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THE INFLUENCE OF MATHEMATICAL DISCIPLINES ON THE FORMATION OF DIGITAL COMPETENCES OF FUTURE SPECIALISTS IN THE ECONOMIC FIELD

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The article considers the main principles of forming the digital competence of future economists. It is emphasized that the development of this competence is the integral characteristic of modern specialist, particularly in the economic field. It was carried out the analysis of the state of digital competences development of the future specialist economist in Ukraine. It has been established that achievements in the field of computer technologies and information systems have a positive effect on the process of forming the digital competencies of economists, which contributes to the formation of the following skills: performing a directed search and evaluation of data; management of data exchange, information and digital content; the use of information resources and technologies for generation of knowledge; development of conceptual solutions for problematic situations in digital environments.

Keywords: *digital economy, digital competences, digital literacy, professional education.*

Problem statement.

The modern space of higher education in Ukraine establishes a new educational paradigm focused on students and lifelong learning. This includes fundamental changes in professional tasks, which are solved by professional education. That is why training must be adapted to the requirements of the new context. The education system is forced to continuously improve, since the future functioning of the state depends on how this field develops.

The new generation is significantly different from the previous one. Society receives and processes a large mass of information every day, adapts to constantly changing conditions. Man needs to adapt in this world. The New Era dictates a change in thinking style. Today, in the educational process, it is necessary to apply innovative approaches and technologies in order to meet modern trends and requirements. The economic situation in Ukraine is changing. There are new requirements for employees. Professional education is the sphere of formation of future personnel for the economy of Ukraine and is undergoing significant changes. The relevance of this problem is related to the change in educational standards and paradigms. Professional training includes more than actual knowledge and skills.

The solution to the above-mentioned problem makes us conduct a search in the



direction of developing the fundamentally new scientific support for the educational process, aimed at the use of IT for the purpose of qualitatively filling the information space, which corresponds to the essence, volume, content, speed of information perception [2].

Recent research and publications analysis.

According to the research of modern scientists, S. Zoria, O. Leha, O. Kirdan [4] digital competence involves confident and at the same time critical application of information and communication technologies for creating, searching, processing, exchanging information at work, in public space and private communication; information and media literacy, basics of programming, algorithmic thinking, working with databases, Internet security and cyber security skills; understanding the ethics of working with information (copyright, intellectual property, etc.). I.V. Laptieva and O.D. Pakhmutova, [3] considering the expediency of integrating digital technologies into the learning process in higher education, it is believed that this is due to a large extent to the fact that the reduction of classroom hours entails an increase of the amount of students self work. T. Pryidak, N. Yurchuk claim that the use of digital technologies in the educational process is especially relevant for specialists in the economic direction, since the development of the modern economy is not possible without the use of digital technologies, which determines the relevance of the formation of digital competence among students of this field.

Considering the above mentioned, we want to explore how the digital competence components of future economists are formed during the teaching of mathematical disciplines in higher education institutions.

The object of the article is to reveal how the formation of digital competence depends on effective methods of teaching mathematical disciplines a future specialist in the field of economics.

Statement of basic materials.

At the current stage of the development of society in Ukraine, European integration processes and socio-economic transformations, aggravation of the political and economic situation in the country along with the strengthening of international competition, the intensive development of digital technologies, the need to improve the provision of the proper level of professional training of economic specialists becomes of great importance.

The system of forming the digital competence of future economists consists of four components: purpose, activity, informativeness and efficiency, which allow to take into account the education process as the most important element of training highly qualified specialists in the future. An increasingly digital and decentralized economy requires not only a new approach to doing business at the macro level, but also new skills to succeed at the macro level.

Digital competences are a set of knowledge, abilities, specific features of character and behavior that are necessary for a person to be able to use digital technologies to achieve goals in his personal or professional life. Competence in the field of digital technologies should be perceived not only as knowledge related to technical skills, but also as knowledge, more focused on cognitive, social and emotional aspects of work and life in the digital environment. Digital competence is a



multifaceted evolving process that is constantly changing with the emergence of new technologies [7].

