

MODEL OF A METHODOLOGICAL SYSTEM FOR TEACHING MATERIALS SCIENCE AND TECHNOLOGY OF STRUCTURAL MATERIALS FOR FUTURE ENGINEERS

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ABSTRACT

On the basis of the methodological provisions of teaching materials science and technology of structural materials for students of technical colleges, a model of the system was constructed, including the goals, content, methods, principles, forms and means of teaching, while each element of the system reflects the interrelation of natural science, general technical and special disciplines, a scientific approach to the content subject and the principle of the unity of the fundamentality and focus of training on solving problems and problems.

Keywords: Model, methodology, system, teaching, materials science, technology, constructional, materials, engineers.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

The basis of the model of the methodological system of teaching materials science and technology of structural materials for students of technical fields is the basis of which are the following methodological provisions:

1) a systematic approach that allows us to consider teaching materials science and technology of structural materials for students as a methodological system, including goals, content, methods, forms and means of teaching;

2) the approach to the structure of the academic subject established in didactics, in accordance with which the content and procedural blocks are distinguished in the academic subject;

3) the idea of interrelation of natural science, general technical, special disciplines, which allows to substantiate the scientific approach to the essence of modern materials science "from microstructure to macro properties";

4) the idea of pedagogical integration, which makes it possible to put forward a particular methodological principle of the unity of the fundamentality and focus of training on solving the problems of the future engineer;

5) analysis of general technical knowledge, which allows to determine the invariant and variable components of the content of the course in materials science and technology of structural materials;

6) an activity-based approach that allows to reflect in the procedural component of the academic subject material science and technology of structural materials cognitive activity that is adequate to the activity of the future engineer.

In accordance with these provisions, a model of a methodological system for teaching materials science and technology of structural materials for students of technical colleges has been developed:

- the learning process should be considered as a methodological system, including goals, content, methods, forms and means of teaching;

- the subject should be considered in the unity of its content and procedural components;

- one of the leading principles of the methodological system of education is the principle of unity of fundamentality and professional orientation;
- in the content of the subject, fundamental knowledge of natural science disciplines, scientific and technical theories and applied general technical knowledge should be presented in unity; in this case, the first is the invariant part of the content, the second is variable;
- the content of the course should be grouped around natural science and scientific and technical theories, which makes it possible to realize the integrity of general technical education; the content of the course should be based on a scientific substrate approach to the structure and properties of materials;
- methods, forms and means of training, along with the traditional ones, should include those that are adequate to the activities of the future engineer.

The validity of the choice of system analysis for constructing a model of a methodological system is due to the fact that system analysis is applied to the study of artificial (arising with the participation of humans, people-students, teachers) systems. In such systems, an important role belongs to the activity of a person (teacher). According to the principles of system analysis, the problem facing society (improving the system of teaching students of technical colleges) should be considered as a whole, as a system in the interaction of all its components. This study complies with the principles of systems analysis, its goal is to create an effective, controlled methodological system for teaching materials science and technology of structural materials for students of technical colleges, which is a subsystem (private system) of a unified system for training engineers. Consequently, the previously substantiated components should be combined into a whole in the model of the methodological system of teaching materials science and technology of structural materials in the technical college. This model is based on the interconnection of all disciplines of the curriculum, a scientific approach to the substrate of modern materials science, the fundamental nature of natural science, scientific, technical and general technical knowledge and the principle of the unity of the fundamentality and focus of teaching on solving problems and problems.

