UDC 371.13(48):004

Angelina O. Roliak
PhD of Pedagogical Sciences, Department of Social and Humanitarian Disciplines, Associate Professor
State Agrarian and Engineering University in Podilya, Kamianets-Podilskyi, Ukraine
ORCID ID 0000-0002-0283-6157
rolyakangel@gmail.com

ICT IMPLEMENTATION IN THE SYSTEM OF TEACHER EDUCATION: NORDIC DIMENSION

Abstract. The main subject of the research is implementation of information and communication technologies in teacher education system of Nordic countries. The article offers a comparative analysis of the main stages in the ICT development in the professional teacher training systems of four developed countries in the Scandinavian region: Denmark, Norway, Sweden and Finland, which are world leaders in the impact of ICT on education and society and have gained a positive experience in creating their own strategies for reforming of all the important teacher education components based on the widespread use of modern information and communication technologies. The author considers that one of the key factors explaining Nordic innovation and digital literacy strength lies in the fact that the progress of using ICT in the system of professional teacher training has taken place in parallel with the processes of informatization, computerization, technological changes and prioritization of the 21-st century skills development in all countries of the Nordic region. Three essential stages of ICT implementation in Nordic educational environment were substantiated. The first is induction (or introductory) stage, connected with the gradual implementation of computer technologies into the educational process. The second is infusion (or partial use) stage, distinguished by joining all the educational institutions to the worldwide information systems. The third is incorporation (or systematic integration) stage, identified by the conceptualization of ICT-related teacher education. These three stages are characterized by the main similar and different principles of the information technologies use in the Nordic pedagogic dimension. The research findings may help to efficiently implement the information and communication technologies into the system of Ukrainian teacher education.

Keywords: information and communication technologies; ICT competence; teacher education; Nordic dimension; implementation; educational environment; digital thinking.

1. INTRODUCTION

The problem setting. Information and communication technologies (ICT) at the present stage of a social development are important elements in the formation and transformation of human knowledge capacity and culture. Any transformation has to be the result of a systematic strategy and since teaching community or pedagogues today are considered to be the driving force for change and carriers of intellectual values of a knowledge-based society, one of the most important criteria of the modern teachers' professional level is their own ICT competences or the abilities to use in practice the acquired knowledge and skills in the field of information and communication technologies [2], [11]. Educators themselves, embodying the concept of advanced education, are able to target their students, future specialists to master technologies (including ICT) that will help them to get better employment in the international labor market adapting to work and life in an epoch of fast digital change.

In conditions of open access to a large number of informational sources, new technologies play a significant role in a learning process. Through new information systems, students and teachers can easily and in a rather short period of time accumulate a certain amount of knowledge, focusing on the 21st Century learning skills, essential for participation in lifelong education. And, therefore, we can assume that the latest technologies challenge the traditional processes, methods, and approaches to teaching. So teachers should be prepared for the use of new ICT in the school learning process. Thus, ICT must become an integral part in the professional education of a modern teacher.

© A. O. Roliak 2019.

However, it should be emphasized that from the point of view of modern technologies introduced into the pedagogical education practice of Ukraine there are quite serious contradictions: on one hand, on a country-wide basis, there is a clear tendency to reform the entire system of teacher education but on the other - at local levels limited access to information sources, lack of coordination, internal resistance to innovations prevent educational institutions from meeting their strategic goals to train high-quality specialists with the 21st century skills and competencies. Therefore Ukrainian specialists find it difficult to compete with professionals from European countries in the international labor market. In order to overcome such contradictions, it is necessary to justify new approaches to training of future educators and make serious adjustments to the use of ICT in the educational system of Ukraine.

Our research shows that an important factor is the comparative study of theory and practice of ICT use in pedagogical education in advanced European countries, in particular, Nordic: Finland, Norway, Sweden and Denmark, which are world leaders in the impact of ICT on education and society and have gained a positive experience in creating their own strategic plans for reforming all important teacher educational components based on the widespread use of modern information and communication technologies.

