



USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE TECHNOLOGICAL EDUCATIONAL INDUSTRY

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Abstract.

The relevance of the article is due to the need to study the modernization of methods of teaching disciplines "Labor Training" and "Technology", given the changes in society caused by active informatization and the use of information and communication technologies; the need to introduce innovative approaches to conducting practical classes, in particular on the implementation of STEM projects, combining work on the study of traditional crafts with the use of computer technology.

Purpose: research and systematization of the possibilities of using ICT, laid down by the State standard of basic secondary education and description of practical experience of using ICT in the educational process in teaching disciplines of technological education.

Methods: analysis, comparison, generalization of processed sources (legal documents, scientific articles, textbooks, official Internet resources); empirical methods (pedagogical observation, interviews): a study of the experience of practical examples of the use of ICT in the educational process of secondary schools.

Results: the experience of innovative teachers in the use of methodological complexes in the educational process of the secondary school (Kompas-3D, Corel Draw, Paint-3D, Solidworks, Inventor, Keyshot, computer embroidery programs Embird, Wilcom ES, and Pattern Maker) to ensure technological education in accordance with the requirements of the "New Ukrainian School".

Conclusions: it was found that the analyzed methods of teaching disciplines with the use of ICT contribute to the realization of the goals and objectives of modern technological education; identified ways to modernize the educational process, taking into account the experience of teachers-innovators; the feasibility of wide introduction of information and communication technologies in the process of teaching the subjects "Labor training" and "Technology" (for illustration, information retrieval, as software tools) is determined.

Keywords: *technological education, modernization of the educational process, information and computer learning technologies, innovative teaching methods, key skills in technology education, software tools, digitalization of society.*

Introduction. Modernization of education involves the creation of an educational environment based on information and computer technology (ICT). This is the most important condition and tool for improving the education sector to ensure continuous improvement of its quality. This is a condition designed to help create conditions for the realization of equal opportunities for all citizens on the path to mastering education at all levels and levels. In accordance with the requirements of the time, basic legislative documents were concluded, which approved the important place of computer technology in the educational process "Law of Ukraine" On Education "(2017), the Concept of state policy in general secondary education reform 2029 (2016) (NUS), the Law of Ukraine on Complete General Secondary Education (2020), the State Standard of Basic Secondary Education (2020).

The NUS program states that graduates of the new school should be well-developed individuals, educated, responsible and patriotic citizens, capable of innovation. The main goal of the NUS project is the reconstruction of the school in order to create comfortable learning conditions in combination with the possibility of obtaining quality knowledge. The most important skill for students is the ability to apply the acquired knowledge in everyday life (Official Website of the Ministry of Education and Science of Ukraine, 2021).

The use of computer technology in the educational process is now a natural phenomenon. The effectiveness of their use depends on a well-formed idea of the place of ICT in the most complex set of relationships between the system "teacher-student". The use of ICT changes the purpose and content of learning. Today, new methods and forms of organizing the educational process are emerging. As a result, we get a qualitatively new model of personality formation, for which the ability to communicate, active mastery of new flexible functions in the work process, creative thinking become a vital necessity.

The organization of student training involves the use of computer technology as: a learning tool that optimizes the process of cognition; subject of study through acquaintance with new methods of processing and giving of the information; tool for solving educational tasks, which provides the formation of relevant knowledge and skills (Grinchenko, 2004, p.191; Gurevich, 2005, p.4; Gurevich, 2014, p.12).

Sources. Pursuant to the Law of Ukraine "On Education", the State Standard of Basic General

Secondary Education (2020) sets out the requirements for mandatory learning outcomes of students in the technological field of education. The state standard is based on the competence approach. Information and communication is recognized as one of the eleven key competencies, and skills based on the use of ICT are included in the general compulsory learning outcomes.

The requirements of the modern world for the introduction of ICT in the educational process are described by V. Kremen (2020, pp. 5-10). The scientific research of I. Dychkivska (2015) is devoted to the theoretical study of innovative processes in education as specific, complex activities that require special knowledge and skills. Features of digitalization of general secondary education and the formation of digital competence of students are set out in the work of M. Yershov (Yershov, 2020, p. 25). Directions for the development of digital competence of teachers were considered by O. Bazelyuk (2018). In the work of scientists of the Department of Pedagogy and Educational Management of Uman State Pedagogical University O. Kobernik, N. Stetsenko, V. Boychenko and others. (2018, pp. 53-57) highlights aspects of didactic support of the educational process of technological education, informatization of education, methodological problems of computer use in the educational process. The introduction of ICT in the field of education has been deeply studied by the founder of the scientific school "Systems of teaching and education in a computer-oriented environment" V. Bykov (Ponomarenko, 2021). New technologies and requirements for knowledge seekers, which are formed as a result of the formation of digital learning environment, are highlighted in the joint work of V. Bykov and O. Burov (2020, pp. 11-21). R. Gurevich's works are devoted to the use of new information technologies in work, study, communication, 2005, pp. 3-10; 2014, pp. 11-15; 2019, pp. 9-13; 2020, pp. 124-126; 2021, pp. 1-13).

