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MATHEMATICAL MODELING AND PRACTICE OF DIFFERENTIAL EQUATIONS

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ABSTRACT

The paper analyzes the relationship of the course of differential equations to practice. The rationale for the practice-oriented teaching of mathematics, the content and methods of teaching the use of mathematics in the production process were discussed.

Keywords: Differential, equation, mathematics, practice, orientation, teaching, methodology.

INTRODUCTION

One of the areas of application of computers remains the study of mechanical processes and mathematical models of objects using computational methods and computer software. The methods of computational mathematics and the modern capabilities of computers together serve to reveal the hitherto unknown features of mechanical processes and objects, and at the same time to improve technological processes.

Today, with the development of science and technology, the role of mathematics is growing. Mathematics is used in physics, mechanics and astronomy, as well as in solving economic problems, analyzing biological processes, and many other fields. The mathematical model of processes in these fields is called differential equations.

In the age of mathematical knowledge, we need to not only impart formal knowledge to our students, but also teach them to see results that have important practical implications behind formal results [1].

It is also necessary to organize the teaching of mathematics in such a way as to help students to understand the laws of the universe around them so that they have a clear idea of the origin of basic concepts and the process of scientific development. The knowledge gained should not be a useless burden, but should be taught in order to be used in practice on a regular basis ”[1].

The term "practice-oriented" is interpreted as follows: "The essence of the practical direction of secondary mathematics education lies in the implementation of a purposeful, meaningful and methodological connection between the school course and practice of mathematics, which implies the introduction of specific ideas in the school mathematics course holds "[7].

Purpose

In this work, elements of applied mathematics are included in the ordinary school curriculum. The aim of this work was to reflect the science of mathematics in its two components - theoretical and applied mathematics as a whole.

The term is interpreted as follows: "practice-oriented is the orientation of the content and methods of teaching mathematics to the use of related sciences and techniques, as well as in professional activities, economics and everyday life" [2].

The practice-oriented nature of teaching mathematics is to focus on the content and methods of teaching the use of mathematics to solve problems that are not in the description of mathematics.

Scientific novelty of the article

Practice-oriented teaching is the use of mathematical apparatus - teaching in the mathematics course itself, as well as in other disciplines, using methods and techniques specific to the field. B.A. Naymanov's dissertation identifies three components of the practical orientation of the course of differential equations in higher education:

• concretization of abstract concepts and theoretical knowledge;

• the connection of theoretical problems of mathematics with the study of real processes with mathematical theory programs;

• To teach students how to get acquainted with the practical direction of mathematics.

When it comes to the practical orientation of teaching differential equations, B.A. Naymanov understands "teaching students to solve practical problems and mastering the methods of solving such problems" [3].

Results and practical applications

We can find different interpretations of the concept of "practical problem". For example, the practical description of mathematical problems means the application of mathematics and related disciplines, the organization of modern production, its use in technology, economics, services and everyday life [8].

A practical problem is a problem that is set outside of mathematics and can be solved using mathematical tools [6].

According to research, the use of practical problems in the organization of teaching mathematics [3]:

• allows students to teach the use of precise mathematical evidence;

• Contributes to the development of students' mathematical skills;

• Provides students with the opportunity to create a scientific view of the world and the correct formation of their ideas about the scientific methods of knowing reality;

• It is possible to establish a dialectical connection between teaching and research methods in solving these problems;

• allows to determine the internal laws of the studied processes;

• Practical issues - one of the most effective means of acquiring new knowledge.

Practical issues should be solved in three stages [8]:

Step 1. Registration. A transition is made from the practical problem to be solved to the construction of its mathematical model;

Phase 2. In the first stage, a structured mathematical problem is solved;

Step 3. Interpretation of results. The solution of a mathematical problem is transferred to the language of the first practical problem.

The steps of solving a practical problem actually overlap with the main steps of mathematical modeling: formalization, solving a problem within a model, interpreting the result obtained.

Thus, mathematical modeling of a particular process or event takes place in solving a mathematical practical problem.

The ability to construct mathematical models of real processes or events, the ability to solve these models and interpret the result is now becoming an integral part of the future specialist's mathematical professional training, which is his educational performance, especially in the era of active mathematics and computerization of various fields of knowledge.

A model is understood to be an object that can be imagined materially or intellectually, replacing the original object in the process of knowing or learning, while retaining some typical features that are important for this research. The process of creating and using a model is called modeling [5]. Modeling methods can be conditionally combined into two groups: material (subject) and ideal modeling.

