
MODERN INFORMATION AND COMMUNICATION TECHNOLOGIES FOR THE PROFESSIONAL TRAINING OF FUTURE TEACHERS



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Abstract. *The role of information and communication technologies in the professional training of future teachers is determined in the paper. The purpose of the article is to understand the problem of the application of modern information and communication technologies and to identify ways of their use in the professional training of future teachers. It defines such modern information and communication technologies for the professional training future teachers: Internet resources and services, systems of educational content management, social services and networks, mobile technologies, artificial intelligence technologies, multimedia, cloud technologies, and mass open distance courses. The article presents the analysis and description of possibilities of software for its application in the teacher professional activity. The usage of the educational content management system at educational institutions in the world and in Ukraine is outlined. The conclusion is made about the expediency of their systematic use through introduction and improvement of the implemented system of information and technological support, which includes professional and pedagogical, technical, managerial, criteria and productive such subsystems, in the professional training of future teachers at pedagogical universities.*

Key words: *information and communication technologies; future teachers; professional training; system of information and technological support.*

INTRODUCTION

Today, the importance of modern information and communication technologies in the society cannot be denied. According to Internet Live Stats, the International Real Time Statistics Project website data of August 2019 there are 4 billion Internet users, almost 2 billion websites, more than 2 billion active Facebook users, 730 million active Twitter users, about 250 active Pinterest users in the world. Every second, approximately 9,000 tweets are tweeted; more than 76,000 Google queries are searched; and more than 2 million emails are sent, about 77,000 GB of data are generated. Today, as noted by S. Savchenko and V. Kurylo, the main feature of the information society is the acquisition of basic social value and goods by information, the transformation of information products and services into the main object of production and consumption, the development

of high-tech information networks that allow people to get the unlimited access to information according to their own needs (Savchenko & Kurylo, 2019: p. 84).

Under such circumstances, education aims at preparation of the younger generation for the successful existence in the modern world of information and communication technologies. Teachers who teach modern children should help them solve problems and tasks that have arisen in this world: the information overload, the search for trustworthy information, protection of personal data and identity in the digital space, increasing information volumes, accelerating innovations, privacy, legal and ethical standards in the information society, etc. After all, a person who is not able to work with information and communication technologies will not be able to participate fully in the social, economic and cultural life.

In order to accomplish the task of preparing the younger generation for their life in today's information society, teachers must have a high level of knowledge of modern information and communication technologies. Their professional grounding should include not only specialized disciplines that involve the study of such technologies, but also the teaching of other disciplines should be carried out with their use. In this regard, the problem of application of modern information and communication technologies in the professional training of future teachers requires a new understanding.

LITERATURE REVIEW

A considerable amount of scientific work deals with the study of the problem of application of information and communication technologies in the professional training of future teachers. In foreign studies, scholars focus on the following issues: leadership of information technology for teacher education (N. Davis), implementation of web-based learning in colleges of education (D.W. Surry, A.G. Grubb, D.C. Ensminger, J. Ouimette), ICT in teacher education (Z. Zhang, D. Martinovic), teacher perspectives on technology (N. O'Haire), etc. D.W. Surry, A.G. Grubb, D.C. Ensminger, J. Ouimette in their research have noted that the use of web-based learning (WBL) has had a significant impact on higher education. Web-based learning allows colleges to increase their enrollment by attracting students from outside their local geographic area, reducing demand for facilities such as classrooms, parking, and computer labs, allowing colleges to stay competitive in the changing educational marketplace, and provide faculty and students with more flexible scheduling options (Surry, Grubb, Ensminger & Ouimette, 2009).

Ukrainian scientists covered the following aspects of the problem under consideration: the use of ICT in pedagogical education (A.M. Hura), the formation of ICT competences (L.V. Bazhan, N.V. Morze, M.V. Rafalska, O.V. Semenikhina, O.K. Vasylieva, A.O. Yurchenko), teacher willingness to use ICT (V.M. Andrievskaya, A.I. Prokopenko), preparation of teachers on the basis of ICT application (I.I. Kostikova, O.G. Naumenko, G.M. Naumenko), preparation of future teachers in terms of educational informatization (V.I. Bobrytska, R.S. Gurevich, V.S. Garkushevskiy, S.D. Tsvilyk), virtual (V.P. Oleksiuk), cloud (O.M. Kovalenko, M.V. Popel, N.V. Yaskova,) and multimedia (O.V. Kuchai) technologies in teacher training.

