. (horizontal support, inclined plane, deformed spring, mathematical pendulum, etc.). This figure is different from a simple photograph, fixing the object in the simultaneous manifestation. Therefore, any educational figure already contains a generalization. Among them a special place is occupied by graphic images. (schemes of hydraulic press, semiconductor diode, etc.). Exemption from the "physical", specific features of the object, they convey mainly the design of the object, its geometric shape, proportions, spatial arrangement of the individual components. The drawing allows you to identify the geometric shape and design features of the object. The working drawing indicates the method of its manufacture and conversion. The kinematic scheme gives an idea of the nature of the interaction of its individual parts, regardless of the specific structural design in the form of individual elements, reveals ways to combine them. The above graphic images, although more abstract, are remote from the image object, help to identify more significant connections and relationships.

They do not easily complement other forms of visibility, but also perform a different, explaining function in the learning process, deepening our understanding of the object being studied, allowing them to penetrate into its more significant connections and relationships hidden from direct observation. They can also transmit various states of objects, both static and dynamic, based on the perception of which one can mentally “see” and trace the movement, change, transformation of an object. (expansion or reduction of the width of the barrier layer at the boundary of two semiconductors, etc.).

The principle of clarity as the main principle of didactics was introduced by Ya.A.Komensky. He noted that everything that is possible should be presented for perception by feelings.: visible - for perception by sight, heard by hearing, smells by smell, subject to taste - taste, accessible to touch - by touch. If objects can be perceived simultaneously by several feelings, then it must immediately be grasped by several feelings. [4].

It is considered that visualization performs an illustrative function, but this function is far from the only. Visual material can perform the function of explanatory, operator, that is, not only to illustrate the content of knowledge, but also to interpret the material, to show the way of action with him.

Students, as a rule, use various visual means, however knowledge about their types and functions is not sufficiently generalized and systematized. In educational literature there is often no clear differentiation of means of visualization, the same image is called differently (schematic drawing, drawing, conventional image, etc.), no instructions on how to use visual material.

In the process of learning, an important role is played by observation, which is a complex activity that ensures the completeness and accuracy of perception. Observation is the starting point for studying a physical phenomenon, a source of primary ideas about it. Organized by the teacher during the demonstrations and laboratory experiment observation is based on knowledge: the more knowledge a person has about an observable object, the more completely, comprehensively and meaningfully he perceives it. But knowledge alone is not enough, one must still possess certain methods of observation that must be learned.

The practice of teaching in higher education shows that many students, even if they have relevant knowledge, cannot observe, many do not notice in perceived objects, does not fix their essential features. In order for observation to be effective, it is necessary not only to encourage students to consider objects, but to organize their activities in this direction. To do this, in each academic subject should be selected integrative means, on the basis of which the process of teaching students the methods of observation will take place. The main purpose of using these funds is to direct students' attention to an independent study of a given object. Independent detection of integrative properties and relationships in the perceived material will contribute to the development of research activities among students.

The task of improving the efficiency and quality of education requires a scientifically based choice of the best options for constructing an educational process. Under the optimization of the educational process in pedagogy is not meant some kind of a new form or a new method of teaching, and a special procedure for the teacher to justify and implement in specific conditions the most effective and high-quality solutions to the training tasks with the minimum necessary time and effort of students and teachers.

In pedagogy, learning means material or ideal objects that are used by the teacher and students to learn new knowledge. The material means include educational and reference books, visual aids, technical devices, laboratory, demonstration and other equipment of the classroom. The ideal learning tools are those previously acquired knowledge and skills that are necessary for the assimilation of new knowledge, that is, in the process of learning, acquired knowledge becomes the basis for learning new knowledge [5].

In the course of physics, topics are studied, the formulation of a physical experiment on which is impossible because of the bulkiness and complexity of the equipment, its high costs, safety considerations. So, while in laboratories it is impossible to set up the experiments of Stern-Gerlach, Rutherford, Mandelstam-Papaleksi, Tolman-Stewart and others. In such cases, it is proposed to partially replace the direct observation of the physical phenomenon being studied by watching an educational film. It is recommended to resort to cinema or video filming in cases where the phenomenon being studied cannot be seen by students due to transience or, conversely, long duration. Films are especially useful in cases when the equipment used does not allow observing the phenomenon to the entire audience, for example, the domain structure of a ferromagnet, Brownian motion, electron diffraction, etc. Video filming of these phenomena makes them accessible to large groups of students.

Often, students have the idea that physics is far from real life. Some modern textbooks of physics are a kind of dictionaries of terms, often the important words in them are in bold type, and the student is only required to memorize them. Words can only make sense when they are associated with phenomena or operations. Our task is to make the student receive information from the original source, from nature itself, and this requires the formulation of real research in the laboratory. Science is not only laboratory work. We connect and summarize our observations, construct models or theories that will raise new questions. Next, we perform new experiments to find answers to these questions, etc. Thus, the learning process should be cyclical: from observations to model building, from model to theory development, from theory to conclusion consequences, from consequences to their experimental testing and further to new observations, that is, the idea should be based on the teaching method: "Teaching is an act of discovery."

In conclusion, it can be said that the orientation to the person during the training implies the integration of forms and means of presenting information on the part of the teacher and the forms and means of receiving it on the part of the student. In order for the idea of personality-oriented education to be achieved, it is necessary to inculcate in students the skills of working with modern technologies, which will facilitate their adaptation to rapidly changing social conditions and the successful implementation of future professional tasks.

REFERENCES

1. Vaganova V.I. Design technology copyright programs in the preparation of future teachers of physics: Bulletin of the Buryat State University, 2014, No 15; 3-6.
2. Danilyuk A.Y. The theory of integration of education. Rostov on Don: Publ. Rost. ped. univer, 2000; 440.
3. Zverev I.D. Interdisciplinary communication in the modern school. Moscow, Pedagogy, 1981; 160.
4. Komensky Ya.A. Selected pedagogical writings. M., 1955.
5. Pedagogy: study guide for students ped-universities and ped-colleges. By ed. P.I.Pidkasistogo; Pedagogical Society of Russia. M., 2001; 640.