The analysis of recent studies and publications. The analysis of scientific sources made it possible to state that some aspects of information and communication technologies implementation in the system of Ukrainian pedagogical education are highlighted in the works of such scholars as V. Bykov [1], R. Hurevych [2], M.Kademiia [3], N. Morze [4], S.Sysoieva [5] and O. Ovcharuk, M. Shishkina, O. Pinchuk, S. Semerikova, O.Sokolyuk, O. Spirina, Yu. Trius,

Currently, the number of studies on the subject of information and communication technologies used in the educational process has increased significantly in European environment [6]. The topics of pedagogical practices with ICT and teachers' ICT competence development are investigated by European [7] and Nordic scholars [8]: Plomp Tj., Pelgrum W., Law N., Ahlqvist T. (Finland), Carlsen H. (Sweden), Iversen J., Rasmussen M. A. (Denmark), Ottestad G., Kristiansen E. (Norway). However, the analysis of pedagogical literature and dissertations demonstrated that the problem of ICT implementation into the system of teacher education has not been the subject of the systematic study.

The objective of this paper. The primary objective of this research is to compare the ICT development strategies in teachers' education of Nordic countries, as they have got the unique in-depth understanding of this process. More specifically two following goals will be considered: 1) to find out the stages of ICT introduction in the system of teacher education in Nordic countries; 2) to conduct comparative analysis and to define the basic principles of ICT effective use in Nordic teacher education dimension.

2. RESEARCH METHODS

The research is based on the main principles of comparative pedagogic theory and methodology. The systematic, synergetic, culturological, axiological approaches to the comparative analysis of pedagogical phenomena have been used. Application of dialectic, objective, continuity principles has made it possible to identify characteristic features of ICT implementation into Nordic pedagogical education and to explore the process in chronological order.

3. THE RESULTS AND DISCUSSION

In European educational dimension, Nordic or Scandinavian countries: Sweden, Denmark, Norway, and Finland are considered to be special ones. By actively participating in the development of knowledge-based societies and, consequently, in educational reforms, these countries create their own strategies, the main principles of which are to highlight their successes and to shed light on the challenges they face in key areas of a society: education and economy. States of the Nordic region accumulate knowledge and information on education, providing a holistic perspective on the

developments in the regions and helping decision-makers to draw up new educational policies [8], [9]. This is the best example of Nordic co-operation. European scholars [7], [8], [9] consider that one of the key factors explaining Nordic innovation and digital literacy strength may be the fact that the process of using ICT in the system of teachers' professional training has taken place in parallel with the processes of informatization, computerization, technological changes and prioritization of this branch of research in all countries of the Nordic region. The statistics show that the region of Scandinavian countries remains one of the strongest in Europe in innovation and ICT use in education with Finland and Denmark leading the way [10].

To understand how these countries achieve success in ICT implementation into educational dimension it is important to analyze their strategies of increasing teachers' professional digital competence from the point of view of their national education policies. For this purpose the author's periodization has been developed. It identifies three interrelated stages of the ICT evolution and convergence into the system of Scandinavian pedagogic education.

The first stage, induction (1970-1990), was connected with the gradual implementation of computer technologies in the educational process. The adaptation of computers to the classroom activities led to changes in the education of teachers, building upon new innovative learning environments and individual pedagogic expertise. This period is characterized by the transition from traditional to innovative models of teaching and learning. However, the usual way of teaching in Nordic teacher training colleges (in Denmark) and universities (in Norway, Sweden, and Finland) consisting of lecturing to students in classrooms and assigning homework to reinforce the lesson still existed. Technologies were used only as a tool for acquiring new material, supporting some part of a current teaching practice (e.g., a part of a lecture or a seminar) by demonstration of electronic photos or diagrams with an overhead projector or PC.

In 1984 Denmark joins the North European Computer Network (NDU). In a year all Nordic countries (Denmark, Finland, Norway and Sweden together with the Netherlands and Iceland) are included into the European Computer Group (CEPIS), with a joint certification project in the field of information technology (ECDL- Pedagogical ICT Driving License- Paedagogisk IT-kørekort) for primary and secondary school teachers [6]. Computer literacy as a single optional subject first appears preferably within the in-service teacher education programs.

