THE IMPORTANCE OF THE MATHEMATICAL KNOWLEDGE IN PREPARATION OF ENGINEERS AND THE TEST-EXPERIENCE CONDUCTED ON THE BASIS OF THE APPLIED APPROACH TO THE SUBJECT OF MATHEMATICS, AS WELL AS THE ANALYSIS OF ITS RESULTS RESUME

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ABSTRACT

It is quoted a detailed information about the importance of Science and education in socio-economic development, education in Uzbekistan, the work carried out on the development of science, training of highly qualified personnel, as well as the role of mathematics in the development of many fields, training of qualified personnel. In the direction of Engineering Education, the analysis of the experience-test and its results on teaching mathematics on the basis of a new approach is described.

Keywords: science, potential personnel, mathematics, mathematical knowledge, applied mathematical analysis, traditional, innovation, experiment-test, creative activity, active creative worldview, efficiency.

INTRODUCTION

It is known from the history that every country in the world strives to increase its military, economic, spiritual and technical strength. The development of machinery, technology and production in each country and, consequently, its high economic power are undoubtedly inextricably linked with the rise of education, science and the training of potential personnel in that country. The experience of developed countries shows that along with the development of education and science, great attention is paid to the training of a high-potential, highly adaptable personnel.

In Uzbekistan, great attention is paid to the development of education, science, training of highly qualified personnel, especially in recent years. In this regard, a number of decrees and resolutions of the President of the Republic of Uzbekistan have been adopted. The Action Strategy for the five priority areas of development of the Republic of Uzbekistan for 2017-2021, in address by the President to Oliy Majlis, special attention is paid to education, science, training of highly qualified personnel, and even the teaching of mathematics, biology and geology. Priorities have been identified for the development of education, science, training of high-potential, qualified personnel. Also, the concept of development of the higher education system of the Republic of Uzbekistan until 2030 will increase the efficiency of research in higher education institutions and the development of integration of science, education, industry, wide involvement of youth in scientific activities, formation of innovative science infrastructure [1-3].

The quality of teaching subjects in the curriculum is one of the main factors in the training of qualified personnel in higher education institutions.

In the current era of globalization, increased and accelerated flow of information, the mathematical apparatus, mathematical methods, mathematical modeling and design of tests play an important role in achieving clear and faster technical and technological solutions in the rapid development and updating of science, engineering and technology. Due to the recent high level of development of computer technology, various methods of mathematics, mathematical modeling, and projection are effectively used in solving many problems of science and technology, production and economics.

Yet it was noted in the Resolution of the President of the Republic of Uzbekistan No. PP-4387 dated July 9, 2019 "On state support for the further development of education and science of mathematics, as well as on measures to radically improve the activities of the Institute of Mathematics named after V.I.Romanovsky of the Academy of Sciences of the Republic of Uzbekistan" that the science of mathematics is becoming more and more important due to the rapid development of modern branches of science and technology, the role of mathematics in information and communication technologies, medicine, biology, digital economy and many other fields [4-6].

LITERATURE REVIEW

Quality teaching of subjects in the cycle of mathematics plays an important role in the training of highly educated specialists in such areas as engineering, production, engineering, technology, economics. The course "Higher Mathematics" has a special place among them.

The goals and objectives of teaching the course "Higher Mathematics" to students of the relevant bachelor's degree programs of higher education are clearly defined. The target of the subject is to help students acquire and apply the necessary mathematical knowledge to help them analyze, model, and solve engineering, technological, and economic problems. Its objectives are to provide students with logical and algorithmic observation, knowledge of mathematical problems, methods of verification, independent development of their mathematical knowledge and the formation of skills and abilities of applied mathematical analysis and solution of engineering, technological and economic problems [7-8].

A leading Uzbek scientist, academician Tashmuhammad Niyazovich Qori-Niyazi, commented on the importance of in-depth study of mathematics: "The most valuable feature of mathematics is that it develops a person's ability to reason logically. ... However, it cannot be mastered by memorizing the formulas and rules of mathematics. The soul of mathematics is in thinking, in logical discussion, in which the truths can be revealed in a rigorous, logical way. Thus, a person with the ability to think logically has a solid foundation for practicing any discipline".