It is known that the concept of «future economist» is quite broad in meaning. Using this term, researchers refer to it specialists of a number of related subject areas: «Economics», «International economic relations»; «Accounting and Taxation», «Finance, Banking and Insurance», «Marketing», «Entrepreneurship, Trade and Exchange Activity», etc. Let's take a closer look at the state and features of the development of digital competencies of future economists.

According to the standard of higher education in Ukraine for economic specialization in the context of our study, the following program competencies are determined [1] (Table 1):

Table 1 - Basic program competencies

| Skills | Characteristic |
|---------------------------|--|
| 1) Basic digital skills | Characterize the functional literacy of the staff when using various information systems and software applications. Similar skills are needed to access and effectively use digital devices and online services. Basic digital skills include the ability to work with various technical devices, files, the Internet, online services, information programs. |
| 2) Derived digital skills | Related to the ability to competently apply digital technologies to solve various functional (professional and official) tasks. Mastering such skills guarantees effective use of digital technologies and obtaining real practical results. Structurally, these skills encompass the creative activities required to work in online applications and digital services. These can be various social networks, messengers, information portals, library and scientific services and databases, etc. |

Also, according to the European Digital Competence Model for Education, basic digital skills also include the psychomotor skills of staff. This is, firstly, the ability to use keyboards of various types professionally, which develops fine motor skills, and secondly, the ability to work with computer equipment of various types and sizes (stationary computers, laptops, tablet PCs, Flipbox, etc.), including equipment and with touch screens.

And derived digital skills, in turn, in addition to the above mentioned, reflect the ability of personnel to create digital content, as well as the ability to work with information, including its collection, structuring, validation, storage and data protection. Professional digital skills are specialized and provide solutions to complex professional tasks in a digital environment. These skills form the basis of the competencies of personnel in such high-tech professions as software developers, Web designers, big data analysts, etc. Special education is required to acquire such skills. According to the European model of digital competences, the structure of professional digital skills includes the ability to work in a team, creativity and critical thinking [6].

In particular, in hiring there is a person's possession of digital skills that make it possible to quickly and efficiently perform tasks, be successful and take advantage of potential opportunities.



At the same time, the need to solve specific theoretical and practical problems stimulates the development of new abstract methods and branches of mathematical science. We can say with confidence that in modern conditions, in connection with the process of mathematization of science and practice, future specialists in various fields need serious mathematical training, which, in turn, determines the place of mathematical disciplines in the education system. Related sciences use a different amount of mathematical knowledge and set new tasks for the content, forms and methods of studying this spectrum of disciplines, which contributes to the formation of students of a modern style of scientific thinking and its application in specific sciences [3].

Analyzing the training of future economists during the study of mathematical disciplines, the teacher has to observe the basic principles of teaching, in particular didactic. By the didactic principle, we understand the system of fundamental requirements that must be followed when determining the content, forms of organization, and teaching methods, which will most contribute to the formation of digital competence of future specialists in the economic profile in accordance with the purpose of the chosen educational program [5].

Therefore, these principles are intended to regulate the learning process, act as a method of regulating practice in creating didactic conditions for the successful formation of digital competence of future economists in the environment of a certain educational institution: scientificity, systematicity and consistency, availability, awareness and activity of learning, evidence, strength of knowledge, connection of theory and practice, emotionality, control and correction of knowledge, optimization of studying. We are going to consider each of them (Table 2).

Analyzing the didactic principles as a system of basic requirements that must be guided when determining the content, forms of organization and methods of training future economists during studying mathematical disciplines, which will contribute to the formation of digital competence to the greatest extent in accordance with the purpose of the chosen educational program (economics; information systems in the economy and business analytics; business economics; economics of the enterprise; economic cybernetics; international economics; personnel management and labor economics, etc. We also note that the implementation mechanisms of these principles are polyhedral and multifaceted. They depend on many factors: the development of pedagogics, didactics, level of digitization of the teacher. The introduction of a system of training in professional digital skills such as coding, data analysis and e-business skills can help young people to take advantage of the new opportunities offered by the labor market.

