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FORMATION OF INFORMATION AND TECHNOLOGICAL COMPETENCE OF FUTURE COMPUTER SCIENCE TEACHERS IN THE PROCESS OF PROFESSIONAL TRAINING

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The article examines the problem of developing information and technological competence of future computer science teachers in the context of modern challenges of society and in the process of their professional training. It is stated that the modernization of higher pedagogical education requires changing the requirements for the professional activities of teachers through the important direction of modernizing the new Ukrainian school of informatization because the introduction of computer technologies into the school work system requires professional information technology competence among teaching staff and, in particular, computer science teachers, which actualizes the problem of professional information technology training of computer science teachers in the context of transformational changes in modern higher pedagogical education.

The pedagogical conditions that ensure the effective formation of information and technological competence of a future computer science teacher are substantiated. They include the focus of the content of the theory and practice of training future computer science teachers on the formation of motivation for such a process; creation of a modern educational and information environment based on traditional and innovative forms and methods of conducting classes, extracurricular activities and independent work. The professional information technology competence of a future computer science teacher is understood as their ability (readiness) to solve professional information technology problems; the totality of these tasks is determined by modern directions of professional information and technological activity of a modern computer science teacher. It is noted that the information and technological competence of a modern computer science teacher presupposes the ability to solve the following professional tasks: professional tasks in the field of pedagogical management (tasks of

an organizational, administrative, communication, and gnostic nature), determined by information technology activities within the school information space; professional basic pedagogical tasks determined by information and technological activities related to the organization of education for general school students using computer technologies; professional tasks associated with teaching information technology and computer science to secondary school students, as well as with the implementation of the information technology activity of a computer science teacher, determined by new state educational standards. It is concluded that the information and technological competence of a computer science teacher determines their ability to solve professional problems in situations of direct teaching activity and presupposes the presence of didactic knowledge and skills to effectively use modern technical means and computer technologies to achieve the goals of secondary school education, in particular, variable use of working methods with electronic sources of information when solving problems of professional growth; independent study of new software products, determining the feasibility of their use in solving problems of professional growth; comprehensive interaction with Internet services and resources to implement professional development; implementation of information retrieval; use of Internet resources in self-educational activities; variable use of standard software for recording the results of self-educational activities

Key words: *information technology competence, computer science teacher, information and communication technologies, professional training.*

Statement of the problem in general terms and its connection with important scientific and practical problems. Our state pays great attention to the formation of personality, organically integrated into the modern world. In order to modernize the general education system, secondary education is at the stage of reform. The Ministry of Education and Science of Ukraine is introducing the concept of the “New Ukrainian School”, the goal of which is noted, “The central place in the education system belongs to the secondary school. Unlike a university, at school it is possible to level out the imbalance in children’s development. Worldview is formed in the family and school. At school, a personality, its civic position and moral qualities are formed. Here it is decided whether a person will want and be able to study throughout their life” (Андрущенко, 2005).

This requires training future specialists of a new formation with a high level of general culture, professional knowledge and information and technological competence, with a developed technological worldview, an algorithmic type of

thinking, formed by the values of technoethics, which determine the level of technological culture as cultural, spiritual and professional (Пехора, 2012).

An analysis of recent studies and publications that provide a solution to this problem, and on which the author relies. This problem is one of the most pressing in many fields of science and is reflected in the research and publications of both foreign and domestic scientists. Thus, the conceptual foundations of professional training of future specialists were studied by scientists: R. Gurevich, A. Dubasenyuk, A. Galus, A. Ligotsky, G. Ponomareva, I. Romanishina, L. Khomich, I. Shorobura, J. Tsekhmister, etc., issues of training future specialists in the context of psychological and pedagogical education – I. Bekh, V. Davydov, L. Kondrashova, A. Pehota, S. Podmaziny, V. Rybalko and others.

Scientists such as V. Bykov, L. Belousova, M. Zhaldak, M. Lapchik, N. Morse, S. Rakov, Yu. Ramsky, M. Rafalskaya, S. Semerikov devoted their work to the scientific advancement of professional training of computer science teachers as well as I. Smirnova-Tribulskaya, O. Spivakovsky, O. Spirin, Y. Trius, M. Umrik and others.

However, the problem of developing information and technological competence of future computer science teachers has not been sufficiently covered in scientific works, despite its significance for the theory and practice of vocational education, which is associated with the need to increase the efficiency of information and technological activities of a modern computer science teacher and insufficient scientific and methodological knowledge. ensuring this process.

Isolation of previously unsolved parts of the general problem to which this article is devoted. Formulation of the objectives of the article (statement of the problem). The purpose of the article is to determine the pedagogical conditions that contribute to ensuring the effective and high-quality formation of information technology competence of future computer science teachers in professional training.