To make a decision on the management of this system in the system analysis, it is recommended to determine its goal, the goals of its individual subsystems and many alternatives to achieve these goals, which are compared according to certain performance criteria and the most appropriate control method for this situation is selected. An important stage of system analysis is the construction of a generalized model of the investigated or constructed system, which takes into account all of its essential variables. After analyzing the above material on the development of the theoretical foundations of teaching methods in materials science and technology of structural materials in a technical college in the light of the provisions of the systematic approach, the following conclusions can be drawn:

- based on the analysis of alternative directions for improving teaching materials science and the technology of structural materials at the technical college, we have chosen a scientific approach of modern materials science, to the fundamental nature of natural science, scientific and technical and general technical knowledge and the focus of training on solving problems and problems;
- the goal is to achieve a high modern level of fundamental and scientific and technical knowledge in materials science and technology of structural materials, the ability to apply them in the professional activity of an engineer;
- on the basis of the principle of unity of fundamentality and professional orientation of training, a methodological scheme (subsystem - private methodical) can be developed to solve the problems of improving the educational process of teaching materials science and technology of structural materials for future engineers;

- a private methodological system has been developed for selecting the content of the course in materials science and technology of structural materials and the received fundamental and scientific and technical knowledge in focus on tasks and problems;
- a private methodological system of fundamental training in materials science and technology of structural materials has been developed;
- an analysis of general technical knowledge was carried out with the development of a private methodological system for the implementation of invariant and variable components of the content of the course in materials science and technology of structural materials;
- private theoretical schemes for determining the invariant and variable material of the course of materials science and technology of structural materials have been developed;
- requirements for methods, forms and means of teaching materials science and technology of construction materials have been developed based on the relationship of natural science, scientific and technical knowledge and professionalism;
- a private methodological model of practical tasks on materials science and technology of structural materials for the training of future engineers was developed.

Consequently, we have identified all the components, developed particular methodological systems, subsystem diagrams, which, on the basis of the provisions of system analysis, must be combined together into a model of a methodological system for teaching materials science and technology of structural materials in a technical college.

The model presents the following components of a complexly organized methodical system of teaching materials science and technology of structural materials: 1) the purpose of the methodological system of teaching in a technical college; 2) fundamental and scientific and technical knowledge of students; 3) professional knowledge and skills aimed at solving problems; 4) the content of knowledge of natural science disciplines and scientific and technical theories in their application to solving problems; 5) methods by which the goal is achieved; 6) the main way (the method by which the goal is achieved on the basis of the developed provisions); 7) the principles that determine the way to achieve the goal; 8) the principle of fundamental teaching; 9) the principle of focusing training on solving problems; 10) forms of education; 11) lectures; 12) workshop on problem solving; 13) laboratory work; 14) the means by which the forms of education are revealed; 15) system of assignments for lectures; 16) system of assignments for term papers; 17) system of tasks for control works; 18) a system of tasks for students' independent work when studying at a technical college; 19) system of tasks for laboratory work; 20) a system of tasks for solving problems aimed at solving problems.

The goals of teaching materials science and technology of structural materials for students of technical colleges include, along with others, the formation of fundamental, scientific and technical, professional knowledge of students and the ability to apply them in future activities aimed at solving problems. In accordance with the interrelation of natural science, general technical, special disciplines, the scientific approach to the substrate of modern materials science and the content of the subject and the principle of unity of fundamentality and professional orientation, we can talk about integration - fundamental, scientific and technical, professional knowledge of students in materials science and technology of structural materials and their skills. application in activities aimed at solving problems. The objectives are also determined by the content of the educational material, which includes fundamental knowledge: laws, concepts of natural science disciplines (physics, mathematics, etc.), scientific and technical theories and professional knowledge. The content consists of the scientific substrate

of modern materials science, fundamental laws, scientific and technical theories studied in teaching materials science and technology of structural materials, aimed at solving problems.

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Thus, the learning content helps to achieve the goal, and the goal setting determines the learning content. The learning objectives and content of the course in materials science and technology of structural materials for technical colleges are implemented in the educational process using methods. The principle of scientific knowledge and unity of fundamentality and professional orientation are implemented in teaching methods. Along with such methods as information-illustrative and reproductive, partial search, problem-solving and research methods are used. Teaching aids are a system of assignments that include assignments for lectures, practical, laboratory exercises and coursework.

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