



RESEARCH OF THEORETICAL ASPECTS OF THE 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 theoretical foundations of digitalization of technological education, taking into account the requirements of modern digital society.

Purpose: to substantiate the features of the use of ICT in technological education in the social and digital transformation of modern society.

Methods: general logical research methods with analysis, comparison, generalization of processed sources (legal documents, scientific articles, textbooks, official Internet resources) to study the relationship between the development of information technology and their use in the study of technological disciplines.

Results: the educational legislation on the basis of which introduction of computer technologies in the course of teaching of technological disciplines is carried out is investigated; the main problems of digitalization of technological education in the conditions of formation of digital society are considered; identified key and "ICT competencies" needed to ensure this development.

Conclusions: it was found that the social and digital transformation of modern society necessitates changes in the methodology of teaching disciplines of the technological cycle; it is shown that among the innovative teaching methods the most optimal for application in the process of teaching technological disciplines can be gamification, virtual educational environment and innovative software products as a means to achieve the educational goal; It is proved that the improvement of methods of teaching disciplines of the technological cycle will help prepare students for the implementation of acquired skills and abilities in life, increase their mobility in dynamic labor markets.

Keywords: *information and communication technologies, information and communication competencies, information technologies of education, digital society, innovative teaching methods, key skills in technological education, gamification of the educational process.*

Introduction. In the process of building the world economy there is a change in technological systems. We live and work in an era of significant change. The usual, stable very quickly becomes an

anachronism, leads to a significant economic and technological lag in the global race of economies and civil societies. The world has become transparent and open thanks to Internet communications. It

is difficult not to see the urgent need for qualitative change, especially in the field of education. Prior to the pandemic in 2019, the use of the latest information technologies was a sign of the work of an advanced teacher who sought to organize the quality of the educational process, its diversification. The realities of the global quarantine 2020-2021 have led to a particularly rapid restructuring of the entire educational process with an emphasis on the use of computer technology.

It was timely to conclude legislative basic documents that legally fixed the important place of computer technology in the educational process. The program "New Ukrainian School" (NUS), which has been implemented by the Ministry of Education and Science of Ukraine since 2017, turned out to be significant. The program states that the graduates of the new school should be educated Ukrainians – comprehensively developed, responsible citizens and patriots, capable of risk and innovation, able to lead the Ukrainian economy forward in the XXI century. The main goal of the NUS project is to create a school that combines comfortable learning conditions and the opportunity to gain quality knowledge. The main goal is the ability to apply the acquired knowledge in everyday life (Official site of the Ministry of Education and Science of Ukraine, 2021). This goal was proclaimed two or three decades ago, but even today the modernization of education must bring the qualitative changes needed in society.

Sources. The importance of the development of the theory and methods of application of ICT in the learning process is a topical issue in the works of many scientists, whose research concerns all components and levels of education: preschool, general secondary, vocational and higher. The question of the practical use of information technology in secondary school was raised in the 80's by R. Williams, K. McLean (Williams and McLean, 1988). The authors of "Computing in schools" described a variety of ways to combine computers with other technical teaching aids and noted their effective use in teaching any school subject.

Theoretical bases of ICT use in domestic education are devoted to the works of scientists of the Institute of Information Technologies and Teaching Aids of the National Academy of Pedagogical Sciences headed by the director of the institute V.Yu. Bykov, according to whom, the use of ICT in the educational process is an integral condition of qualitative changes that will have an impact in the near future on important sectors of the economy: production, technology, science. ICTs will have an indirect impact on the ability of today's students to

master professions that do not yet exist today (Bykov, Spirin and Pinchuk, 2017, p.191-198; Bykov and Yatsyshyn, 2019; Bykov, Litvinova and Lugovyi, 2019; Bykov, Spirin and Pinchuk, 2021). Innovative tasks of the modern stage of informatization of education are covered in the works of V.G. Flint (Flint and Bulls, 2014).

In the research of scientists of Kyiv University. B. Hrynychenko are key developments in the form of practical manuals that remain relevant for many years, for example, T.I. Nosenko (2011). Researchers have studied the modern processes of formation of key and subject competencies of students by robotic means of STEM-education (Gladun, Morse and Dziuba, 2018, pp. 37-52). In the collaboration of Polish, Ukrainian and Russian scientists, a study of the formation of new educational strategies in the latest digital environment was carried out (Smirnova-Tribulska et al., 2016, pp. 6-24). Many other researchers are working on the implementation of ICT in the educational process: O. V. Belous, Yu. M. Bogachkov, O. V. Ovcharuk, P. S. Wuhan, V. O. Radkevich, N. G. Nichkalo, I. M. Dychkivska, M. O. Kizima, I. Yu. Matyushenko, I. V. Shostak, I. D. Nischak, G. G. Shvachych, B. B. Tolstoy, L. M. Petrechuk, Yu. S. Ivashchenko, O. A. Gulyaevpa, O. V. Sobolenko and others.