METHODOLOGY

The methodological basis of the study includes the analysis of published scientific and methodological works, the comparison of their contents, the hermeneutic and systematic approach to their interpretation, generalization, combined for possible conclusions. The purpose of the article is to understand the problem of the application of modern information and communication technologies and to determine the ways of their use in the professional training of future teachers. In order to achieve this purpose, the theoretical methods have been chosen as leading research

methods, in particular: the analysis of scientific literature, the structural analysis, the synthesis, the generalization for the search of expedient means of information and communication technologies of the professional training of future teachers; the forecasting to determine the further development of the theory and practice of teacher training in the information society.

MAIN RESULTS

Scientists identify resources and services of the Internet (V.Y. Bykov, V.V. Osadchyi), systems of educational content management (Y.M. Bogachkov), social services and networks (E.D. Patarakin, A.V. Yatsyshyn), mobile technologies (S.O. Semerikov, K.P. Osadcha), artificial intelligence (M.J. Timms, O.C. Santos), multimedia (R.S. Gurevich, O.V. Kuchai), cloud (S.H. Lytvynova, T.A. Vakaliuk), and mass open distance courses (V.M. Kukharenko, J. DeBoer) as modern information and communication learning technologies.

In the training of future teachers, the Internet allows users to get the information they need quickly, help them understand certain educational information, provide regular communication, development of new concepts, information structuring and analysis, accelerate the process of material learning, and increase the degree of information memorization. With the help of various means it is possible to make the process of the professional training of future teachers more flexible, forward-thinking, and variable, to promote its publicity through interactive discussions. We give examples of such tools: search engines (DuckDuckGo), mail services (Ukr.net), messengers (Viber), generators of didactic materials (LearningApps), online surveys and testing tools (Kahoot!), educational games (MinecraftEdu), online presentations (Prezi), cloud storages (Dropbox), video hosting (Youtube), online boards (Stixy), planners (Remember The Milk), organizers (Google Calendar), notepads (EverNote), tools for saving and commenting of Internet resources (Pocket), social services for storage of multimedia resources (Pinterest, Slideshare), book reading services (Bookmate), blogs (Blogger), WikiWiki (Mediawiki), social geoservices (Google Maps), social networks (Learning Partnership), integrators (Glogster), class tools (ClassDojo), game educational services (Classcraft), knowledge bases (Wolfram Alpha), plagiarism testing services (UNICHEK), virtual worlds (Second Life), virtual research spaces (Graasp), and virtual labs (PhET).

The use of learning content management systems (LCMS) in the professional training of future teachers is appropriate for the formation of their ICT competencies, since, according to the society demand for alternative forms of education, future educators must master the technologies of distance e-learning. V.V. Osadchyi identifies two groups in the large number of LCMSs: 1) systems with Ukrainian localization (Moodle, Joomla!, ATutor, Ilias); 2) systems that do not have Ukrainian localization, but support the display of Cyrillic characters (OLAT; Interact; Docebo; Wordcircle; e107) (Osadchyi, 2009). Today, the most popular and the most used system is Moodle. Many universities in Ukraine and teacher training courses teach the basics of working with Moodle. Scholars (N.V. Morze, Y.V. Tryus) have written teaching aids to train both future teachers and working educators to use Moodle in the educational process. However, there are already questions about the implementation and development of methodological approaches to the use of platforms with an intuitive, not complex software interface to create distance courses, which will promote the distribution of quality programs for the organization of distance learning (Sysoieva & Osadcha, 2019).

The advantage of using social networks in the training of future teachers is that these technologies are familiar for most students, i.e. teachers do not need to teach students how to work (as in the case with VET). Accessibility, functionality and cybersecurity of services are provided by leading 24/7 IT companies in the world. The popularity of services (Facebook, Instagram) implies an interest in their use, which can also be used for educational purposes: to save time on acquaintance with new technologies and direct activities to mastering educational materials

immediately. In addition, students can promote their educational or research activities through a social network. In general, working in a familiar environment that is most commonly used for fun and socializing with friends can be psychologically comfortable for distance learning purposes. Both teachers and students have the opportunity to create their own educational content, to transform it, to rethink it, to discuss it in different formats (text, documents, videos, drawings, emoticons, etc.). Some social networks have applications or the possibility to integrate external components for educational purposes.