The second stage, infusion (1990-2005), was marked by joining of all educational institutions, from schools to colleges and universities, to global, worldwide information systems. This period is characterized by existing separate technologies and product groups and as teacher education systems in Finland, Norway, Sweden, and Denmark are decentralized the logic of ICT use and development in pedagogic colleges and universities was quite fragmentary and only at the initial stage of systematization. In the decentralized educational systems of the Nordic countries, the municipalities started the programs of ICT infrastructure provision into teacher education [9].

In 1995 Nordic governments launched ICT-strategy – a long-term "Strategy for Education, Learning, and ICT". This strategy is based on the fact that Nordic region development depends on how these countries share knowledge and that teachers have a key role in the diffusion of the use of ICT through education. By 1996 Swedish Minister for Education marks the formal beginning of the European Schoolnet project. Schoolnet starts with a number of Nordic national, commercial and independent networks, using the web to support teacher ICT development and to provide curriculum materials in this sphere [11]. Later, based on the experiences of Scandinavian countries, which by the mid-nineties had well organized electronic educational networks, Nordic Schoolnet was changed into European Schoolnet Therefore the existing practice and specific methodological projects undertaken by governments and teacher educational institutions provided a foundation for building a context for ICT development in teacher education.

Having analyzed the teacher educational programs in Danish pedagogical colleges Hjorring Seminarium, Norre Nissum Seminarium, Aalborg Seminarium; in Swedish University of Gothenburg; Norwegian University of Science and Technology (Department of Teacher Education), Oslo University College, Sør-Trøndelag University College, Vestfold University College and Finnish University of Helsinki (Faculty of Educational Sciences) we come to the conclusion that

there seems to be no formal, central plan as for the ICT learning. In Finland and Norway there are only general recommendations; in Denmark and Sweden students' ICT competence is set and defined by each institution as a part of the goals for each subject area. Curricula survey demonstrates that in some pedagogic institutions of Norway and Finland of this period computer technologies are taught as an optional subject and future teachers are basically trained in general understanding and use of equipment and software in their pedagogical context [6], [8].

In 2001 virtual distance education courses for teachers were established in Sweden and then this idea was developed in Denmark and Norway in the form of expanding initiatives with two basic models. The first is the creation of virtual universities entirely based on this concept, while the second is the provision of online courses which have also been given in standard classroom form in conventional educational institutions [11]. Finland also supports the development of virtual schools for teachers' in-service training but a bit later.

So ICT infusion into all the components of teacher education both on structural and contextual levels leads to the third phase of information and communication technologies development in Nordic dimension.

The third stage, incorporation (2005-2018), is grounded on the fact that intensification of ICT application in the sphere of teacher education in Nordic countries is going through an increase in relationships entering into the everyday functioning of a society as a whole and converging to modular technologies in the entire education system (including teacher education). It makes it possible to conceptualize a realistic idea for ICT-supported teacher education. Teacher education curricula become more universal and clearly include topics of study that would hardly exist without information and communication technologies, and learning process for most students no longer corresponds to the conventional model [4].

During this period ICT has become an integral part of teacher education system. The integration of ICT into teaching and learning is called "informatization" of education. The underlying thought is that the global competition is increasing, so computational thinking has emerged as a new concept to help teachers prepare children for future challenges in a knowledge-intensive digital society. So teachers must be ready to empower students with the advantages of digital technologies. Modern schools must have teachers equipped with technology resources and competencies that can give them the opportunity to effectively teach the necessary subject matter content incorporating technology concepts. The sophisticated collection of data and resource materials, analysis of real-world laws and tools are only a few of the resources that allow teachers to provide unbelievable opportunities for developing their students' conceptual understanding [3], [6].

Such new independent model of education promoting freedom, initiation, and creativity with information reinforces the role of independent research, so learners are expected to collect, select, analyze, organize, and present knowledge and teachers are expected to promote collective work and to facilitate individual and group activities [5].

In addition, increasing the potential to transform IT in education and learning, changing requirements for skills and competencies should also concentrate on educators' information and communication technologies competence. This means that Nordic countries call for new generation teachers, pedagogically competent in both their core subjects and algorithmic thinking. European documents substantiate that the 21st-century teachers should be lifelong learners, technologically confident in problem-solving, with critical thinking skills, communicative ideas, and competencies of collaborative work over multidisciplinary projects [6], [10], [11].