The purpose of the article is to substantiate the peculiarities of the use of ICT in the technological educational field in the conditions of social and digital transformation of modern society.

Methods. On the way to achieve this goal, the authors use general logical research methods with analysis, comparison, generalization of processed sources (legal documents, scientific articles, textbooks, official Internet resources) to study the relationship between the development of information technology and their use in the study of technological disciplines.

In particular, the legislative documents of Ukraine, State standards of basic and complete secondary education, materials of the World Education Forum "Education 2030", publications of foreign and domestic scientists, which addressed the use of ICT in technological education, publications on education reform, analytical materials were analyzed. Institute of Information Technologies and Teaching Aids of the National Academy of Pedagogical Sciences of Ukraine, Internet resources (national online platform for digital literacy "Action. Digital Education", "World Economic Forum", etc.). The purpose of the analysis and comparison was to generalize the content of the processed sources in order to identify the features of the introduction of

ICT and their impact on the traditional methods of teaching subjects of the technological cycle.

Results and discussion. A high-tech society determines the informatization of all branches of science and education, so a person who does not have information and communication technologies will inevitably be pushed out of its borders.

Article 12 of the Law "On Education" contains a list of key competencies that students will acquire in the learning process (Official website of the Trade Union of Education and Science of Ukraine, 2021). An important place is given to competences in the field of engineering and technology, competence of innovation and information and digital competence. It is information and digital competence involves the confident, critical application of information and communication technologies for the search, processing, creation and exchange of working information, information literacy, mastering the basics of programming.

Implementing the Law, the State Standard of Basic and Complete General Secondary Education, approved by the Resolution of the Cabinet of Ministers of Ukraine of September 30, 2020 № 898, outlines the requirements for mandatory learning outcomes in technological education. Common compulsory learning outcomes include, among many, ICT-based skills. Such skills, for example, indicate the design of personally and socially significant product. One of the guidelines for evaluating the effectiveness of such a skill is to draw up an individual plan of product manufacturing technology using, if necessary, digital devices and graphics editors (9 Feasibility study 1.1.7-5).

Next is a key skill such as manufacturing a designed product in accordance with the technological sequence, which will be assessed through another important skill – improving manufacturing technology through the use of appropriate methods, technological or technical techniques (9 Feasibility study 1.2.4-1).

The ability of effective work of students in accordance with the types of decorative and applied arts is indicated. The results of students' activity can be assessed through their participation in public events, projects on creation and popularization of works of decorative and applied arts of their community and art of European cultural heritage (9 Feasibility study 2.1.2-2) (Official site of MES of Ukraine, State standard of complete secondary education), Appendix 12, 2021).

These skills are part of the competence potential of technology education and basic knowledge, where the key competence "innovation" is defined through the ability to transform acquired knowledge of technology and equipment into process improvement, new or improved product with new qualities, awareness of the importance of innovation in sustainable processes. development of society (Official site of the Ministry of Education and Science of Ukraine, State standard of complete general secondary education, Annex 11, 2021).

The world is gradually adapting to a new way of life. ICTs, which before the pandemic were part of learning technology, have become the main way of distance learning. As a result of quarantine measures, the provision of educational institutions with computers and high-speed Internet, accessible to both teachers and students, has become a priority issue of the entire educational process.

The key question of didactics is the question of how to teach, ie how to transfer knowledge, information so that they are best mastered. The widespread use of computers in education has given rise to the term "learning information technology."

Under information technology is understood a set of methods and technical means of collecting, organizing, processing, storing, transmitting and providing information that expands people's knowledge and develops their ability to manage technical and social processes (Fig. 1).