The technology education industry has been found to be inherently integrated. This is the only branch of the new Ukrainian school that implements subject-transforming activities (from the idea to its implementation in the finished product). Technological education integrates knowledge from almost all educational fields, including computer science. The transition to computer technology creates the conditions for their testing, implementation, finding a reasonable combination of new and traditional, requires the solution of many psychological, pedagogical, educational and other

problems. Professional training of student youth should take into account the achievements and prospects for the development of technology and engineering. An important role in solving the problem of quality technological education is given to the teacher of technological education, from which the appropriate professional knowledge and skills will depend on the degree of readiness of students to work in the field of material production.

The aims of the article is to study and systematize the possibilities of using ICT, laid down by the State Standard of Basic Secondary Education and describe the practical experience of using ICT in the educational process in teaching disciplines of technological education.

Research methods. The paper uses: general scientific methods (analysis, comparison and generalization of official (Law of Ukraine "On Education", State Standard of Basic Secondary Education), industrial and practical (labor training program (2017), Model curricula "Technology. 5-6 classes" For general secondary education (2021) and scientific sources (including publications of teachers-innovators), Internet resources, personal experience in technological education; and empirical (pedagogical observation, study of ICT experience in the educational process of secondary schools).

Results and discussion. The introduction of ICT in all areas of educational activities has led to the reconstruction of traditional technological education. The purpose of technological education of the new Ukrainian school is the realization of creative talents of students, the formation of critical and technical thinking in them, preparation for the creation of the world without harming the environment by means of modern technologies. Today forms a demand for a specialist capable of productive professional activity, taking into account the changes in the digital society with its high-speed evolution. This request is reflected in the educational concept of "ICT competence" (NUS), proclaiming the important idea of educating such a specialist who, above all, must be a highly moral person who not only has the necessary knowledge but also able to apply them in practice; a person capable of adequate action in real situations and ready to take responsibility for their actions.

The social and cultural changes witnessed by the world community create the conditions for the demand for training specialists with high potential. adaptation to constantly changing working and production conditions. Therefore, the new

State Standard for Technological Education defines the formation of skills in students related to the implementation of project-technological activities that form the information and communication competence. These include skills: safe and effective work with social networks in the process of finding and discussing ideas; critical use of ICT in the process of searching, processing, transmitting information; ethical work with information that corresponds to intellectual property rights; use of digital devices to present results

In contrast to the current labor training program (2017), the Model Technologies programs developed in accordance with the State Standard also indicate the ability to use digital technologies in modern production, including robotics and implementation of projects using the digital environment.

Generalized areas of use of ICT in the process of project-technological activities (by type of work), provided by the State standard for technological education, are presented in table 1.

The study of the experience of using ICT in the educational process of secondary schools by Ukrainian teachers-innovators shows that such activities today are applied and depend on the teacher's personality, his innovative aspirations, experience and material and technical base of the school. The most common examples of the use of ICT – as tools to illustrate educational topics. Today, the MozaBook interactive software package approved by the Ministry of Education and Science of Ukraine and running on the Mozaik platform (Official website. Packages of electronic textbooks for use in the classroom, 2021) is gaining popularity. This is a quality resource in which unique educational materials are collected.

For example, based on the materials that are freely available in the Mozaik program, the teacher of Kalush Polytechnic Vocational College MM In the framework of the discipline "Computer Design" he develops animated films for the subjects "Labor Learning" and "Technology", places them in free access for online communities of teachers of the technological field of education. When creating demonstration materials, the teacher works with the programs Kompas-3D, Solidworks, while illustrating the topic "Machine Parts" he used the programs Solidworks, Inventor, Keyshot. The complex of animated films "Mechanics in Ukrainian" developed by M. Romaniv is an example of an effective means of motivating students (Official page. Mechanics in Ukrainian, 2021).

Generalized directions of ICT use in the process of project-technological activity (by types of works), in accordance with the obligatory results of students' education in technological education in the State standard of basic secondary education.

