

ESTABLISHING DIGITAL COMPETENCIES FOR STUDENTS LEARNING MATHEMATICS AT THE TECHNICAL UNIVERSITY

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The era of the post-industrial knowledge society differs from the previous socio-economic period not only in total digitalization, automation and robotization, but also in the interdisciplinary integration of various sciences, among which mathematics occupies a special place. The language, apparatus and methods of mathematics have become the basic universal research tools in physics, biology, chemistry, engineering, production organization and many other theoretical and applied fields of activity in recent decades.

The way people think is evolving and changing. Indeed, creativity is needed to search “wider” something that may be relevant for orientation in a large amount of information. Still, critical thinking is required to assess the adequacy and reliability of the information. Actual trends related to the quick development of technology and increased mobility strongly affect the dynamics of employment in the labor market. In the context of global digitalization, the transition from education that develops factual knowledge to education that forms competencies for their successful implementation is inevitable [1-3]. Digital competencies are the basis for mastering special, in particular mathematical competencies.

Mathematical education is a mandatory component of the educational process of all technical universities, as well as a number of natural specialties of other universities and colleges. As a rule, this is carried out when students study the discipline "Higher Mathematics". Students studying higher mathematics pursue the following main objectives:

- creating a basis for further studying a number of special disciplines,
- mastering the methods of applying mathematics in their future practical activities,

- familiarizing themselves with typical mathematical models of the subject area in order to master the general techniques for constructing and studying such models for solving applied problems.

One of the tasks of mathematical education of students in technical universities is to ensure the training of a highly qualified engineer in accordance with modern requirements. A future graduate of a technical university must possess knowledge both in his professional field and in related ones. This can be achieved by having a fairly good mathematical background, being able to navigate new achievements in science and technology, and also adopting these achievements in solving professional problems. All this makes it possible to consider mathematical education as an important component of the training of a modern engineer.

It is impossible to form a modern worldview of a future intellectual specialist without high-quality mathematical training and understanding and assimilation of information technologies. Today, education cannot be imagined without the use of computer technology in the learning process [4-6]. In a rapidly developing society, the process of digitalization takes place as result new opportunities have appeared for using computer technologies in teaching the basics of mathematics. Mathematics and computer science are inseparable, and the correct organization of the educational process significantly increases the efficiency of studying and understanding each of the disciplines [7].

At this stage in the development of teaching students of a technical university, one can note the existence of an imbalance between the fundamental mathematical training that is relevant for a modern person and the competency-based approach that dominates today in education. The latter one prevents students from a holistic understanding of mathematical knowledge even within the boundaries of a separate discipline. Based on the concept of developing education, the professional orientation of the training of students of technical universities, and the idea of continuous education, one can conclude that the dominant learning trend should not have a competency-based setting focused on specialization. The cultural competence educational models which form general cultural ideas about modern mathematics in accordance with the principle of cultural conformity should be applied instead. As the most significant pushing mathematical culture on a new level of its evolution can be distinguished mathematical modelling, discrete mathematics and computing processes. Taking the mathematical training of students as a basis of education plays a leading role in the development and improvement of their logical and professional innovative thinking through comprehension of multifunctional cognitive structures and schemes (as means and methods of cognition), similar to mathematical schemes and structures. In the variable part of master's programs (depending on their profile), implying primarily research activities of students, it is advisable to include special courses: "Mathematical Modeling in Vocational Education", "Discrete Mathematics", "Mathematical Foundations of System Analysis", etc.

The practice of introducing digital technologies into the educational process in mathematical disciplines allows us to conclude that the most significant didactic principles, pedagogical and methodological goals and digital means are connected. In

particular, digital technologies and educational resources based on digital technologies, introduced into the practice of teaching mathematical disciplines, contribute to:

- the formation of digital competencies based on an activity approach to the designed educational process;
- implementation of the principles of individualization and differentiation of mathematical training while maintaining its integrity;
- the growth of cognitive activity of students in the study of mathematical disciplines;
- activation of self-control and self-correction mechanisms, including working with digital educational resources;
- implementation of technological diagnostics at all stages of the educational process in mathematical disciplines;
- strengthening awareness in the educational and cognitive activity of students, increasing their intellectual and logical capabilities;
- increasing motivation in the construction of mathematical and simulation models, as well as in the process of applying quantitative methods;
- the development of channels for the exchange of didactic information as the basis for the correction of the educational process in mathematical disciplines;
- saturation of the practice of mathematical training with principal new digital tools that make it possible to implement previously inaccessible computational experiments, to build mathematical models and to resort to imitation when solving applied problems, including those related to future professional activities in the context of universal digitalization.