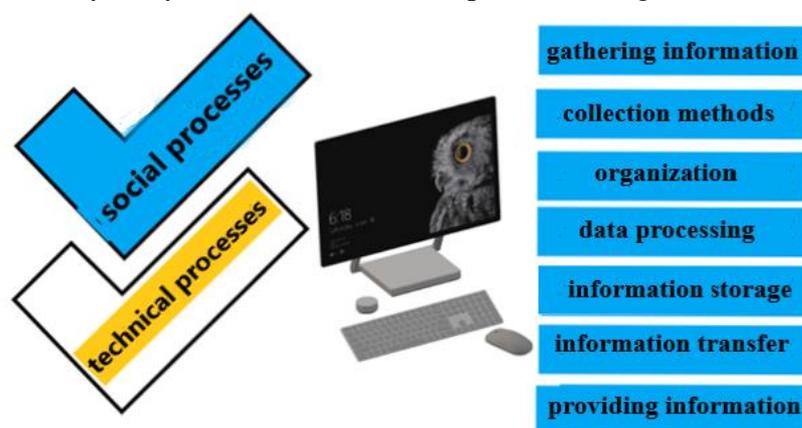


Fig. 1. The content of information technology

The use of computer and information technologies in the educational process belongs to the category of "innovation": the creation and dissemination of innovations and changes in ways of doing things and related styles of thinking (Dychkivska, 2012, p.22).

Traditional teaching methods and tools do not meet modern requirements, and this encourages the introduction of innovative teaching methods, use and adaptation of these technologies in the educational process (Shvachich, 2017, p. 5). It is important to use a sufficient number of examples to achieve the learning goal, as the acquisition of professional skills and abilities is not possible without the demonstration of visual aids and interactive tools.

The effectiveness of the educational process today directly depends on the introduction of computer technology in the practice of teaching. This question has been studied by world and domestic scientists since the 80s of the last century. The use of computers in the learning process is revealed, for example, in the works of R. Williams and K. McLean. Forty years ago, the authors predicted an "explosion" of interest in computer technology on the part of education authorities and educational institutions, predicted the need to master new teaching skills, and said that the school of the future would have to teach not only children but also adults (Williams and McLean, 1998, pp. 41-42).

Nosenko T. I. (2011, p. 32) identified the active use of ICT as a tool for presenting and acquiring knowledge by teachers and students through various activities: information-educational, educational-game, experimental-research and independent. It is a tool to support traditional teaching methods and opportunities to create a variety of methods that contribute to the personality-oriented development of students.

The research of scientists of the Institute of Information Technologies and Teaching Aids of the National Academy of Pedagogical Sciences of Ukraine on key issues of implementation of information and communication technologies in domestic education (Bykov et al., 2017, p. 191) is based on the analysis of UN international monitoring results 2017-2018. Forum). According to its results, Ukraine has unbalanced indicators and a significant increase in the gap with developed countries in the pace and speed of the domestic information society. Therefore, the authors define the informatization of education as a priority for the effective development of the information society in Ukraine and a prerequisite for increasing the pace of creation, exchange of information, knowledge and technology. The authors

characterize the lack of joint efforts in the development of the country's ICT as an "internal and external digital divide" (Bykov, Spirin and Pinchuk, 2017, p. 192). The authors' opinion is based on the historic commitment made in 2015 by the Incheon Declaration "Education 2030" at the World Forum on Education, which was guaranteed by UNESCO. The declaration, in accordance with the goal of sustainable development of society, points to the importance of using information and communication technologies in strengthening educational systems, disseminating knowledge, providing access to information, quality and effective training and more efficient services (Official Website of the Verkhovna Rada of Ukraine Science and Education, 2021).

In the joint work Kyzym M. O., Matyushenko I. Yu. And Shostak I. V. (2012, p. 454-458), the prospects of development of information and communication technologies and artificial intelligence in the economies of the world and Ukraine in the perspective to the middle of the XXI century are investigated. As a result of the work, the authors emphasize that modern human life will be increasingly freed from hard work and will become a pleasure, thanks to the total use of ICT. This, without a doubt, is a positive phenomenon that contributes to the optimal direction of free time for spiritual and professional development. According to scientists, humanity will have to experience the exponential growth of new technologies, which is possible through the merger and synergistic enrichment of various sciences: biology, computer science, physics and more. At the same time, this should improve the quality of the goods created. A person in a high-tech society must be prepared for these changes. Education and its ICT-based component should play a key role in this training.

Gurevich RS (2014, p.11-15) pays considerable attention to the integration of disciplines and notes the expansion of the use of computer technology and related IT as a means of intensifying the study of all general education subjects. The author lists all types of educational activities in which the computer is used: lecturing, including electronic lectures with the dissemination of theoretical material through computer networks (which is actively used in the process of distance learning during the quarantine period 2020-21); conducting practical and seminar classes in which multimedia computer technologies become a means of developing skills; control and testing of knowledge and skills in various categories from current education to final knowledge; conducting audio and video conferences, exhibitions, as a

presentation of the results of achievements in the process of studying the subject using on-line and off-line technologies; as an independent work (with partial or full use of CT).

Modern education is not possible without a competency-based approach, when the formation of students' ability to act must precede the process of accumulation of any knowledge. Such an activity

approach in education can be implemented through the formation of students' key competencies as the most visible feature of European education.