The relevance of general and specific digital skills has become especially acute during the pandemic, when the forced transition to distance learning in March 2020 due to the spread of COVID-19 «exposed» the situation with digital skills and indicated the shortcomings of digital training.

For example, almost 60% of students in Europe had no experience of distance learning before the pandemic, a fifth of European youth do not have even a basic level of digital skills, more than 50% plan to improve their digital skills as a result of the transition online, while only 39% of European teachers feel well prepared for



their daily work on the online mode.

Digital skills are gradually taking their place among other general competences and literacies, which cannot affect the content and practices of education, including in higher education. Being directly related to information technologies, digital skills, at first glance, may appear to be the prerogative of training areas in the field of information technologies. However, if we proceed from the end-to-end nature of general digital skills (their application in all types of activities), there is an assumption that it is laid a «cushion» of general digital skills in each direction of training, which can be fixed in the methodological and normative base of the educational process, and de-facto - in teaching practices.

Table 2 - Principles of digital competence formation of future economists

| Principle | Requirements | Implementation mechanisms |
|----------------------------------|---|--|
| 1) Scientificity | Carry out a retrospective analysis of information and communication technologies, the content of the digital economy; objectively reveal scientific facts, introduce new achievements in digital technologies in business, etc. | Scientific debates, scientific conferences on the theoretical and practical application of digital technologies in the economy, actualization of students' scientific works, involvement in competitions, grants, participation in Olympiads, etc. |
| 2) Systematicity and consistency | Actualization of previously studied material from various disciplines, a cycle of modeling and analytics disciplines; optimization methods and models; simulation modeling; economic analysis; intelligent systems; marketing analysis, etc. | It provides such the organization of the studying process of future economists so as not to violate general approaches to mastering the content of the educational program, logical connections between disciplines, between modules in each discipline; taking into account intersubject connections. |
| 3) Availability | It requires that the scientific concepts of the development of the digital transformation of education, all the variety and depth of their provisions, implementation measures should be understandable to all students in accordance with their age, level of mental development, and therefore should be presented in educational and methodological materials in an understandable form. | Presupposes that the entire amount of knowledge about the digital society, digital economy, and digital technologies accumulated by humanity, all their diversity and depth should be understandable to all students in accordance with the level of their intellectual development. |
| 4) Awareness and activity | It requires not just mechanically memorizing educational material, but also understanding what is being studied, deeply realizing and comprehending the phenomenon of the digital economy and information society, scientific concepts of the development of the digital economy and society, the digital transformation of education, the enormous potential of modern digital technologies. | Aimed at students' aware understanding of educational material, their aware attitude to educational activities, the formation of digital competence through the stimulation of their cognitive activity, it assumes that the main thing in education is to teach students to search for information, critically analyze it, prove, explain, check conclusions based on facts, on examples. |



| | | |
|--------------------------------------|---|--|
| 5) Evidence | A harmonious combination of textual educational information with various means of visualization in the learning process, which leads to a positive result both in the assimilation of knowledge and in the formation of digital competence of students, the development of students' awareness, and the understanding of the phenomenon of the digital economy and information society. | Methods of visualizing knowledge, stimulating visual thinking of students (schemes, diagrams, mental maps, tag clouds, media content, etc.), presentation and animation graphics, video lessons, electronic textbooks and manuals, etc., which contribute to the development of cognitive activity, the formation of skills for successful search activity, and confidence education in their own power. |
| 6) Strengths of knowledge | Obtaining such knowledge, which would be in the memory for a long time, would be reproduced consistently without much effort and which students would easily and skillfully use while solving various practical problems in professional activities and which would help them use digital technologies to solve life and professional problems | Methods of self work, project activities, creative tasks, memorization training methods, etc. |
| 7) Connection of theory and practice | They should learn not only theoretical material from the disciplines of the educational program, but also master the methods of its application in practice, learn to use it effectively in professional activities. | Practical studying, project activities, excursions to enterprises (firms, organizations), meetings with economists, visits of economic forums, exhibitions, etc. |
| 8) Emotional learning | Providing students with positive emotions that play the role of an internal motivating force in educational activities. | Techniques of relaxation, self-regulation, teacher's style, techniques for relieving emotional tension, methods of developing self-confidence, interactive teaching methods, effective communication methods, partnership pedagogics, electronic learning tools, etc. |
| 9) Optimization of studying | Optimizing the content of the forms and methods of this activity, highlighting didactic conditions, optimal combination of traditional learning tools with electronic, individual and group forms of learning organization for the highest achievement of a specific learning goal, etc. | Determination and implementation of specially created didactic conditions, development of a functional didactic model of formation of digital competence of future specialists in economic subject areas, etc. |