Mobile learning, a new learning technology, defined as an approach to learning, in which mobile electronic devices create a mobile educational environment where students can use them as a means of accessing educational materials contained on the web, anywhere, anytime, is based on the intensive use of modern mobile devices and technologies. It is important for the use of mobile technologies in the professional training is that, compared to e-learning and distance learning, mobile learning gives the learning subject more “degrees of freedom” – higher interactivity, greater movement freedom, more technical means (Ultra-Mobile PCs, tablet PCs, portable laptops, PDAs, audio players for recording and listening to lectures, multimedia guides to museums, multimedia gaming consoles, e-books, mobile phones, smartphones and many more) (Semerikov, Striuk & Moiseienko, 2012).

The use of Artificial Intelligence (AI) technologies in the training of future teachers in Ukraine is rather a promising direction than a realized one. The most examined issue of this field is adaptive learning (P.I. Phedoruk, Y.G. Nosenko). Foreign scholars see AI in education in: monitoring and analyzing data, including big data, creating and validating teaching and learning practices (K. Porayska-Pomst); creating more advanced natural user interfaces based on voice recognition and natural language usage; developing online learning through the improvement of adaptive learning software and research processes towards more intuitive interaction with students; improving approaches to competence-based learning through an AI variety capable of assessing specific skills and providing individual feedback (B.S. Adams, M. Cummins, A. Davis, A. Freeman, C. Hall Giesinger, V. Ananthanarayanan).

Nowadays, providing students with such methodological and educational materials that have the ability to identify, illustrate and present structured information plays a crucial role in the professional training of future teachers. This is achieved through the use of multimedia technologies. The visualization of educational information, which involves converting abstract data and submitting it to a form to improve students' perception and understanding is important for the effective professional development process of future teachers through multimedia. It is appropriate to use corresponding ICT tools, in particular, to create different types of graphs (line charts, bar charts, pie charts, plane charts, doughnut charts, radar charts) and diagrams (square diagram, cycle diagrams, Sankey diagrams, Gantt charts, Venn diagrams), students should be offered to study and teachers to such computer and web-based applications like Datawatch Panopticon, Tableau Smart Art, Microsoft Office, Plant Simulation, Gantt, Tom'sPlanner, Ganttify, Hohli, Creately, Many Eyes, Mapalist, Knoema, etc. To create infographic visualizations for the purpose of the representation of large data arrays it is expedient to use Adobe Photoshop, Inkscape or online services Piktochart, Easel.ly, Infogr.am, Visual.ly. With the help of Internet technologies it has become possible to create and publish interactive visualizations to display data that changes from time to time depending on data coming from other Internet resources. The easiest tools to build them are Google Forms, Google Sheets, and Google Fusion Tables, but professional rendering is done using PHP frameworks and jQuery packages and libraries.

The information visualization focuses on the use of computer support tools for presenting or delivering training material to future teachers, and the knowledge visualization is aimed at generating ideas and creating new knowledge. With the help of special ICT tools, the work of future teachers in visualization of knowledge will help to overcome the information overload, the analysis

and generalization of the concepts and phenomena being studied, the design and planning of their activities. One of the effective tools of visual presentation and recording of knowledge (ideas) is an intellectual map that will help students in any educational activity: preparation for exams, fixation of thoughts during brainstorming, preparation of presentations, note making, project work and others. Therefore, students should learn and use software and online resources for their creation in their educational and future professional work, such as Mind Manager, Mind Manager, Bubbl.us, FreeMind, MindMeister, etc.

Among the technologies of visual knowledge representation scribing is emphasized, it operates with bright images, drawings, simple schemes, etc. to accompany theoretical training materials. Analyzing scribing as an instructional strategy, P. Harless identifies the following advantages of this technology: 1) scribing extends the potential of whole-class discussion, and the added benefits of scribing dependence on technology; 2) with a tablet, scribing produces a permanent digital record that can be viewed at any time; 3) students focus on ideas rather than the speaker, the scribe, or the teacher; 4) scribing motivates all students to deepen their understanding of concepts, facts, and procedures; scribing naturally encourages students to talk to one another rather than the teacher, requires them to clarify their thinking, and provides immediate feedback. Like discussion, scribing can be challenging, even stressful, yet it nonetheless captures students' interest and builds their confidence (Harless, 2011).