In the first quarter of the XXI century we have objective conditions and trends in the development of digital civilization (Fig. 2). Ukraine, like the whole world, is on the path of formation and development of the information society.

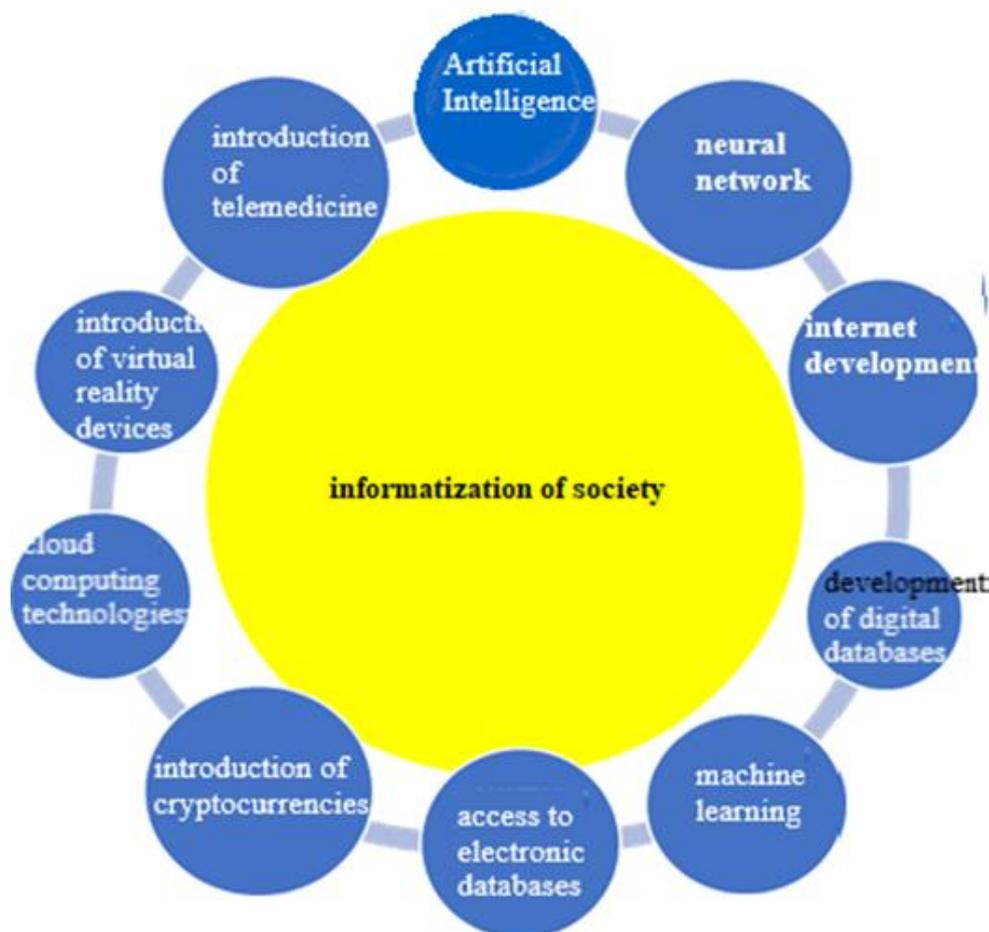


Fig. 2. Objective reasons for the development of informatization of education in the XXI century

How fast we will go depends on the digitalization of education, which is a definite requirement of the time. V. Bykov (2020, p.28) defines the informatization of education as a structure of interacting processes: legal, organizational, social, economic, educational, methodological, scientific and technical, production and management. The result of their interaction is to meet the needs associated with the introduction of information and communication technologies in the educational process, as well as their scientific and methodological support.

According to the report of the World Economic Forum (World Economic Forum, 2019), the level of ICT competencies and digital competencies of the population remains low in Ukraine. Compared to world indicators, our position in the category "Digital skills among the active population", which includes, for example, computer skills, digital reading,

is quite low (56th place among 141 countries). This indicator has deteriorated during the study period (previous position 55) and is mostly a reflection of archaic approaches to learning (World Economic Forum, The Global Competitiveness Report 2019, p 572, index 6.05, 2021).

Most educators, as subjects of the pedagogical process and pedagogical activity, are not interested in the use of progressive ICT. This problem needs to be addressed, as assessing society's digital capacity is key to the competitiveness of a country's economy. Necessary cooperation and response of education to the urgent needs of the digital society, development of practical and effective examples of experience in ICT, its evaluation and promotion.