Conclusions.

So, in order to make the process of forming digital competencies of future economists more efficient and effective, it is necessary, in our opinion, to take into account the latest achievements in the field of computer technologies and information systems. As a result, students will acquire digital competencies that enable targeted data retrieval and evaluation. Also, using digital technologies, will be able to manage the processes of data exchange, information and digital content. Future specialists, interacting with other users of digital content, will be ready to use information



resources and technologies effectively for the joint generation of knowledge, as well as develop conceptual solutions to problem situations in digital environments. In addition, students will be able to develop their cognitive skills, including focusing on self-development and achieving high results.

Prospects for further research.

Increasing the creativity of thinking, proactiveness in achieving the set goal will allow future economists to solve successfully non-standard tasks and see the potential opportunities of the digital environment. Thus, in Ukraine, in higher education institutions that carry out their educational activities of the training of specialists in economic subject areas, the state standard of higher education provides the comprehensive formation of information and digital competence. Therefore, our further research will be even more focused on the formation of digital competences of future economists during mathematical disciplines.

References:

1. Boliubash N.M. Theoretical principles of formation of professional competence of future economists. *Scientific works of the Black Sea State University named after Petro Mohyla complex «Kyiv-Mohyla Academy». Series «Pedagogy»* . 2009. Issue 99. Vol. 112. P. 88-95.
2. Hulivata I.O. Formation of mathematical competence of students of economic subject areas by means of information technologies. *Physical and mathematical education* . 2018. Issue 2(16). P. 35-39.
3. Husak L.P. The role of mathematical disciplines in the process of forming the digital competence of future economists. *Socio-political, economic and humanitarian dimensions of the European integration of Ukraine : materials of the 2nd International . science and practice conf . (Vinnytsia, September 14-16, 2021). Vinnytsia, 2021. Ch 2. P. 180-186.*
4. Kirdan O.L. Information and digital competence of a graduate of a general secondary education institution: theoretical analysis. *Conceptual problems of the development of modern humanities and applied science : materials of II All-Ukrainian science - practice conference (Ivano-Frankivsk, April 20-21, 2018). Ivano-Frankivsk, 2018. P. 110-113.*
5. Kononets N.V. Functional didactic model of resource -oriented teaching of computer cycle disciplines in higher education. *Social and Economic Aspects of Education in Modern Society*. 2018. Vol. 2. C. 38-41.
6. On the approval of the standard of higher education in the subject area «Economics» for the first (bachelor's) level of higher education: Order of November 19, 2018 No. 1260 / Ministry of Education and Science of Ukraine. URL: <https://mon.gov.ua/storage/app/media/vishcha-osvita/zatverdzeni%20standarty/12/21/071-oblik-iopodatkuvannya-bakalavr.pdf>. (date of application: 10.06.2022).
7. Ferrari A. DIGCOMP: a Framework for Developing and Understanding Digital Competence in Europe. European Union, Luxembourg, 2013. URL: <https://publications.jrc.ec.europa.eu/repository/handle/JRC83167>. (дата звернення: 14.06.2022).