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Research Article

VOCATIONAL ORIENTATION THROUGH THE DEVELOPMENT OF MATHEMATICAL COMPETENCES IN THE STUDENTS OF TECHNICAL HIGHER EDUCATION INSTITUTIONS

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ABSTRACT

In this article, students studying in technical higher educational institutions thought about the direction to the profession through the development of mathematical competences. Also in the article, topical issues related to the integration of the educational process, the study of its methodological foundations, the development of forms and methods, the state standard and the system of continuous education are discussed.

KEYWORDS

Technology, continuing education, criterion, differential, derivative, integration, theory, methodology.

INTRODUCTION

A vehicle is a specialized specialist in teaching fundamental analysis, a mathematician in conveyor training, as well as a specialist in a universal subject who conducts analysis, as well as a specialized mathematician based on education. Naturally, the implementation of vocational orientation in education should begin with the introduction of Corrections to programs and the selection of the content of the course.

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Technical universities have specific criteria for choosing the content of specific subjects education, They [1]:

application many times;

internal integrity of science;

minimal;

time;

spiritual-motivation;

professional expediency;

are interdisciplinary security criteria.

We clarify and supplement the above criteria for specialties of vehicle engineering of technical universities:

1. Criteria for compliance with state educational standards (content for this specialty must comply with state educational standards);
2. Criteria for multiple application. Intend to use the knowledge gained from specific sciences in solving internal scientific problems and in situations relevant to various practices.
3. The internal integrity of the sciences of mathematics and physics is the preservation of the internal logical structure of the sciences, the internal interdependence, and the conformity of the logic of the material presented to the logic of the science. The impossibility of applying it to a profession does not mean rejecting material that is clearly visible, as it can be an integral part of the theoretical structure. When we say compliance with the criterion of internal integrity of science, it means that the content of the course is filled with the necessary information, logically correct, consistent.
4. Criteria of comprehensibility. In the exact sciences, the logical structure of the theory corresponds to the logic of science, but in order to coordinate it for educational purposes, it is necessary to build a convenient form of material structure, taking into account the spiritual nature of students' perception of knowledge;
5. Criteria for professional suitability.

It is necessary to analyze the content of the material, its volume, sequence, the number of hours allocated for its study from a practical and professional point of view. At the same time it is necessary to pay attention to the sections and topics of this specialty, the mathematical apparatus of great importance for this profession, the availability of mathematical modeling methods, materials used to strengthen career orientation, for example, textual issues of professional content;

6. Criteria for ensuring interdisciplinary connection - determines the compliance of the course of mathematics and physics with the requirements of general and specialized disciplines;

7. Minimum criterion. According to this criterion, the content of the study material is said to be minimal so that nothing can be deduced from it. This criterion allows to regulate some questions, the depth of their narration according to their methodological and professional significance, as well as the lower limit of the narration of the presented material.

8. The time criterion regulates the volume of the content of the mathematics course, corresponding to the time allotted to it.

Based on the analysis of mathematical knowledge used in general and specialized disciplines, we distinguish the relevant sections of professional significance, for example, the topics of higher mathematics:

1) "Vectors and linear algebra": operations on matrices, solving systems of linear equations,

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finding eigenvectors and eigenvalues, approximate methods of solving systems of linear equations.

2) "Differentiation": product and its physical meaning, differential and its physical meaning, higher order products and differentials, examination of functions.
3) "Integration": indefinite, exact, unique, multiple, curvilinear integrals, geometric and physical applications of different types of integrals, methods of numerical and approximate calculation of integrals.
4) "Differential equations": the solution of differential equations by systems, approximate and numerical methods, divided into variables, first and higher order, incomplete high order differential equations.
5) "Rows": numerical, level, Fure rows, approximate calculations using rows.
6) "Differential equations with specific products": special product equations, types of special product equations, canonicalization, Fure method, thermal conductivity equation.
7) "Probability Theory and Mathematical Statistics": random events and their distribution law, differential and integral functions of distribution, characterization of random variables and the law of distribution on the basis of experimental data, random processes.