Since 2007 incorporation of information and communication technologies (both as subject related and as a tool) into all levels of overall Nordic teacher education systems becomes increasingly important. Analysis of curriculum documents and results of surveys, (table 1) shows that every Scandinavian country goes its own way and has its own strategy in this direction [7], [9].

Our research focuses both on some key similarities and differences of the Nordic national trajectories in the landscape of ICT incorporation into teacher education. The combined Nordic strengths are similarities in ICT infrastructures, the existence of globally competitive ICT platforms and resources for teachers and their availability in all educational levels. The Nordic region is

considered to be an advanced educational environment with pedagogues and regional pedagogical communities, in general, quite willing to adopt new innovative learning. Nordic countries have strong national teacher education systems and strong national investments in certain ICT fields [8]. So, the basic similar features of Nordic dimension are the following: 1) ICT is cross-curricular, integrated into all modules of initial teacher education, pedagogical internship, and in-service training; 2) information and communication technologies are introduced in the context of pedagogical education; 3) students experience innovative ICT-supported learning environments in their teacher education programs[7], [9], [10], [11], [12]. Basic similar and different features of ICT introduction into the education of four Nordic countries are depicted in table 1.

Table 1

ICT-related teacher education in Nordic countries

Country	Denmark	Sweden	Finland	Norway
Responsible sides	1) Danish Parliament 2) Ministry of Education; 3) National Agency for IT and Learning	1) Swedish Parliament 2) National Agency for Education; 3) National Agency for Special Needs Education and Schools.	1) Finnish Parliament 2) Ministry of Education and Culture 3) Finnish National Board of Education.	1) Norwegian Parliament 2) Ministry of Education and Research.
Legislation	ICT for teachers of primary and lower secondary schools is cross-curricular modules integrated almost in all subjects. ICT for teachers of upper secondary schools is not compulsory.	Universities are responsible for how ICT is covered in teacher training. ICT is one out of four major perspectives in teacher training (according to the proposal of 2010) and in order to be qualified for an exam the student should be able to use digital tools in pedagogical practice in a safe and critical way and to consider the impact of media and digital environment for this practice.	Independent universities provide initial teacher training, so it is up to their curricula if ICT related training is compulsory and integrated in the basic modules.	ICT is not implemented well in the education and is not widely supported by management at the institutions. Curriculum framework has developed only some points regarding digital competencies but they do not generally include sufficient use of ICT.
ICT competence area (according to curricula)	Compulsory competence area 2.10 in the national curriculum. The student teachers' ICT competencies have been summarized in four positions: - critical investigator, -analyzing receiver, -focused and creative producer -responsible participant.	There are no nationally decided grading criteria concerning digital competence. The local level (universities) is responsible for how that kind of competence is reflected in the curriculum	ICT is one of the seven broad-based competences defined in the new core curricula that entered into force in 2016. The four areas of ICT competences are: • understanding of the main functional principles, concepts and user logic of ICT; • safe and responsible use of ICT and ergonomically sound working methods. • use of ICT for managing information, inquiry-based and creative forms of work. •experience and practice on using ICT for interaction and networking purposes.	Targets for students' ICT competence are mainly related to the use of digital tools and information assessment and management skills.

ICT assessment schemes	Currently no recognized assessment frameworks are in place	There is no general assessment schema. Within the in-service training program run by the National Agency for Education (i.e.PIM), the participants are granted a diploma	There is no national assessment framework available	There is no general national assessment. For in-service teachers Lærermentor is provided for self-control of their ICT competencies

Taking into account the data from table1 we start our analysis from ICT in Danish teacher education, judging from the fact that in 2013 Denmark launched the program "Teacher education for Digital Learning". In the curricula of initial teacher education in Denmark (in college programs for primary and lower secondary school teachers) ICT is included in the compulsory competence area: the student has knowledge of ICT and media skills; the student can plan, implement and develop teaching with and about ICT and media that support the student's ability to be a critical examiner, analytical receiver, purposeful and creative producer and responsible participant [12, p.63]. The national curriculum for tertiary teacher education in Denmark is goal-oriented. The goals define what students should learn and ICT is integrated in a cross-curricular way. ICT is not a separate subject in any of Scandinavian teacher education institutions. ICT is considered both as an educational resource and pedagogical tool so students' ICT competencies are developed in the context of the subjects learning.