In addition to multimedia learning tools (software, presentations, textbooks), scientists also highlight cloud technologies and Google Glass technologies as modern learning technologies (Kuchai, 2015). In particular, Google Glass in Teacher Training can be used to: create first-person video guides for a collective class experience in real time; documenting lessons that require demonstration and hands-on experience, using the augmented reality feature of Google Glass on class trips/excursions or historic tours to display facts or figures about relevant buildings or landmarks instantly; student hobbies Science in everyday life and share with the classrooms; one-on-one trainer and assessor sessions; learn new languages using the Google Translate Translator / Real Time Language Translation; create timetables / schedules for teachers; create mini-documentaries to enhance storytelling in the classroom; facial recognition to help teachers identify their students; evaluation of teachers without the physical presence of an observer in the classroom; connect with other educators from different parts of the world via Google Hangout; create a Teacher's View online to watch a colleague's lesson and offer real-time suggestions that appear in the teacher's eye-line; transfer videos and images to student's tablets / devices for show-and-tell; display academic information for instructors, allowing them to craft lessons to experiences students have had, making lessons more personal and memorable; real-time searching and cross-referencing; provide accessibility modules for people with visual and physical disabilities.

Google Glass technologies will also be appropriate for: observing children for signs of a learning disability as they work in their classroom with their teacher; live eye examination demonstrations; using Augmented Reality Feedback System: a HUD that lets teachers know when their students are falling behind; using Google Now for personalized search and retrieval on cards that are tailored to personal learning needs (based on repeated use); using interactive, augmented, reality-based problem-solving games inside the classroom; recording role-plays or public speaking exercises without the "observer effect"; creating instant homeschool connections via Tumblr to share with the rest of the family; recording lessons from the teacher's perspective and editing together with views from the student perspective as a tool for revision and reflection; for virtual communication between groups of students; virtual connections, despite splitting into lab, library and field teams; send messages information to parents, such as progress reports; interacting with instructors and peers in a classroom setting via online learning; YouTube education for distance learning; sending questions via SMS to Google Glass by students who are reluctant to ask aloud questions in lectures; using Ggroup tutorial lessons like Google Hangouts with teachers to clarify

any points or questions that may have been missed or coordinate with teachers on homework (TeachThought, 2018).

Nowadays, with the proliferation of mass open distance courses (MISC) (Sysoieva & Osadcha, 2019; Kukhareenko, 2012), it is advisable to include them in the training of future teachers and to develop methods for the professional training of future teachers with their help. After all, the use of MISCs does not put any limits for the teacher and the student in the content of training. There are students who have enough theoretical material provided by the teacher, and there are students who quickly learn the proposed material and want to deepen their knowledge of the subject. The propositions of MISCs, which can be found on the Internet, are so large and varied, that the teacher may offer students the opportunity to learn a variety of courses on different platforms, including in the English language, according to their individual requests.

The leading MIPC service providers abroad are Coursera (4254 courses), edX (2788), FutureLearn (1178), Swayam (1003), Canvas Network (582), France Université Numérique (557) (List of 43 providers offering MOOCs, 2019), and MIT OpenCourseWare, a Massachusetts Institute of Technology project that publishes 2400 courses with open access materials for all institute courses. In Ukraine, there are also online education platforms for teacher training and retraining: Prometheus, Ukrainian public project of mass open online courses, EdEra online education site, Lesson educational project site, Open University of Maidan civic education platform, British Council Ukraine resources to learn or improve English, to improve knowledge of a wide variety of subjects, and to communicate with students from all over the world.

Taking into consideration the diversity and ongoing development of ICTs, it should be supposed to use them in the training of future teachers through the application of the system of information and technological support in the professional training of future teachers at a pedagogical university (Osadchy, 2013). The developed and implemented system includes such subsystems: professional and pedagogical, technical, managerial, criteria and productive ones. The professional and pedagogical subsystem reflects the improvement process of the professional training of teachers using appropriate traditional and computer-oriented forms, methods and means of training and controlling students' progress, the selection of innovative and diverse contents of information science disciplines for the professional training of teachers in different fields. The technological subsystem represents the application, development and implementation of informatization tools of the educational process of a pedagogical university and information resources which create an information environment for the university. The managerial subsystem displays the functioning of information technology system management at the management and subject-subjects levels, that supposes the participation of educational institution managers, IT-specialists, employees, teachers and students in the implementation and application of the system. Criteria and productive subsystem is based on the criteria and indicators, which are used to monitor the status of professional training and the result of implementation of information and technological systems. Each of these subsystems has their own structural units which are linked to each other by connections and mutual impacts, the property of subordination and integrity and have the only purpose to provide the high level of the professional training of future teachers taking into account their fields of study and specialities according to the world and European standards of the informatization of the educational process and the introduction of ICT into the professional training of future teachers. The functioning of such a system should provide its constant updating according to changes in the field of information technology and pedagogical innovations.