An important factor in the successful implementation of the tasks of high-quality professional training of future teachers, which makes it possible to intensify the cognitive activity of applicants for higher education, is the high level of their technological culture, which ensures the effectiveness and efficiency of the professional activity of a modern teacher (Морзе, 2003). The main reasons hindering this process are the lack of updated scientific and methodological support and organizational and pedagogical conditions, the implementation of which in the practice of higher pedagogical educational institutions should ensure high-quality training of future computer science teachers and the effective development of their information and technological competence.

The Ukrainian Pedagogical Dictionary defines pedagogical conditions as pedagogical techniques, forms, methods and means of implementing the

educational process (Український педагогічний словник, 1997, с. 779). The Encyclopedia of Education interprets pedagogical conditions as a system of specially created forms, methods, material conditions, real situations necessary to achieve a specific goal (Енциклопедія освіти, 2008, с. 1040). The modern explanatory dictionary of the Ukrainian language defines pedagogical conditions as the environment or circumstances under which this or that phenomenon, process appears, exists and develops (Сучасний тлумачний словник, 2009, с. 235).

Justifying the pedagogical conditions for the formation of information and technological competence of future computer science teachers in accordance with the analysis of scientific sources and relying on the substantive characteristics of the phenomenon of technological culture as a holistic integrative professionally significant education in the personality structure of the future computer science teacher, which represents a developed technological worldview, algorithmic thinking, a set of professional knowledge and competencies in the use of pedagogical, information and communication technologies and interactive learning tools in professional activities and determines the information and technological readiness and cultural and spiritual level of a modern teacher, we consider pedagogical conditions as purposefully organized circumstances and opportunities for the formation of information and technological competence of future computer science teachers, to increase the effectiveness of organizing the educational process of a pedagogical institution of higher education and the effectiveness of professional training of future computer science teachers (Роганов, 2015).

In the context of the study, we have identified the following pedagogical conditions for the formation of information and technological competence of future computer science teachers, such as the focus of the content of the theory and practice of training future computer science teachers on the formation of motivation for such a process; creation of a modern educational and information environment based on traditional and innovative forms and methods of conducting classroom, extracurricular activities and independent work.

The first organizational and pedagogical condition is the focus of the content of the theory and practice of training future computer science teachers on the formation of motivation for such a process, ensuring the focus of the professional training of future computer science teachers on the formation of sustainable motivation to master professionally significant information technology knowledge and skills in the use of information and communication technologies in professional activities (Гуревич, 2006). The first condition is implemented at the motivational-target stage of formation of information and technological competence of future computer science teachers, which coincides with the period of professional self-determination of students and contributes to the formation and

development of an ever-growing interest among future teachers in mastering their chosen profession. To create a high degree of motivation to master technological culture, students must not only be aware of the goals and personal meaning of their professional activities, but also subordinate other forms and interests of their employment to the implementation of assigned tasks, possess the skills of self-organization and self-control of the distribution and implementation of educational activities (Семиченко, 2004).

The second pedagogical condition for creating a modern educational and information environment based on traditional and innovative forms and methods of conducting classroom, extracurricular activities and independent work is implemented at the reflective-corrective stage of the formation of technological culture, aimed at developing students' reflective skills and adequate self-esteem in the formation. with subsequent adjustment, the desire for professional self-development and self-realization as a computer science teacher that meets the reflective and creative criterion (Лодатко, 2015).

The content of the process of forming information and technological competence of future computer science teachers contains two main directions: development of the relevant competencies of the future specialist; the formation of the personality of a computer science teacher as an educated, technologically developed, highly cultural person. The implementation of the second condition was ensured by the holistic educational process of preparing a future computer science teacher. Teaching, project method, educational dialogue, brainstorming, sparring, situation modeling, case method, group discussion of creating a situation of success, colloquium); various forms: classroom: binary lecture, lectures with consideration of professional situations, interactive lecture, lecture-messages, lecture-visualizations, workshops, webinar, master classes, video conferences, business games); extracurricular: briefing, forum, chat, video conference, virtual consultation, debates, virtual tutorial, discussions, disputations, trainings, participation in online community projects, simulation games; self-education: coaching, scientific project work, scientific and practical, defense of an innovative project, portfolio method, delegation of authority, internship; means: multimedia and information and communication systems, electronic textbooks, electronic interactive whiteboards, simulators, etc.

