



FUNDAMENTAL PRINCIPLES IN TEACHING THE SCIENCE OF MATERIALS SCIENCE AND CONSTRUCTION MATERIALS TECHNOLOGY

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ABSTRACT

Fundamental principles are the basis for teaching "Materials science and technology of construction materials" in higher education. Because mastering the fundamental principles and the scientific and technical theory based on it - the perfect understanding of the physical rules of technique and technology, as well as the nature of teaching special subjects, creates an opportunity to creatively solve issues and problems. The application of the principle of fundamentals in the process of training engineers can have a good effect in a rational combination of fundamental, general technical and special training components.

KEYWORDS

Materials science, construction materials, technology, fundamental principles, professional organizers, etc.

Introduction

In the system of higher education, there is no common opinion on the ratio of fundamental and professional organizers for "fundamental science" and fundamental educational subjects. Some authors promote the "depth" of in-depth specialist training in a certain direction, while others promote "broad" education as fundamental. In the scientific-methodical literature, the question of the role of fundamentalism is interpreted in different ways: 1) as a whole of higher education, 2) in the training of engineers, 3) it is important in the development of the concept of fundamental natural-scientific courses.

Thus, "fundamentalism of education is a whole with its focus on determining the deep important bases and interactions between various processes of the surrounding world, general purpose fundamentalization, object of research, each of the sciences to interdisciplinary relations. If these general subjects are not only a collection of traditional lessons, but also form integrated cycles of basic subjects, education will be fundamental" [2].

- Analysis of literature on the topic (Literature review).

S. A. Tikhomirov emphasized that the main characteristic of a specialist is the ability to solve professional problems competently and responsibly. The psychological-pedagogical condition for the success of training a specialist is that the student's educational activity corresponds to his future activity. L.G. Nartova's research on the methodology of teaching geometrical sciences is based on

integrative principles (summation, emphasis, comparative analysis, differentiation, etc.) based on connecting connections.

Based on the above mentioned points, it is worth noting that higher education is fundamental in order to determine the most relevant relationships and connections between various activities of the environment in the objects and technologies of the engineering fields. In this case, it combines two didactic principles - fundamentalism and the principle of the unity of professional orientation of education with the aim of interdisciplinary coherence on the basis of education aimed at solving the problems of engineering specialties.

- Research Methodology

The principle of professional orientation of knowledge is important in higher education institutions, and it is fully studied in connection with vocational and technical pedagogy. This principle has different interpretations. A broader approach to determining the principle of vocational orientation of education shows that the following are included in the concept of vocational orientation: "a person's vocational orientation (in terms of work activity and a specific profession), vocational orientation of general education and includes the professional direction of professional education" [2, p. 95].

The principle of vocational orientation of general education means the theory of coherence between basic subjects and vocational training of students. The main content of the principle expresses the need for an organic combination of general and professional education and is considered to be aimed at teaching students to use the acquired knowledge system in the field of their profession.

It follows that the "category of professionalism" is designed on the basis of subjects that take into account the interrelationship and character of general education subjects, educational goals and functions aimed at the development of a person in a specific direction, professional cycle and special social training, labor expresses and defines its technical and social aspects.

Thus, the principle of career orientation reflects the following: 1) career orientation of general education; 2) orientation of vocational education to solving the problems of vocational education specialties (quality and reliability of professional objects); 3) orientation of a person to a specific profession, that is, the quality and reliability of his products - his professional honor.

- Analysis and Results

One of the main functions of higher education is to establish coherence between natural-scientific, general technical and special sciences. The unit of education of natural-scientific, general technical and special sciences is to implement the principle of modern materials science and fundamental unity in the teaching of the subject "Materials science and technology of construction materials" as a method of scientific knowledge, aimed at solving various problems and issues in the educational process. creates the ground for From the point of view of this science, the principle of orientation to the elimination of problems determines the general structure of educational activities, educational plans and educational programs, which are an organizational component of the educational and methodological complex.

The professional process of qualified personnel determines the goals of learning all educational subjects and determines the essence and forms of the relevant educational activities of the students preparing for this professional activity [4; 49]. Thus, in the methodological system, two principles should be implemented at the same time: the principle of fundamental and professional orientation.

The interaction and close interaction of these principles, as well as their combination, allows us to talk about the unity of the principles of fundamental and professional orientation aimed at solving problems related to activity.

Based on the requirements for qualified personnel formed in the qualification description, the purpose of teaching material science and construction material technology is to develop the knowledge of the scientific content of the subject in students based on fundamental and scientific-technical theories and skills, focused on application in various forms of the process aimed at eliminating professional issues. For engineering majors, the course "Materials Science and Technology of Construction Materials" shows the fundamentals of science about the composition and properties of bases, their use in machine details and their renewal in processing. The essence of this course covers the following: 1) proofs, concepts, quantities, basic laws, scientific and technical theories; 2) methods of obtaining bases and their characteristics; 3) changes in the characteristics of bases as a result of updates in their microstructures during the performance of technical activities during updating and use; 4) specific rules and ways of mental and practical process; 5) putting knowledge and skills into practice.

The content of the materials science and technology of construction materials course should correspond to the direction of modern materials science - "from microstructures → macro properties". Therefore, its essence is based on the coherence between the fundamental laws of natural and scientific sciences and scientific and technical theories, and the scientific content of the "Materials Science and Technology of Construction Materials" course should show the mechanisms of renewal and destruction of bases in the structural structure.