Digital technologies and products allow the teacher and students of mathematical disciplines to carry out, design and save research projects of an integrative nature in a new way such as electronic files, in which text, calculations and graphic images can be used simultaneously. The role of digital technologies is great in the implementation of the classical didactic principle of teaching mathematics - the principle of visibility. In particular, digital technologies and products make it possible to create and use in the educational process a variety of high-resolution animations of graphic objects. Digital technologies and products have great didactic potential due to their ability to design and use subject-oriented databases and knowledge, which are designed to build and study mathematical models and simulations as well as the use of quantitative methods in solving applied problems.

Formation of the professional competence of a student of a technical university is possible only under the condition of integration of knowledge and skills acquired in the process of studying natural sciences. Let's define the competence of a specialist as the ability to acquire, store, restore and interpret information relevant to functioning in a certain work process, as well as act on its basis. Competence is a holistic characteristic of a person that combines separate competencies and personal attitude to activity. Competence is a characteristic that implies the presence of a set of knowledge, abilities and skills, experience and the ability to perform separate, private types of professional activity. A specific consumer of specialists does not need a set of knowledge, but a set of competencies.

Mathematical education should be considered in the professional context of the general goals of higher technical education, which means considering the content of mathematical education as a subsystem of professional education. Mathematical education at a university at the bachelor's degree is a continuation of mathematical education at school or college and is itself a basis that allows you to continue your education at a master's degree according to personal needs. In ensuring the quality of education based on the formation of a holistic, professionally demanded, integrative system of knowledge in students, the mathematical component must correspond to modern trends in the scientific and technical sphere and the modern content of technical disciplines.

Modern processes of globalization of educational processes require mastering of new forms and methods of learning. One of the most progressive forms of education based on modern information technologies is distance learning. Distance education is a method of learning in a remote mode, at a distance, which does not require the mandatory physical presence of the student and the teacher at the university. At the same time, the necessary educational materials are delivered to the student using various technologies. Today, distance education uses all the possibilities provided by modern computer technologies. Currently, one of the priority ideas is the idea of continuous education throughout life, and distance learning in this case can act as the main tool for its implementation. An important factor explaining the growing popularity of online education is the volatility of the modern labor market, and such a system of acquiring knowledge allows for fairly quick retraining. In addition, a highly qualified specialist may need knowledge from many different areas and disciplines, the teaching of which often cannot be provided in one educational institution. During studying at one university, the necessary additional courses can be taken at other universities. In addition, the distance learning system allows the university to export educational services.

The development of information technology allows you to create and use new opportunities in the study of higher mathematics. This is, first of all, an opportunity for the student to independently receive educational, reference, training material and material for the control of knowledge directly from the information environment. In addition, computer technologies make it possible to assess knowledge in mathematics using computer testing, and in some cases this can be a fairly effective method for assessing the quality of assimilation of educational material for students of non-mathematical specialties.

The participation of students in the modern digital learning environment involves not only the provision by the university of the necessary access to computer rooms and the Internet, access to electronic resources of the university library and other information products and services. It is necessary to understand to what extent the acquisition of certain skills for working in an interactive environment helps students in their effective participation in the educational process in a creative and innovative way. To achieve greater effectiveness of the educational process, successful use of information and communication technologies is necessary, which involves not only the acquisition of skills to search and find useful information and resources, but also the

ability to analyze and synthesize the information received, share and discuss different ideas and points of view that can support team work students' work in solving problems and cases. Adapting students to the challenges of the digital society and new learning practices requires determining more effective ways of engaging, encouraging and motivating them to acquire high-quality theoretical and practical knowledge and skills in working with information and communication technologies. The digitalization process affects all components of methodological systems of mathematical training, and digital technologies and products can act as a tool for the modernization of already functioning methodological systems of teaching mathematical disciplines.

The formation and development of digital literacy of students should be carried out in an effective and dynamic information-educational environment in accordance with the ever-increasing requirements of the time, resulting in the actual problem of providing education-scientific space with the necessary resources. It is necessary to form information-digital competencies in all participants of the educational process that allows for increasing the level of effectiveness of their professional and social activities. The organization of the information-educational environment of the Technical University is possible on the basis of cloud-based technologies, the creation of electronic educational resources and their implementation in the educational process. The involvement to the process of development and approbation of electronic educational resources in mathematics during the study gives students the opportunity to be felt active subjects of educational activities and be responsible for the results of these activities. Thus, the process of digitalization affects all components of methodological systems for teaching mathematical disciplines, and digital technologies and products can act as a tool for modernizing already functioning methodological systems for teaching mathematical disciplines.

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