This stage is a period of methodological and creative formation of future computer science teachers, providing students with the knowledge necessary for the methodologically competent implementation of information and communication technologies and interactive learning tools in a modern Ukrainian school, students mastering educational material in the process of self-education, developing students' skills to implement a creative approach to learning schoolchildren's cultural and moral behavior in the modern educational and

information environment. The forms of work to implement the fourth pedagogical condition are such as: research work on a diploma project, teaching practice, self-educational activities, participation in international projects, which ensured systematization and reflection of the assimilation of competencies and competencies, which ensured the formation of the self-regulatory component (reflective and creative criterion) information technology competence.

The outlined blocks of the functional-content model of the organizational-methodological system for the formation of information and technological competence of future computer science teachers are in close interrelation and assume their stage-by-stage (motivational-target, information-technological and effective-corrective stages) complex implementation in a holistic, implementable process of higher education, which should contribute to: the formation of basic concepts in the field of technologization and informatization of education, the development of the information environment of the pedagogical higher education institution; developing the ability to design and implement the educational process and professional contacts in teaching activities; expanding the scope of application of modern means of information and communication technologies based on interactive, network, mobile and multimedia technologies for the professional activity of the future computer science teacher; adaptation of a computer science teacher to carrying out professional activities in the information environment of a dynamically developing higher pedagogical educational institution; the formation of ways to carry out professional actions when solving general didactic and methodological problems using information and communication technologies and interactive learning tools (Колас, 2011).

A certain set of pedagogical conditions for the formation of information and technological competence of future computer science teachers through their stage-by-stage (motivational-target, information-technological and effective-corrective stages) integrated implementation in the holistic educational process of a pedagogical institution of higher education ensured the formation of sustainable motivation for the future profession, arming with a knowledge system on the use of information and communication technologies and interactive learning tools in education; formation of a knowledge system about methods of development and use of electronic educational resources, taking into account didactic, technical, technological and ergonomic-physiological requirements; formation of information and communication competencies and technological skills to apply interactive teaching methods in teaching practice based on reflective skills and adequate self-esteem; mastering the technology of using basic and specialized software for the development and use of electronic educational resources; creating conditions for mastering the experience of development, expert assessment, sharing and use of electronic educational resources in the professional and

pedagogical activities of computer science teachers; consolidating the use of information and communication technologies and interactive learning tools with schoolchildren in the process of teaching practice; work on self-education and self-improvement of information technology education in improving the pedagogical skills of students.

Conclusions. Thus, the development and phased implementation of pedagogical conditions, the content of each stage reflected the strategic goal of the educational process in the institution of higher pedagogical education for the professional training of computer science teachers, contributed to the solution of key tasks in the formation of their technological culture, namely: ensures the formation of basic concepts in the field technologization and informatization of education, development of the information environment of a pedagogical institution of higher education; developing the ability to design and implement the educational process and professional contacts in teaching activities; expanding the scope of application of modern means of information and communication technologies based on interactive, network, mobile and multimedia technologies for the professional activity of the future computer science teacher; adaptation of a computer science teacher to carrying out professional activities in the information environment of a dynamically developing higher pedagogical educational institution; the formation of ways to carry out professional actions when solving general didactic and methodological problems using information and communication technologies and interactive learning tools.

Література

1. Андрущенко В. П. Головне це модернізація змісту педагогічної освіти. *Вища школа*, 2005. № 1. С. 32-40.
2. Биков В. Ю. Методичні системи сучасних інформаційно-освітніх технологій. *Проблеми та перспективи формування національної гуманітарно-технічної еліти* : зб. наук. праць / за ред. Л. Л. ТОВАЖЯНСЬКОГО та О. Г. РОМАНОВСЬКОГО. Харків : НТУ «ХПІ», 2002. Вип. 3. С. 73–83.
3. Морзе Н. В. Система методичної підготовки майбутніх вчителів інформатики в педагогічних університетах : дис. ... доктора пед. наук: 13.00.02. Київ, 2003. 600 с.
4. Пехота О. М. Формування технологічної культури сучасного викладача як складової його педагогічної майстерності. *Естетика і етика педагогічної дії*, 2012. Вип. 3. С. 165–180.
5. Роганов М. В. Технологічна культура вчителя: психолого-педагогічний аспект. *Багатоманітність культур як педагогічна проблема*: зб. наук. статей. Бердянський державний педагогічний університет. Бердянськ, 2015. С. 242–245.
6. Семиченко В. А. Проблеми мотивації поведінки і діяльності людини. Модульний курс психології. Модуль «Спрямованість» (Лекції, практичні заняття, заняття для самостійної роботи). Київ. Міленіум, 2004. 521 с.