In Ukraine, from 2020, in partnership with the Ministry of Digital Transformation, a free National Online Platform on Digital Literacy "Action. Digital

education ". On this platform there is a section "Digital skills for teachers". Its purpose is to teach teachers to use online tools in order to increase the efficiency of the educational process, to make it exciting (Official Website of the Ministry of Education and Science of Ukraine, 2021). Within the framework of this educational platform, the review educational series "Quarantine: online services for teachers" (Official portal. Action. Digital education, 2021) is additionally posted.

It may be interesting to use the skills of computer games and the composition of their construction in the teaching of technological disciplines. In our society, the use of computer games is regarded as antisocial behavior and a waste of time. But we must take into account the fact – a generation has grown up for which this leisure industry has become the subject and tool of work. Today, the world offers methods for developing game disciplines or game design, focused on developing programs for the study of academic disciplines.

The methodology is based on a visual generalized block diagram, where the teaching of academic disciplines takes place according to the scheme and methods of game design. For example, there is a symbiosis of games as cyberculture, project activities and marketing Lugova TA (2021, p. 235) suggests the use of cyber environment technologies in the learning scheme. For example, the researcher cites the already known basis of the discipline in the form of a technological map of the methodological complex of the distance learning platform Moodle, with which today a large number of educational institutions are actively cooperating. The base of organizational and normative actions, from which the list of categories of occupations is formed, is perceived by students as a sequence of actions for controlling tasks (Luhova, 2021, p. 240). The author considers the sequence and structure of methodical development of game design-oriented disciplines. This method formalizes the discipline in accordance with the restrictions set by the basic regulations (description of the educational program, educational and qualification characteristics of graduates, employers' requests for general professional competencies; formalization of organizational requirements of the subject; gamification of the discipline model and its transformation into a playing field) .

As a result, through the development of game rules and their metaphorization, the plot and scenario of the game discipline are developed (Luhova, 2021, p. 248). More than three million scientific researches in the world are devoted to graphics and

game design in education, from which about 500 – domestic (Luhova, 2021, p.238, table 1).

Gamification – the use of games in non-game processes is popularly explained to participants in training on the above-mentioned national online platform for digital literacy "Action. Digital education ". Series of materials. hosted on a platform created with the support of ASBIS-Ukraine, which specializes in the distribution of products and solutions in the field of information and communication technologies from global suppliers, including Apple, Logitech, Prestigio Solutions, Microsoft (Official Portal. Action. Digital Power, 2021) .

The experimental base within the project of digital transformation "Digital State" was Liko-School and its teachers (Official portal. Action. Digital education, 2021). In the section "Interactive learning: tools and technologies for interesting lessons" teacher M. Lyutynska notes that gamification can affect the content of education and its quality. This is especially important in the world-wide distance learning environment during long-term quarantine. Teachers-experts of Liko-School widely use Classcraft, PowerPoint, Quick Start, LinguaLeo, LEGO Education WeDo, Simple city programs in the learning process.

Working with programs, using augmented reality are of interest and help to involve students in working on multidisciplinary projects by gamifying the educational process. This is an example of the work of talented and multifunctional specialists. As a result, critical thinking is formed, collaboration skills, communication skills are formed and creativity is developed.

Student Minecraft-distance project work, built in such a system of education, allows you to combine the features of different school subjects and acquire skills in different areas of activity. As a result, a "symbiosis" of creativity and technical knowledge is provided, and in combination with the use of modern technology, a real STEM-revolutionary trend in the educational and professional spheres is realized (Official Portal. Action. Digital Education, 2021).

Simultaneously with this innovation, the introduction of the necessary health education measures and the formation of a set of knowledge of students on the safe use of ICT tools remains relevant.

Conclusions. The analysis of the processed sources, comparison of results of various scientific researches, generalization of the received information has allowed to come to a conclusion that information and communication technologies are necessary addition (and sometimes and replacement) of

traditional educational methods. In Ukraine, the process of studying and implementing the best world experience in the use of ICT in the educational process, building areas and ways to improve the content and forms of learning. Pilot tests of pedagogical innovations are being carried out, methods of teaching disciplines of the technological cycle and teacher training are being developed and improved. According to the "Law on Education", as a result of mastering the programs of the technological field of education, students have to master various competencies in the field of engineering and technology. It was found that, according to the Incheon Declaration

"Education 2030", strengthening the education system is not possible without providing access to information using ICT (informatization of society should be based on the informatization of education). The New Ukrainian School program aims to provide students with the knowledge, skills and abilities that they will be able to use in real life, and among the important key skills is the mastery of ICT. Therefore, the informatization of education should be considered as an important component of the development of the information society of Ukraine and an effective way to prepare students for future professions of high-tech society.