Types of work		Possible direction of ICT use	How to use ICT	Tasks that can be solved by using ICT	Class
Designing a personally and socially significant product	Generating and substantiating a creative idea or identifying a problem and choosing a design object for its implementation / solution	the computer is used as a storage medium	examples of search work with analogues on the Internet	the rationality of the use of digital devices at different stages of design and technological activities is determined	5-6
			search work with analogues on the Internet, accumulation of "bank of ideas", creation of a clause	intensification of the educational process, development of cognitive skills	7-9
	Implementation of marketing research, search for information about the design object	the computer is used as an information carrier and communication tool, for printing texts	organizing and conducting marketing surveys via Internet resources	use of computer technology and telecommunication systems for research activities of students in extracurricular activities, formation of information culture of students	5-9
	Implementation of artistic design of the product, applying the basics of design using design methods	the computer is used to perform graphic operations; to visualize the results of artistic design of the product on the screen	the use of graphic editors for the artistic design of the product	improving the efficiency and quality of the educational process	7-9
	Creating a technology card	the computer is used as a tool	use (if necessary) of digital devices and graphic editors;	improving the efficiency and quality of the educational process	5-6
	Creating an individual plan for the technology of manufacturing the product				7-9
Evaluation and presentation of results of design and technological activities	Presentation of design results	use of computer technology and telecommunication systems to visualize the results on the screen	use of digital devices and information environment, if necessary, to present design results	formation of information culture of students; improving the efficiency and quality of the educational process	5-9
Creative application of traditional and modern technologies of decorative and applied arts	Identification of decorative and applied arts. Recognition of works of different types of decorative and applied arts, acquaintance with their creators	possibility of visualization of materials and tools used in the main types of decorative and applied arts, research of works of famous Ukrainian masters of decorative and applied arts	formation of own judgments on the basis of culturological information on decorative and applied arts, in particular from the Internet	development of skills of experimental research and cognitive activity; formation of information culture of students.	5-9
	Replacing manual technology with computer software	the computer is used as a tool that uses software to upgrade execution technology	transfer of information from a computer by digital media to a machine that performs the technological process	acquaintance with software, performance of work with the help of the teacher or other persons	5-6
				performing work using software, mastering new functions in the workflow	7-9

Today, a large number of online resources are offered for the preparation of lessons in labor training and technology, distance learning of teachers in order to effectively use computer software (Official site. Effective use of online resources for labor training and technology, 2021). Also popular are the courses "Computer Aided Design", "Technical Drawing Based on Computer Programs", which teaches the capabilities of automatic design (CAD), using the application of software and methodological systems Kompas-3D, Corel Draw and Paint-3D. This is a selective course "Professional tests" for students of 8-11 grades in the curriculum of elective courses (Official site of the Ministry of Education and Science of Ukraine. Curriculum of elective courses, 2021). The task of this course is to enable successful adaptation of students to the conditions of the modern labor market, to form their professional mobility and competitiveness, in other words, to be able to use ICT to create knowledge and innovation in processes (technologies) and products.

The example of work on this course can be observed as the process of digitalization of education and changing learning requirements. As a result, graduates are ready to change within existing professions, and in the future - to master new professions, which do not yet exist today.

The experience of using software in working on projects by the teacher of Liko-School (Kyiv) V. Petrenko was also studied. The initial tests of the teacher were the use of the freely available program "Text embroidery". According to the program, the printed words were transformed into graphic geometric ornaments. There were more sophisticated programs that reproduced a photographic image in the form of embroidery patterns, but it was only a graphic image that had to be embroidered by hand. The process of embroidery technology remained labor-intensive, but reduced the time for assembling and selecting embroidery patterns. This work was interesting and progressive in early 2010, and today the teacher teaches them how to use Embird, Wilcom ES and Pattern Maker machine embroidery programs when students design a project product. V. Petrenko notes the great interest of students in working with software computer embroidery. The interface of these programs is not difficult to work in grades 5-6. As a result, the product is made according to the technology required for study, and software embroidery is chosen as an additional technology. Interest contributes to the intensification of learning during the lesson and additional extracurricu-

lar activities. In this way, the embroidery process is accelerated and students can get the result of their design idea faster.

However, the described method of using ICT is possible with special equipment for computer embroidery. Thus, the constant modernization of material and technical base should become the norm for all schools in the country. The implementation of such works is aimed at the development of design-technological and information-digital competencies and clearly demonstrates what changes can occur in the known professions (Personal page Petrenko Victoria. Shopper with machine embroidery, 2021). The number of students who can master machine embroidery is much greater than those who can qualitatively and in sufficient quantities to finish the product by hand. Students have a choice of how to achieve the result and practical experience of combining traditional types of decoration with ICT skills.

Vinnitsia teachers-practitioners R. Leschuk and O. Loik discovered the possibility of to seek the motivation of students to work training through the active use of ICT, as it allows to improve the quality of practical work and their results. An example of such work is the implementation of practical tasks by students in grades 5-6: drawing a working drawing, building a 3D model, developing a scheme for assembling parts in the manufacturing process (Leschuk, Loik, 2013, p.2-8).