7. Український педагогічний словник. Київ : Либідь, 1997. 376 с.
8. Енциклопедія освіти / гол. ред. Кремень В. Київ : Юрінком Інтер, 2008. 1040 с.
9. Сучасний тлумачний словник української мови : 100 000 слів / укл. Н. Д. Кусайкіна, Ю. С. Цибульник; за заг. ред. В. В. Дубічинського. Харків, 2009. 1008 с.
10. Лодатко С. Інформаційно-технологічна компетентність як основа підготовки майбутніх інженерів-педагогів до розвитку технічної творчості учнів. *Молодь і ринок*, 2015. № 7. С. 13-16.
11. Колос Ю. З. Формування інформаційно-технологічної компетентності у процесі профільного навчання. *Вісник Черкаського університету*, 2011. Вип. 201. Ч. II. Серія "Педагогічні науки". С. 35 – 38.
12. Добровольська А. М. Формування ІТ-компетентності майбутніх фахівців в межах реалізації моделі педагогічної системи. *Молодий вчений*, 2017. № 5. С. 312-324.
13. Гуревич Р. С. Використання інформаційних технологій у навчальному процесі. Вінниця: ТОВ «Діло», 2006. 296 с.
14. Гуржій А. М. Дискусійні питання інформаційно-комунікаційної компетентності: міжнародні підходи та українські перспективи. *Інформаційні технології в освіті*, 2013. № 15. С. 38-43.

References

1. Andrushchenko, V. P. (2005). Holovne tse modernizatsiia zmistu pedahohichnoi osvity [The main thing is the modernization of the content of pedagogical education]. *Vyshcha shkola. №1*. S. 32-40 (ukr).
2. Bykov, V. Yu. (2002). Metodichni systemy suchasnykh informatsiino-osvitnikh tekhnolohii [Methodical systems of modern information and educational technologies]. *Problemy ta perspektyvy formuvannia natsionalnoi humanitarno-tekhnichnoi elity : zb. nauk. prats / za red. L. L. Tovazhnianskoho ta O. H. Romanovskoho*. Kharkiv : NTU «KhPI». Vyp. 3. S. 73–83 (ukr).
3. Morze, N. V. (2003). Systema metodychnoi pidhotovky maibutnikh vchyteliv informatyky v pedahohichnykh universytetakh : dys. ... doktora ped. nauk: [The system of methodical training of future informatics teachers in pedagogical universities: diss. ... doctor of pedagogy of science]. 13.00.02. Kyiv (ukr).
4. Piekhota, O. M. (2012). Formuvannia tekhnolohichnoi kultury suchasnoho vykladacha yak skladovoi yoho pedahohichnoi maisternosti [Formation of the technological culture of a modern teacher as a component of their pedagogical skills]. *Estetyka i etyka pedahohichnoi dii*. Vyp. 3. S. 165–180 (ukr).
5. Rohanov, M. M. (2015). Tekhnolohichna kultura vchytelia: psykhologo-pedahohichnyi aspekt [Teacher's technological culture: psychological and pedagogical aspect] Bahatomanitnist kultur yak pedahohichna problema : zb. nauk. statei / Berdianskyi derzhavnyi pedahohichnyi universytet. Berdiansk. S. 242–245 (ukr).
6. Semychenko, V. A. (2004). Problemy motyvatsii povedinky i diialnosti liudyny [Problems of motivation of human behavior and activity]. Modul «Spriamovanist» (Lektsii, praktychni zaniattia, zaniattia dlia samostiinoi roboty). Kyiv. Milenium (ukr).