List of references

Биков, В. Ю., Спірін, О.М. та Пінчук, О.П., 2017. Проблеми та завдання сучасного етапу інформатизації освіти. В: Кремень, В. Г., ред. *Наукове забезпечення розвитку освіти в Україні: актуальні проблеми теорії і практики (до 25-річчя НАПН України)*. Київ: Національна академія педагогічних наук України, с. 191-198.

Биков, В. Ю., Спірін, О.М. та Пінчук, О.П., 2020. Сучасні завдання цифрової трансформації освіти. *Вісник Кафедри ЮНЕСКО «Неперервна професійна освіта XXI століття»*, 1, с.27-36. DOI: <https://doi.org/10.35387/ucj> [Дата звернення 05 Травень 2021].

Вильямс, Р. та Маклін, К., 1985. *Комп'ютери в школі*. М.: Прогресс.

Гуревич, Р.С., 2014. Сучасні комп'ютерні технології як засіб інтердисциплінарного навчання. В: *Актуальні проблеми навчання, виховання та розвитку учнів загальноосвітньої школи*. Київ-Вінниця: Інститут педагогічної освіти і освіти дорослих НАПН України, Вінницький державний педагогічний університет ім. М. Коцюбинського, 40, с.11-15.

Міністерство освіти і науки України, 2020. Державний стандарт повної загальної середньої освіти, затверджений Постановою КМУ від 30.09.2020 року № 898, [online] (Останнє оновлення 02 Жовтень 2020) Доступно: <https://mon.gov.ua/ua/news/oprilyudneno-derzhavnij-standart-bazovoyi-serednoyi-osviti> [Дата звернення 31 Березень 2021].

Дичківська, І. М., 2012. Інноваційні педагогічні технології. Київ: Академвидав.

Дія. Цифрова держава, 2021a. [online] Доступно: <https://plan2.diiia.gov.ua/> [Дата звернення 30 Березень 2021].

Дія. Цифрова держава, 2021b. [online] Доступно: <https://osvita.diiia.gov.ua/courses/online-services-for-teachers> [Дата звернення 30 Березень 2021].

Дія. Цифрова освіта, 2021. [online] Доступно: <https://osvita.diiia.gov.ua/> [Дата звернення 30 Березень 2021].

Закон України «Про освіту» від 05.09.2017 № 2145-VIII, 2017. Київ: Відомості Верховної Ради України.

Інчхонська декларація: концепція розвитку освіти до 2030 року, 2015. [online] Доступно: <https://pon.org.ua/international/4171-inchxonska-deklaraciya-koncepciya-rozvitku-osviti.html> [Дата звернення 01 Березень 2021].

Інтерактивне навчання: інструменти та технології для цікавих уроків. *Оглядний освітній серіал про інновації в навчанні*, 2021. [online] Доступно: <https://osvita.diiia.gov.ua/courses/interactive-learning> [Дата звернення 05 Березень 2021].

Коронавірус та освіта: аналіз проблем і наслідків пандемії, 2020. [online] Доступно: <https://cedos.org.ua/uk/articles/koronavirus-ta-osvita-analiz-problem-i-naslidkiv-pandemii> [Дата звернення 25 Листопад 2020].

Кизим, М. О., Матюшенко, І. Ю. та Шостак, І. В., 2012. *Перспективи розвитку інформаційно-комунікаційних технологій і штучного інтелекту в економіках країн світу та України*. Харків: «Інжек».

Лугова, Т.А., 2021. Геймдизайн орієнтований підхід до розробки навчальних дисциплін закладів вищої освіти. *Інформаційні технології і засоби навчання*. [online] Доступно: <http://journal.iitta.gov.ua/index.php/itlt/article/view/3265/1770> [Дата звернення 03 Березень 2021].

Нова українська школа, 2018. [online] Доступно: <https://mon.gov.ua/ua/tag/nova-ukrainska-shkola> [Дата звернення 25 Лютий 2021].

Носенко, Т.І. *Інформаційні технології навчання*, 2011. Київ: ун-т ім. Бориса Грінченка.

Цифрові навички для вчителів, 2021. [online] Доступно: <https://osvita.diiia.gov.ua/courses/serial-iz-tyfrovoi-hramotnosti-dlia-vchyteliv> [Дата звернення 12 Лютий 2021].

Швачич, Г.Г., Толстой, В.В., Петречук, Л.М., Івашенко, Ю.С., Гуляєва, О.А. та Соболєнко, О.В., 2017. *Сучасні інформаційно-комунікаційні технології*. Дніпро: НМетАУ.