There are problems in applying the knowledge gained from specific disciplines in some general disciplines (theoretical mechanics, applied mechanics, material resistance). While students acquire knowledge of certain specific subjects in parallel, sometimes there are cases of lagging behind the mentioned subjects. One way to solve this problem is to introduce the necessary concepts in the introduction to the subject.

It is not always appropriate to give all the concepts in the introductory part of the subject. For example, knowledge of simple differential equations that can be divided into variables will be required in the second semester of a physics and theoretical mechanics course. Therefore, it is advisable to enter the simple differential equations for the variables in the "Product" section after the differentiation, before the differentiation applications (it should be noted that students in lyceums and vocational colleges are given simple concepts about this). In the report, two or three examples (which take 8-10 minutes in terms of time) are sufficient for the concept of differential equations to be divided into variables, and adding this does not reduce the volume of the other material. In practice classes, it is enough to solve a few examples and problems to consolidate the knowledge provided, as well as to give homework, to add this material in the intermediate control. As a result, the volume of differential equations divided into input variables will be sufficient to apply in the desired part of physics and theoretical mechanics. This solves the problem and in addition this material remains the introductory part for the indefinite integral.

When it comes time to go through the section on differential equations, the differential equations, which are divided into variables, can be solved based on integration methods.

Not only analytical (formula) methods, but also numerical and approximate computational methods are offered by students for the use of various methods of solving mathematical problems in their future professions in the specialty disciplines. When using approximate and numerical methods: In the section "Exact integral" approximate calculations are performed using the formulas of Simpson and trapezoids; In the section "Differential equations" students learn to approximate the first-order

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differential equations by the Euler method; In the Rows section, the approximate calculation method is used to spread the differential equations to the Taylor series. [2]

Another key component of career guidance is the enrichment of theoretical material related to future professional activities with examples. Here, the application of career-oriented issues in lectures, the interpretation of the practical meaning of mathematical concepts, the introduction of the possibility of applying this or that mathematical knowledge and methods to a particular area of the profession. Analyzing the application of knowledge gained from specific disciplines in the field of vehicle engineering, we found that there is a correlation between the basic concepts used and their interpretation and the field of vehicle engineering.

In the section "Differential Equations", career-oriented issues are used to bring the practical significance of this section to the concept of differential equations with the help of concrete examples. Students majoring in Vehicle Engineering will learn how to use differential equations and the application of their different types. When solving problems related to professional practice, it is expedient to dwell on the practical meaning of derivatives, differentials, integrals (construction of integral equations).

In addition, we use the relevant topics, taking into account the need to use differential equations in other technical disciplines studied in these specialties: physics, theoretical mechanics, resistance of materials, electrical engineering, etc. The goal is not only to increase motivation in education, but also to form in students the view of specific sciences as a means of studying technical processes and phenomena, in other words, not as an abstract science, but as a means of solving their internal problems. The future engineer should have a similar view of the exact sciences [3].

"In order to successfully use mathematical methods in solving a problem, you must first have the necessary knowledge and be able to use the mathematical apparatus correctly." The mathematical apparatus of solving professional problems is a concrete material that can be used in a particular profession, which is useful in solving sufficiently comprehensive problems. More vectors and linear algebra, differential equations, complex analysis and its applications, operational and variational calculus, etc. are used as mathematical apparatus for technical directions. Vector and linear algebra, however, serve as differential equations, as a mathematical apparatus for specialties in vehicle engineering. [4]

In the process of teaching differential equations in practical training the following objectives are set:

1. To be able to classify differential equations;

2. Teaching to create mathematical models in professional-practical problems - differential equations in products or differentials;

3. To develop the ability to solve different types of differential equations provided for in the program;

4. Training in the analysis of data and solution results in professional-practical issues;

5. Demonstrate how a future engineer can use a apparatus of differential equations;

6. Demonstrate different methods of solving differential equations (analytical, numerical, approximate);

7. Focus on developing the ability to solve the most commonly used equations in general and specialized disciplines.

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All the issues we use in the teaching of specific sciences are divided into the following types according to their application:

1) Clear mathematical concepts that are formed before the study begins in the relevant sections and topics;

2) Creative tasks aimed at strengthening theoretical knowledge (conceptual modeling, block diagrams, solution plans, tables);

3) Problems aimed at mastering the basic mathematical apparatus of the specialty;

4) Textual problems of professional and practical nature, the main purpose of which is to teach to create a mathematical model of the real situation, to analyze it and the result obtained;

5) To teach students to solve problems using approximate and numerical methods, in addition to analytical methods in the professional field, to acquaint students with alternative methods of solving equations, integrals, etc., the purpose of its application.