So, it is not enough to theoretically study certain definitions, theorems, rules or formulas of mathematics. In the process of studying science, it is important to pay attention to its more applied side.

The teaching of mathematics in some areas of higher education in Uzbekistan and abroad in the fields of engineering, manufacturing, engineering, technology, economics was studied and analyzed. In teaching a science, for some objective and subjective reasons, it is mainly given theoretical knowledge, and appropriate exercises are performed. There are very few practical exercises in the textbooks and manuals used in practice. There is almost no textbook on the application of mathematics in engineering, manufacturing, engineering, technology, economics,

and for various other reasons, less attention is paid to the implementation of practical issues relevant to the field of education. As a result, most students are not able to independently apply their mathematical knowledge, mathematical formulas, or mathematical rules to solve problems in the field in which they are studying. They find it difficult to carry out practical tasks in the field of study. This shows that students do not have enough creative activity, active independent learning, the ability to apply mathematical apparatus in their field of specialization. As a result of observations, it is revealed that the formation of the creative worldview in many of them is at a low level. It is necessary to increase the creative activity of students to develop the skills of active independent learning and the ability to apply mathematical knowledge in their field of specialization, resulting in the formation of an active creative worldview in students.

Due to the urgency of the above problems, the department of "Higher Mathematics" of Tashkent State Technical University named after Islam Karimov conducted a scientific-methodical, pedagogical trial-experiment on teaching the course "Higher Mathematics" to students on the basis of an innovative approach, i.e. the application of science to solve specific problems in the field of education held in 2018-2019 [9-11].

METHODOLOGY

For the pedagogical experiment on teaching the subject "Higher Mathematics" on the basis of a new approach from the 2018-2019 academic year the 1st and the 2nd year students of the "Energy" and "Electric Power" fields of the Faculty of Energy, from the 2019-2020 academic year –students of "Automotive and Tractor" and "Ground Transportation Systems" fields of the Faculty of Mechanical Engineering were selected by the method of selection of mathematical statistics on the basis of the criterion of similarity of mathematical knowledge levels.

Based on the new approach, the training groups were defined as experimental groups, traditional training groups, control groups. The pedagogical experiment was conducted during the 1st, 2nd and 3rd semesters. The indicators of mastering the specialty subjects of the group of students who took part in the experiment in the following semesters and other cases related to the educational process are observed, studied and monitored.

Initially, a pilot program was developed based on pedagogical research methods for teaching the course "Higher Mathematics" on the basis of a new approach. Appropriate work has been done on the items of the program.

The content of programs and disciplines of general and specialized disciplines was studied in collaboration with specialists. Topics covered in the subject "Higher Mathematics" can be applied to general and specialized disciplines, as well as issues relevant to the field of education, studied from relevant sources and divided into the groups. The experiment was conducted mainly in practical classes. In the experimental groups, practical lessons from the course "Higher Mathematics" were conducted mainly on the basis of a new approach, i.e. with a focus on the application of topics, with more practical exercises.

RESULTS

The results of the mastery of the students of the experimental and control groups in the current control, intermediate control and final control were monitored. The analysis of the results of experiments was discussed at scientific and methodological seminars of the department.

Appropriate recommendations were given by scientists of the department on the successful, error-free conduct of experiments. Experimental groups included issues relevant to the direction of education in the independent work of students, as wellas the composition of the graphic work. Students of experimental groups who are the members of the student scientific society gave lectures on applied mathematics and were heard at student scientific conferences held at the department.

Further the analysis of the preliminary results of experimental work carried out in the field of "Energy", "Electric Power Engineering" of the Faculty of Energy in the 2018-2019 academic year is considered.

In the practical classes of the course "Higher Mathematics", attention was paid to the application of topics to the solution of problems in the field of general and specialized disciplines taught in these areas of education, based on the specifics of the topics.