Material modeling is characterized by the fact that research work is carried out on the basis of a material model, which replicates the basic geometric, dynamic and functional properties of the object under study.

Ideal modeling is based on an ideal, imaginary resemblance, not on a material object. This modeling has theoretical significance. There are two types of ideal modeling: intuitive and symbolic. Intuitive modeling, based on the intuitive concepts of an object, cannot formalize this type of modeling, nor does it need to. Symbolic symbols are used as a model in symbol modeling: graphics, diagrams, formulas, sets of symbols. However, symbolic modeling involves the introduction of a set of laws, according to which it is necessary to work with symbolic images.

One of the most commonly used types of symbol modeling is mathematical modeling, in which the study of an object is carried out using mathematical methods, and the model is formed and constructed in mathematical language.

Mathematical modeling should become an important element of the professional training of the future engineer. Lack of skills and competencies in mathematical modeling leads to the inability to apply this method of knowledge in future production activities. Students should be able to learn to see and analyze specific phenomena of the universe around us through mathematical concepts.

Differential equations arose from problems of practical description, and after the further development of the theory they were reflected in many disciplines. That is why they are so often used as mathematical models.

The differential equation of any real event or process obtained as a result of research is called the differential model of that event or process. The concept of differential models is a special case of a set of many mathematical models that can be created in the study of the environment. It should be noted that there are different types of differential models.

The peculiarity of models described by simple differential equations is that the unknown functions in these equations depend on only one variable. Differential equations represent the curvature of the state and dynamics of a process at a given time by interconnecting their derivatives with variable quantities.

The solution of the equation is a function that describes the interdependence of the variables and represents the general law of the process.

We can emphasize the importance of the following mathematical modeling in the study of the course of differential equations:

1. Cognitive significance. It consists in forming an image of the object under study.

2. The importance of practical issues in the management of cognitive activity. In creating a mathematical model, the teacher observes the sequence of students ’actions, is able to control the logic of reasoning, and prevent possible errors, thereby directing students’ cognitive activities.

3. The importance of interpretation. Mazur is concerned with the ability to analyze a mathematical model that has been created. Analyzing the result and interpreting it to the field in which the task was initially structured allows the teacher to understand the essence of the process or event being considered by the students through its quantitative properties.

CONCLUSIONS AND SUGGESTIONS

Thus, the study of practical problems in the course of differential equations is directly related to the concept of mathematical model, and teaching the construction of such models is one of the main tasks of mathematical education. It is important for students to note that the application of mathematics is not limited to solving specific problems and selecting appropriate formulas. In the course of differential equations it is necessary to consider the creation of mathematical models for uncomplicated processes and events, and to include the possibility of translating them into the mathematical language of the "real world".

REFERENCES

1. Гнеденко, Б.В. Математическое образование в вузах / Б.В. Гнеденко. -М.: Высшая школа, 1981. — 174с.

2. Колягин Ю.М О прикладной и практической направленности обучения математике. // Математика в школе. - 1985, № 6. — С.27-32.

3. Найманов Б. А. Реализация прикладной направленности преподавания дифференциальных уравнений в педагогическом институте: автореф. дис. ... канд. пед. наук: / Найманов Бахтияр Аспандиярович. — М., 1993. - 19с.

4. Терешин, Н.А. Прикладная направленность школьного курса математики. Книга для учителя / Н.А. Терешин. — М., «Просвещение», 1990. — 96с.

5. Столяр А. А. Педагогика математики / А.А. Столяр. — Минск, «Вышейшая школа» 1986. - 414с.

6. Трусова П.В. Введение в математическое моделирование: Учеб. пособие / П.В. Трусова. — М.: Логос,2005. — 440 с.

7. Фирсов В.В. О прикладной ориентации курса математики. -М.: Просвещение, 1977. — с. 215-239

8. Шапиро И. М. Использование задач с практическим содержанием в преподавании математики: Кн. для учителя /И.М. Шапиро. — М.: Просвещение, 1990. —96 с.

9. Шодиев Р.Д., Турдиев Ш.Р. On questions of particularities of teaching mathematics in technical higher education institutions (HEI). Austrian Journal of Humanities and Social Sciences № 9–10.Vienna , 2014.pp 141-144

10. Ergashev N.G’. “Using visual program technology methods in engineering education”. European Journal of Research and Reflection in Educational Sciences Volume 7

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