Proofs, concepts, basic laws, scientific and technical theories should be systematically and consistently shown to students in a systematic form, in accordance with didactic principles. The need to systematize knowledge not only with the principle of systematic education (systematic teaching), but also with the main integrated principles: summation and unification, giving importance to images with the main meaning, autonomy, structural structure, using certain associations and stereotypes is determined. A large amount of knowledge and a lack of opportunities to increase the time to study the material - requires careful selection and systematization of educational material focused on solving problems.

These problems should be solved in the direction of modern material science "from microstructure to macro properties", which corresponds to the new dislocation-structural-structural approach to the strength of materials. This ensures the durability and reliability of materials in their operational conditions. The strength of materials under operating conditions is not determined by the initial mechanical properties of the material (determining the limits of strength in stretching, compression, and similar static tests), but by the mechanism of transboundary structural-structural updates in materials under dynamic loads, the formation of brittle structural-structural areas, later it is determined by the appearance of microcracks in their decay, which in turn shows the scientific content of modern material science.

In the methodology of teaching natural and scientific sciences, the specific methodical principle of gathering knowledge is widely used in determining the essence of the educational base and improving its structure. It involves isolating one or more main ideas and grouping the material around those ideas. In our research, when gathering knowledge for such an idea, it is appropriate to choose the modern idea about the physical strength of the bases, which is the scientific basis (substrate) of material science - the mechanisms of transboundary structural-structural changes in materials based on the

loads that affect them in operational conditions and corresponds to the appearance of microcracks of decay in them.

Grouping bases around fundamental and scientific-technical theories allows students to convey and summarize a certain amount of knowledge, to use the knowledge gained in explaining and predicting events and activities, that is, to form their theoretical vision and synergistic scientific-technical worldview. . Separation of the theory as a leading component of the educational material opens up great opportunities for choosing the specific educational material in accordance with the purpose and in a goal-oriented manner.

In the process of teaching the course "Material science and technology of construction materials", it is necessary to separate the scientific substrate from scientific and technical theories when grouping the source based on the principle of knowledge accumulation. This structure of the educational resource is distinguished by its fixed and variable parts. The variable part provides an opportunity to apply scientific and technical theories and fundamental knowledge based on a scientific approach separated from them to solve the problems of effective implementation of technological processes for the production and use of objects.

The content of the variable part is aimed at the development of students' knowledge and skills of general technical materials science, taking into account the direction of engineering, based on the interrelationship of sciences. We define the essence of the science and distribute the educational base in view of the principle of unity of education and fundamentality aimed at solving the problems of the scientific basis of modern materials science based on the interrelationship of natural-scientific, general technical, and special sciences.

The fixed part (component of the system) includes materials that all students of higher educational institutions of various specialties who study "Material science and technology of construction materials" should know: 1) fundamental experiments of an empirical nature; 2) models, concepts and quantities forming the basis of scientific and technical theories; 3) the full core of theories - scientific-technical theories, the scientific substrate of structural-structural changes in materials; 4) some important conclusions and recommendations for practical application.

Variable part (component of the system) - includes materials related to the professional training of a student in a specialty. Through the content of this material, a scientific approach is implemented with the principle of teaching aimed at solving the problems of the specialty. A variable part of the course content includes some elements of the empirical basis and the application of scientific and technical theories. The basis of the theory, its empirical basis, includes the results of experiments (evidence) that play an important role in the stage of gathering knowledge in order to turn them into scientific and technical theories, in addition to the fundamental experiments that served as a basis for the promotion of hypotheses. At this stage, there is a real opportunity to attract material in professional activities related to the type of work of an engineer. This motivates students to become more interested in studying the educational material. Especially, the materials focused on technical specialties are the consequences of scientific and technical theories, considering their practical application, to eliminate technical problems. is studied in depth while performing directed laboratory work. Fixed and variable components together form the essence of the course program "Material science and technology of construction materials" for future qualified personnel.

In substantiating the essence of the science "Materials science and technology of construction materials", looking at the scientific substrate - the basic concepts of the atomic-crystalline composition

of the data, the physical and mechanical properties of the data due to the change in the structure and microstructure of the data as a result of the mechanisms of structural changes renewed, naklep - surface hardening and recrystallization phenomena occur, which in turn is the physical essence (substrate) of material processing technologies.

It allows to improve the requirements for the essence of the course "Material science and technology of construction materials": 1) this course is as follows: - constant (fundamental - laws, scientific and technical theories, scientific approach - mechanisms of structural changes in materials); - it should consist of variable (practical - oriented to the objects and technologies of railway transport) components; 2) The immutable source should be included in the basis and core of scientific and technical theories; 3) The variable (oriented to practical objects and technologies) base should be included in the consequences of scientific and technical theories and should be used as issues related to the professional process in improving the expressions that form the basis of scientific and technical theories; 4). The content of the variable part of the course should be related to the content of professional and special training of students of higher education institutions.

Conclusions and Recommendations

In short, to determine the composition of variable (oriented material), taking into account the interdependence of natural-scientific, general engineering, special sciences, the scientific approach and the principle of unity of orientation aimed at solving engineering problems, the following must be done:

- to determine the objects, technological conditions, and operations of which future qualified personnel must work;
- show the basic rules, scientific and technical theories used in the implementation of technological operations and situations;
- working educational programs created in accordance with the principle of unity of natural-scientific, general technical, special sciences, scientific approach and focused unity aimed at solving fundamental, engineering issues.

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