CONCLUSIONS

On the basis of the analysis of scientific works on modern information and communication technologies in education and generalization of the ways of application of modern information

and communication technologies (Internet, social services and networks, mobile, multimedia and cloud technologies, technologies of artificial intelligence) in the professional training of future teachers, expediency of their systematic use through implementation and improvement of the developed system of the information and technological support in the professional training of future teachers at pedagogical university.

REFERENCES

- 30 Ways Google Glass In Education Might Work. (2018). Retrieved 2019 from <https://www.teachthought.com/technology/30-ways-google-glass-education-might-work>
- Harless, P. (2011) Scribing: A Technology-Based Instructional Strategy. *The Mathematics Teacher*, 104 (6), 420-425. Retrieved 2019 from <http://www.jstor.org/stable/20876908>
- Kuchai, O.V. (2015). *Vykorystannia multymediinykh tekhnolohii u pidhotovtsi vchyteliv pochatkovykh klasiv* [Use of multimedia technologies in the preparation of elementary school teachers]. Cherkasy: Publisher Chabanenko Y. A.
- Kukhareno, V. (2012). Navchalnyi protses u vidkrytomu dystantsiinomu kursi [Massive open on-line course]. *Teoriia i praktyka upravlinnia sotsialnymy systemamy*, 1, 40-50.
- List of 43 providers offering MOOCs/free online courses. (2019). Retrieved 2019 from <https://www.classcentral.com/providers>
- Osadchyi, V.V. (2009). Peredumovy ta tekhnolohii stvorennia osvitynih Internet-resursiv Internet-resursiv [Pre-conditions and technologies of creation of educational Internetresources]. *Problemy inzhenerno-pedahohichnoi osvity*, 22-23, 162-170.
- Osadchyi, V.V. (2013). *Systema informatsiino-tekhnolohichnoho zabezpechennia profesiinoi pidhotovky maibutnykh uchyteliv v umovakh pedahohichnoho universytetu: avtoref. dys. ... d-ra ped. nauk : 13.00.04* [System of information and technological support in professional training of future teachers in conditions of pedagogical university]. (Dr.Sc. Thesis). Vinnytsia State Pedagogical University named after Mykhailo Kotsyubynskiy.
- Savchenko, S. & Kurylo, V. (2019). Mediasotsializatsiia yak skladnyk sotsializatsii osobystosti v informatsiinomu suspilstvi [Media Socialization as a Component of Personality Socialization in the Information Society]. *Visnyk Luhanskoho natsionalnoho universytetu imeni Tarasa Shevchenka. Pedahohichni nauky*, 1 (324), 83-89.
- Semerikov, S.O., Striuk, M.I., & Moiseienko, N.V. (2012). Mobilne navchannia: istoryko-tekhnolohichni vymir [Mobile learning: a historical and technological dimension]. *Teoriia i praktyka orhanizatsii samostiinoi roboty studentiv vyshchyykh navchalnykh zakladiv* [Theory and practice of organizing independent work of students of higher educational institutions], 188-242.
- Surry, D.W., Grubb, A.G., Ensminger, D.C. & Ouimette, J. (2009). Implementation of web-based learning in colleges of education: Barriers and enablers. *Canadian Journal of Learning and Technology / La revue canadienne de l'apprentissage et de la technologie*, 35(3), Retrieved 2019 from <https://www.learntechlib.org/p/42880>
- Sysoieva, S.O. & Osadcha, K.P. (2019). Stan, tekhnolohii ta perspektyvy dystantsiinoho navchannia u vyshchii osviti Ukrainy [Condition, technologies and prospects of distance learning in the higher education of Ukraine]. *Informatsiini tekhnolohii i zasoby navchannia*, 70 (2), 271-284.
- TeachThought. (2018). 30 Ways Google Glass In Education Might Work. Retrieved 2019 from: <https://www.teachthought.com/technology/30-ways-google-glass-education-might-work/>