1) Issues are divided according to the form of application:

2) 1) Oral assignments aimed at strengthening theoretical knowledge;

3) 2) Creative tasks (conceptual modeling, block diagrams);

4) 3) Exercises aimed at developing the ability to solve equations and systems;

5) 4) tests aimed at the formation and control of this or that skill (including electronic);

1. Professional-practical textual issues.

2. Here are the requirements we developed for each type of issue.

1. To formulate specific science concepts before beginning the study in relevant sections and topics:

- adaptation to the requirements of internal or interdisciplinary communication;
- to be logically connected with the department to be mastered;
- relying on the knowledge of specific sciences of current students;
- to introduce the necessary and necessary concepts to prepare for the study of the main sections.

Creative tasks such as conceptual modeling, block diagrams, solution plans, tables, etc. should be designed to strengthen theoretical knowledge:

- be selected based on knowledge of relevant theoretical material;
- be designed to be applied by students in the practice process in solving specific problems;
- contain theoretically important topics;
- have an appropriate algorithmic structure in the description of the material;
- it is advisable to provide interconnected schemes, plans and tables;
- the teacher should check the assignments done by the students and make recommendations if necessary.

Issues aimed at mastering the basic mathematical apparatus of the specialty:

- varying levels of complexity (higher in complexity than the element and larger in size);
- should be solved according to the mastered or independently developed algorithm;
- the gradual complication of questions on a single topic (from simple to complex

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principle), focused on the development of actions;

- The tasks recommended for independent study should be similar to the examples solved in practical lessons (but based on the knowledge of the exact sciences).

3. However, tests for independent work must meet the following requirements:

- cover all the material studied;
- compliance with the course program and adherence to the sequence of topics;
- test assignments are given with answers (but should not be identifiable by asking a question);
- The test result should be announced immediately.

Professional-practical textual issues:

the text should be selected taking into account the use and analysis of knowledge of specific disciplines in the chosen specialty;

- the level of complexity may vary;
- the solution should be constructed for educational purposes at the stage of mathematical modeling of the process or event;
- the proposed problems cannot be other subject problems (theoretical mechanics, etc.), they can be based on certain laws in the relevant fields of knowledge and should serve the following purpose - to teach mathematical modeling of the process and solve the appropriate model (equation);

5. To solve problems using approximate and numerical methods:

- they cannot be solved by analytical methods;
- have a set of techniques that can be applied in the future profession;
- have the imagination to apply the appropriate method;
- the number of steps to be taken to solve the problem should be relatively small to use in order to strengthen the appropriate method. [5,6]

By studying the areas of differential equations that can be used in the field of vehicle engineering, it is possible to distinguish a number of basic types of professional-practical problems, and it is recommended to solve them in specific science courses.

Remember to look at the models:

I. Geometric (product - the angular coefficient of the experiment);

II. It has such types as physical or technical (product - speed or acceleration in various processes related to this specialization).

According to the structure of the equations are divided into the following types:

1. Derivative equations;

2. Differential equations;

3. Integral equations.

Differential equations are divided into specific types according to:

I. First-order equations: divisible by variables; same-sex; linear; Bernoulli's equation; full differential equation.

II. Higher order equations: order decreasing; linear unisexual; linear non-homogeneous.

III. Systems of differential equations.

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The problems presented to students are solved as analytically as possible, as close as possible to those encountered in practice on the topic, and are characterized by a sufficiently simple mathematical model and serve as a starting point, ie acquaint students with the method of mathematical modeling of real physical processes and events.

Our goal is to teach students to solve practical problems based on the method of mathematical modeling. Mathematical modeling is used in the description of theoretical material and in solving problems in practical classes. Students should be made aware that this method is not new to them, that mathematical modeling has been applied in a variety of practical situations, and that they have solved problems in the past, including in colleges and high schools. [7]

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