World Economic Forum. The Global Competitiveness Report, 2019. [online] Доступно: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf [Дата звернення 05 Лютий 2021].

Translated & Transliterated

Bykov, V.Y., Spirin, O.M. ta Pinchuk, O.P., 2017. Problemy rozvytku suchasnoho etapu informatyzatsiyi osvity [Problems and tasks of the modern stage of informatization of education]. V: *Naukove zabezpechennia rozvytku osvity v Ukraini: aktualni problemy teori i praktyky (do 25-richchia NAPN Ukrainy)* [Scientific support of education development in Ukraine: current issues of theory and practice (to the 25th anniversary of the NAPS of Ukraine)], s. 191–198, [in Ukrainian].

Bykov, V.Y., Spirin, O.M. ta Pinchuk, O. P., 2020. Suchasni zavdannya tsyfrovoyi transformatsiyi osvity [Modern tasks of digital transformation of education]. DOI: [https://doi.org/10.35387/ucj.1\(1\)](https://doi.org/10.35387/ucj.1(1)), s. 27-36, [in Ukrainian].

Vilyams, R. ta Maklin, K., 1985. *Kompyuteryi v shkole* [Computing in schools]. M.: Progress, [in Ukrainian].

Hurevych, R.S., 2014. Cuchasni kompiuterni tekhnolohii yak zasib interdystsyplinarnoho navchannia [Modern computer technologies as a means of interdisciplinary learning]. V: *Aktualni problemy navchannia, vykhovannia ta rozvytku uchniv zahalnoosvitnoi shkoly* [Actual problems of training, education and development of students of secondary school]. Kyiv-Vinnytsia: Instytut pedahohichnoi osvity i osvity doroslykh NAPN Ukrainy, Vinnytskyi derzhavnyi pedahohichnyi universytet im. M. Kotsiubynskoho, 40, s.11-15, [in Ukrainian].

Ministerstvo osvity i nauky Ukrainy [State standard of complete general secondary education], 2020. Derzhavnyi standart povnoi zahalnoi serednoi osvity, zatverdzenyi Postanovoiu KМУ vid 30.09.2020 roku № 898 [Resolution of the Cabinet of Ministers № 898 of September 30, 2020], [online] (Ostannie onovlennia 02 Zhovten 2020) Dostupno:<https://mon.gov.ua/ua/news/oprilyudneno-derzhavnij-standart-bazovoyi-serednoyi-osviti> [Data zvernennia 31 Berezen 2021], [in Ukrainian].

Dychkivska, I., 2012. Innovatsiyini pedahohichni tekhnolohiyi: pidruchnyk [Innovative pedagogical technologies]. Kyiv: Akademvidav, [in Ukrainian].

Diya. Tsyfrova derzhava [Action. Digital state, 2021. [online] Dostupno: <https://plan2.diia.gov.ua/> [Data zvernennia 30 Berezen 2021], [in Ukrainian].

Diya. Tsyfrova osvita [Action. Digital education], 2021a [online] Dostupno: <https://osvita.diia.gov.ua/courses/online-services-for-teachers> [Data zvernennia 30 Berezen 2021], [in Ukrainian].

Diya. Tsyfrova osvita [Action. Digital education], 2021b.[online] Dostupno: <https://osvita.diia.gov.ua/> [Data zvernennia 30 Berezen 2021], [in Ukrainian].

Zakon Ukrainy «Pro osvitu» vid 05.09. 2017 № 2145-VIII, 2017. [Law of Ukraine "On Education" Law of Ukraine of 05.09.2017 no. 2145-VIII]. Kiev: Vidomosti Verkhovnoyi Rady Ukrainy [Vedomosti of the Supreme Council of Ukraine], 38-39, s. 380, [in Ukrainian].

Inchkhonska deklaratsiia: kontseptsiiia rozvytku osvity do 2030 roku [Incheon Declaration: the concept of education development until 2030], 2015. [online] Dostupno: <https://pon.org.ua/international/4171-inchkhonska-deklaraciya-koncepciya-rozvitku-osviti.html> [Data zvernennia 01 Berezen 2021].

Interaktyvne navchannya: instrumenty ta tekhnolohiyi dlya tsikavykh urokiv. Ohlyadovyy osvityniy serial pro innovatsiyi v navchanni [Interactive learning: tools and technologies for interesting lessons. Review educational series about innovations in learning]. [online] Dostupno: <https://osvita.diia.gov.ua/courses/interactive-learning> [Data zvernennia 05 Berezen 2021], [in Ukrainian].