In particular, during the study of the topics of determinants, matrices, systems of linear equations of science – the problems of the power supply system and the construction of its state equations; development of projector lights, electric lighting devices for vehicles, interior lighting – inthe study of the second-order curves section;speed and current transfer, current strength, maximum and minimum values of electric charges – in the study of derivative and differential coil; processes in electrotechnical devices, pressures of liquids in power devices, work done by force, kinetic energy, work done by an electric motor of variable power – in the study of topics related to the integral section; in the study of Fure series – the processes of change of alternating currents in transformers, the change of current in any form over time; the law of electromagnetic induction in electromotive force – in the study of differential equations, the process of transition in an electric circuit, oscillations - in an electric circuit;electrodynamics, electrical engineering and electrical drives – in the study of curvilinear and surface integrals, the function of complex variables, and such applications to general and specialized sciences or to solve problems in the field.

DISCUSSION

It is known that the section "Probability Theory and Mathematical Statistics" of the course "Higher Mathematics" is most often and directly applied to the solution of modern engineering and economic problems, research and development in various fields. In teaching of the section "Probability Theory and Mathematical Statistics" in almost every practical lesson were presented issues related to the application of the topic. For instance, it includes conditional probability, multiplication of probabilities, determination of conformity of electrical devices to standard requirements in the study of hypotheses theorem (Beyes formula), determination of reliability of electrical devices, determination of the state of electric current in a circuit with elements connected in series and free operation; Determining the conformity of electrical appliances to the standard during the exercises on the Bernoulli, Poisson and Muavr-Laplace theorems, finding the probability of production of suitable electrical appliances in manufacturing plants; Determining the period of operation of power tools, mainly for energy, even when performing exercises on the topics of binomial distribution, Pusson distribution, flat distribution, exponential distribution, normal distribution, issues related to the operation of electric feeders serving electrical consumers, the probability of failure of some of a certain number of electrical appliances at a given time, ensuring a smooth distribution of power transmission, detection of breakdowns in electric motors. In addition, during the training of

this section, the issues of accidents that occur in the process of electricity generation and transmission in the field of education were also highlighted.

Pedagogical experiments were strictly controlled from the very beginning. The work done on each item of the plan of pedagogical experiments was analyzed. The mastery of students of experimental and control groups, the results of pedagogical experiments were statistically processed and analyzed. The following table shows the effectiveness of teaching methodology based on applied teaching of mathematics.

Field of study	Groups names	Number of Students	Rating				The average value of the rating	Efficiency
			"5"	"4"	"3"	"2"		
Electric Power Engineering	Experimental group	51	6	21	17	7	3,51	1,11
	Control group	50	3	13	22	12	3,15	
Energy	Experimental group	48	4	15	23	6	3,35	1,10
	Control group	49	2	9	27	11	3,04	

The results of students' mastery of the subject "Higher Mathematics" in the experimental groups were statistically analyzed by current methods. The average grade was 3.51 in the experimental groups of the "Electric Power Engineering" direction, and 3.15 in the control groups, and the efficiency was 1.11. The average value of the same grade was 3.35 in the experimental groups of the "Energy" direction, and 3.04 in the control groups, and the efficiency was 1.10. Preliminary experimental results were considered satisfactory.

CONCLUSIONS

Along with the increase in the effectiveness of teaching the subject "Higher Mathematics" on the basis of a new approach, the following positive results were observed:

Students realize that the subject of "Higher Mathematics" is not only a theoretical subject, but also has a wide range of applied features, and their interest in a deeper study of the subject increases;

Interdisciplinary communication will improve and, as a result, the quality of study of general and specialized disciplines will increase;

Students will have the skills to use mathematical devices in the study of general and specialized disciplines in the course work, graduate work, and then in research work;

Students' skills of active independent learning will increase;
Significantly increases the creative activity of students;

The share of qualified personnel with the skills of mathematical logical analysis and modeling of production processes will increase.

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