7. Ukrainskyi pedahohichnyi slovnyk [Encyclopedia of education] (1997) / ch. ed. Kremen V. Kyiv : Lybid (ukr).
8. Entsyklopediia osvity [Encyclopedia of Education] (2008) / hol. red. Kremen V. Kyiv : Yurinkom Inter (ukr).
9. Suchasnyi tlumachnyi slovnyk ukraïnskoi movy 100 000 sliv [Modern explanatory dictionary of the Ukrainian language: 100,000 words] (2009) / ukl. N. D. Kusaikina, Yu. S. Tsybulnyk; za zah. red. V. V. Dubichynskoho. Kharkiv (ukr).
10. Lodatko, Ye. (2015). Informatsiino-tekhnologichna kompetentnist yak osnova pidhotovky maibutnikh inzheneriv-pedahohiv do rozvytku tekhnichnoi tvorchosti uchniv [Information technology competence as a basis for training future engineer-pedagogues for the development of students' technical creativity]. *Molod i rynek. № 7. S. 13-16* (ukr).
11. Kolos, Yu. Z. (2011). Formuvannia informatsiino-tekhnologichnoi kompetentnosti u protsesi profilnoho navchannia [Formation of information and technological competence in the process of specialized training]. *Visnyk Cherkaskoho universytetu. Vyp. 201. Ch. II. Seriia "Pedahohichni nauky". S. 35–38.* (ukr).
12. Dobrovolska, A. M (2017). Formuvannia IT-kompetentnosti maibutnikh fakhivtsiv v mezhakh realizatsii modeli pedahohichnoi systemy [Formation of IT competence of future specialists within the framework of the implementation of the pedagogical system model]. *Molodyi vchenyi. № 5. S. 312-324* (ukr).
13. Hurevych, R. S. (2006). Vykorystannia informatsiinykh tekhnolohii u navchalnomu protsesi [Use of information technologies in the educational process]. R. S. Hurevych, M. Yu. Kademiiia, Yu. V. Badiuk, L. S. Shevchenko. Vinnytsia: TOV «Dilo» (ukr).
14. Hurzhii, A. M. (2013). Dyskusiini pytannia informatsiino-komunikatsiinoi kompetentnosti: mizhnarodni pidkhody ta ukraïnski perspektyvy [Discussion issues of information and communication competence: international approaches and Ukrainian perspectives]. *Informatsiini tekhnolohii v osviti. № 15. S. 38-43* (ukr).

ФОРМУВАННЯ ІНФОРМАЦІЙНО-ТЕХНОЛОГІЧНОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ УЧИТЕЛІВ ІНФОРМАТИКИ У ПРОЦЕСІ ПРОФЕСІЙНОЇ ПІДГОТОВКИ

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У статті розглянута проблема формування інформаційно-технологічної компетентності майбутніх учителів інформатики в контексті сучасних викликів суспільства і процесі їх професійної підготовки; констатується, що модернізація вищої педагогічної освіти вимагає зміни вимог до професійної діяльності вчителя через важливий напрям модернізації нової української школи – інформатизацію, адже впровадження комп'ютерних технологій у систему роботи школи потребує наявності професійної інформаційно-технологічної компетентності у педагогічних кадрах і, зокрема, вчителів інформатики, що актуалізує проблему професійної інформаційно-технологічної підготовки вчителя інформатики у контексті трансформаційних змін сучасної вищої педагогічної освіти.

Обґрунтовано педагогічні умови, що забезпечують ефективне формування інформаційно-технологічної компетентності майбутнього учителя інформатики: спрямованість змісту теорії і практики підготовки майбутніх учителів інформатики на формування мотивації до такого процесу; створення сучасного освітньо-інформаційного середовища на основі традиційних і інноваційних форм і методів проведення аудиторних, позааудиторних занять і самостійної роботи. Під професійною інформаційно-технологічною компетентністю майбутнього вчителя інформатики розуміється його здатність (готовність) вирішувати професійні інформаційно-технологічні завдання; сукупність даних завдань визначається сучасними напрямками професійної інформаційно-технологічної діяльності сучасного вчителя інформатики. Зазначено, що інформаційно-технологічна компетентність сучасного вчителя інформатики передбачає вміння вирішувати такі професійні завдання: професійні завдання у галузі педагогічного менеджменту (завдання організаційного, адміністративного, комунікаційного, гностичного характеру), що визначаються інформаційно-технологічною діяльністю в рамках шкільного інформаційного простору; професійні базові педагогічні завдання, які визначаються інформаційно-технологічною діяльністю, пов'язаною з організацією навчання учнів загальної школи з використанням комп'ютерних технологій; професійні завдання, пов'язані з навчанням інформаційних технологій та інформатики учнів середньої школи, а також з реалізацією напряду інформаційно-технологічної діяльності вчителя інформатики, що визначається новими державними освітніми стандартами.

Робиться висновок, що інформаційно-технологічна компетентність вчителя інформатики визначає його здатність вирішувати професійні завдання у ситуаціях безпосередньої педагогічної діяльності та передбачає наявність дидактичних знань та умінь ефективно використовувати сучасні технічні засоби та комп'ютерні технології для досягнення цілей середньої шкільної освіти, зокрема: варіативне використання способів роботи з електронними джерелами інформації під час вирішення завдань професійного зростання; самостійне вивчення нових програмних продуктів, визначення доцільності їх використання під час вирішення завдань професійного зростання; комплексна взаємодія зі службами та ресурсами Інтернету для реалізації професійного розвитку; реалізація інформаційного пошуку, використання ресурсів Інтернету в самоосвітній діяльності; варіативне використання стандартних програмних засобів для оформлення результатів самоосвітньої діяльності.

Ключові слова: інформаційно-технологічна компетентність, учитель інформатики, інформаційно-комунікаційні технології, професійна підготовка.

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