Koronavirus ta osvita: analiz problem i naslidkiv pandemiyi [Coronavirus and education: analysis of the problems and consequences of a pandemic]. [online] Dostupno: <https://cedos.org.ua/uk/articles/koronavirus-ta-osvita-analiz-problem-i-naslidkiv-pandemii> [Data zvernennia 25 Lystopad 2020], [in Ukrainian].

Kizim, M., Matyushenko, U. and Shostak, I., 2012. *Perspektyvy rozvytku informatsiyno-komunikatsiynykh tekhnolohiy i shtuchnoho intelektu v ekonomikakh krayin svitu ta Ukrainy* [Prospects for the development of information and communication technologies and artificial intelligence in the economies of the world and Ukraine]. Kharkiv: Inzhhek, [in Ukrainian].

Lugova, T., 2021. Heymdyzayn oriyentovanyu pidkhid do rozrobky navchal'nykh dystsyplin zakladiv vyshchoyi osvity [Game design-oriented approach to the development of academic disciplines of higher education institutions]. Informatsiyni tekhnolohiyi i zasoby navchannya [Information technologies and teaching aids.], 16. [online] Dostupno: <http://journal.iitta.gov.ua/index.php/itlt/article/view/3265/1770> [Data zvernennia 05 Berezen' 2021], [in Ukrainian].

Nova ukrainska shkola [New Ukrainian school], 2018. [online] Dostupno: <https://mon.gov.ua/ua/tag/nova-ukrainska-shkola> [Data zvernennia 25 Liutyi 2021], [in Ukrainian].

Nosenko, T.I. Informatsiini tekhnolohii navchannya [Information technologies of training: the initial manual], 2011. Kyiv: un-t im. Borysa Hrinchenka, [in Ukrainian].

Tsyfrovi navychky dlya vchyteliv [Digital skills for teachers]. [online] Dostupno: <https://osvita.diia.gov.ua/courses/serial-iz-tsyfrovoi-hramotnosti-dlia-vchyteliv> [Data zvernennia 12 Lyutyi 2021], [in Ukrainian].

Shvachych, H.H., Tolstoy, V.V., Petrechuk, L.M., Ivashchenko, Y.S., Hulyayeva, O.A. and Sobolenko, O.V., 2017. Suchasni informatsiyno-komunikatsiyni tekhnolohiyi [Modern information and communication technologies]. Dnipro, 230 p., [in Ukrainian].

World Economic Forum. The Global Competitiveness Report 2019. [online] Dostupno: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf [Data zvernennia 05 Lyutyi 2021], [in English].

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ДОСЛІДЖЕННЯ ТЕОРЕТИЧНИХ АСПЕКТІВ ВИКОРИСТАННЯ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ У ТЕХНОЛОГІЧНІЙ ОСВІТНІЙ ГАЛУЗІ

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Реферат:

Актуальність статті зумовлена необхідністю вивчення теоретичних засад цифровізації технологічної освіти з урахуванням вимог сучасного цифрового суспільства.

Мета: обґрунтувати особливості застосування ІКТ в технологічній освітній галузі в умовах соціальної і цифрової трансформації сучасного суспільства.

Методи: загально-логічні методи дослідження з проведенням аналізу, порівняння, узагальнення опрацьованих джерел (нормативно-правових документів, наукових статей, навчальних посібників, офіційних інтернет-ресурсів) з метою вивчення зв'язку між розвитком інформаційних технологій та їхнім використанням у процесі вивчення технологічних дисциплін.

Результати: досліджено освітнє законодавство, на основі якого здійснюється впровадження комп'ютерних технологій у процесі викладання технологічних дисциплін; розглянуто основні проблеми цифровізації технологічної освіти в умовах становлення цифрового суспільства; визначено ключові та «ІКТ-компетентності», необхідні для забезпечення даного розвитку.

Висновки: з'ясовано, що соціальна й цифрова трансформація сучасного суспільства зумовлюють необхідність внесення змін до методики викладання навчальних дисциплін технологічного циклу;

показано, що серед інноваційних методів навчання найбільш оптимальними для застосування у процесі викладання технологічних дисциплін можуть бути гейміфікація, віртуальне освітнє середовище та інноваційні програмні продукти як засоби досягнення поставленої освітньої мети; доведено, що вдосконалення методики викладання дисциплін технологічного циклу сприятиме підготовці здобувачів освіти до реалізації набутих умінь і навичок у житті, підвищенню їх мобільності на динамічних ринках праці.

Ключові слова: *інформаційно-комунікаційні технології, інформаційно-комунікаційні компетентності, інформаційні технології навчання, цифрове суспільство, інноваційні методи навчання, ключові уміння в технологічній освітній галузі, гейміфікація освітнього процесу.*

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