The studied experience allows us to conclude that the use of ICT is not possible without self-education and development of an important participant and organizer of the educational process - teacher, teacher, educator. There are objective conditions that demonstrate the urgency of this task, but in contrast there are subjective reasons that slow down this process. They can be attributed to two main groups: underdeveloped material and technical base of educational institutions and low motivation of teachers.

The Ministry of Digital Transformation of Ukraine has been established in Ukraine, and programs have been launched to remove these obstacles and promote the process of digitalization of society and education. An example is the state program "Action", which helps to improve the digital skills of teachers. In addition, the Ministry of Education and Science of Ukraine approved the Standard Program for Professional Development of Teachers for the Development of Digital Competence (2021). Today, communities of like-minded teachers are being created, which share common issues from the experience of ICT im-

plementation and the desire to be on a par with the world in the process of implementing digital technologies.

Conclusions. Ukraine is in the process of modernizing its education sector. These innovations are recognized by law and reflected in the State Standard of Basic Secondary Education, which publishes the key competencies of the technological education sector, which include information and communication competence and innovation. Innovative teachers explore areas for improving the content of education, introduce the latest forms of ICT in the educational process. These are important pilot projects that need to be studied quickly for widespread implementation in secondary education. Today, the transfer of a new system of knowledge to students is not possible without building a new educational model based on ICT and changing the classical scheme of knowledge transfer. The rapid digitalization of society affects the study of subjects of technological education ("Labor training" and "Technology"), which are directly related to material production. The technological education industry is a shining example of working with programs that modernize the product design process. With the help of ICT, students develop skills in finding models-analogues,

building a creative idea and the practical use of ICT in the technological process of manufacturing products. The digitalization of education has become an objective condition for modern trends in the information society, but continues to depend on subjective conditions - teacher self-education and the conditions of the educational process. The use of ICT promotes mobility in the selection of materials for lessons, makes classes much more interesting and modern. Illustrative material, multi-schemes and interactive models promote the development of visual thinking of students through the involvement of sight, hearing, imagination and emotions. The practical use of ICT in the implementation of projects promotes the conscious assimilation of knowledge by students, forms a positive attitude to learning, arouses interest in learning subjects, motivates in achieving the results of the educational process. ICT is a tool that allows teachers to use a differentiated approach in practice in working with students. Given the needs of the information society, the use of computer technology in schools helps to properly prepare students for new professions created by the demands of the digital society through the formation of relevant key competencies: lifelong learning.

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ВИКОРИСТАННЯ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ У ТЕХНОЛОГІ-ЧНІЙ ОСВІТНІЙ ГАЛУЗІ

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Реферат.

Актуальність статті зумовлено необхідністю дослідження напрямів осучаснення методики викладання дисциплін «Трудове навчання» та «Технології», зважаючи на зміни в суспільстві, викликані активною інформатизацією та використанням інформаційно-комунікаційних технологій; необхідністю впровадження інноваційних підходів до проведення практичних занять, зокрема з виконання STEM-проектів, поєднання роботи з вивчення традиційних ремесл із використанням комп'ютерних технологій.

Мета: дослідження та систематизація можливостей використання ІКТ, закладених Державним стандартом базової середньої освіти та опис практичного досвіду використання ІКТ в освітньому процесі при викладанні дисциплін технологічної освітньої галузі.

Методи: аналізу, порівняння, узагальнення опрацьованих джерел (нормативно-правових документів, наукових статей, навчальних посібників, офіційних інтернет-ресурсів); емпіричні методи (педагогічного спостереження, бесіди-інтерв'ю): дослідження досвіду практичних прикладів використання ІКТ в освітньому процесі загальноосвітніх шкіл.

Результати: досліджено досвід педагогів-новаторів щодо використання в освітньому процесі загальноосвітньої школи методичних комплексів (Kompas-3D, Corel Draw, Paint-3D, Solidworks, Inventor, Keyshot, комп'ютерних програм для вишивання Embird, Wilcom ES i Pattern Maker) для забезпечення технологічної освіти відповідно до вимог «Нової української школи».

Висновки: з'ясовано, що проаналізовані методики викладання навчальних дисциплін з використанням ІКТ сприяють реалізації мети й завдань сучасної технологічної освітньої галузі; визначено шляхи модернізації освітнього процесу з урахуванням досвіду педагогів-новаторів; визначено доцільність широкого впровадження інформаційно-комунікаційних технологій у процесі викладання предметів «Трудове навчання» та «Технології» (для ілюстрування, пошуку інформації, в якості програмних інструментів).

Ключові слова: *технологічна освітня галузь, модернізація освітнього процесу, інформаційно-комп'ютерні технології навчання, інноваційні методи навчання, ключові уміння в технологічній освітній галузі, програмні інструменти, цифровізація суспільства.*

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