In the binary system of Danish pedagogical education for upper secondary school teachers graduating from universities, ICT is not compulsory and is not really focused on and it is the weak side of Danish ICT reforms. On the other hand, every teacher training institution curriculum may be supplemented by a guideline on how to employ IT in the academic subject modules including the above-mentioned four basic students' competences.

As for Sweden, according to reports analysis regarding teacher education, presented in 2010 by Swedish National Agency for Higher Education, ICT is considered as one of the major perspectives in the universities' teacher training programs. Universities are totally responsible for ICT implementing in the education of teachers.

Swedish pedagogical programs are aimed at developing in teacher candidates profound knowledge of the content, standards, and teaching methodologies of their disciplines. So the central idea is that the students, future teachers, should learn to use information and communication technologies powerfully and meaningfully in the context of teaching content and in a subject area [6]. That is the reason why in Swedish universities curricula ICT modules are transversal; they are interrelated with pedagogical and subject-oriented disciplines. As indicated in the Gothenburg University educational programs: in order to be qualified for the final exam the student should be able to use digital tools in pedagogical practice in a safe and critical way and to consider the impact of media and digital environment for this practice [12, p.64].

In Finland since 2012 ICT related training of future teachers in all independent universities is compulsory and all ICT-supported modules are reflected in university curricula. These facts state that ICT is a teacher's significant skill, and is also an aspect of multi-literacy [9]. In Finland it is a learning target as well as a medium for learning. ICT is systematically embedded throughout all the period of the initial teacher education.

Our research demonstrates that Finnish pedagogic education is known all over the world for its humanistic, student-centered approach. In such learning environment, students' opportunities are developed on problem-solving basis. Future teachers are taught to identify pedagogic problems, collect and analyze data, summarize and suggest new decisions or nonstandard ways of acting using ICT appropriately for collaboration, acquisition of resources, study and synthesis, presentation, and publication [6].

In this way, the modular structure of ICT-supported programs can be quite logically grounded. In universities of Finland, every module is organized within a separate project and introduces students to a particular area of ICT use, developing both their professional decision-taking skills and ICT-competence in different spheres.

Such module system provides a basic model for a teaching and learning activity of future teachers in pedagogic institutions all over the Nordic region, although it may be modified and customized widely according to circumstances and country's educational environment [9].

In 2013 Nordic Institute for studies on innovation, research and education (NIFU) evaluated the degree of ICT implementation in initial teacher education. According to this report, ICT is not sufficiently implemented and is not widely supported by institutional management in Norway.

Recent studies reveal that ICT is not generally used as a basic part of teaching but as an additional or secondary tool in traditional teaching practices. Institutional curricula study shows that in Norwegian pedagogical educations ICT is provided as a separate module but it is not integrated into relevant pedagogic subjects. Norwegian universities with pedagogical specialization experience different approaches to the organization of teaching with and through ICT. The curriculum framework for initial teacher training has developed some points regarding teachers' digital competences but they include only general skills that do not correspond to high confident and proficient use of ICT in the modern knowledge-based educational environment. Authorities in Norway have expressed concern that newly educated teachers lack ICT competence they need for efficient work at school [12].

We think that the problem of the lack of competence in the pedagogical use of ICT lies in the fact that the use of ICT has not been integrated into teacher training policy due to a formalized position of administration on the national level. As teacher training in Norway is governed by a national curriculum, all institutions should teach the same, or at least a similar, curriculum. Our analysis of teacher education curricula for Oslo University College and Sør-Trøndelag University College shows that ICT is not an issue covered in the current or former overall strategic plans [13]. The special ICT modules are learned by all students in their first or second year during specific classes on ICT and the use of ICT in education. During the last two years of teacher training, ICT is taught as one of the optional modules that students can choose to specialize in. It seems that there is no particular developed program of ICT integration in all components of pedagogical education

In 2017 the Norwegian Centre for ICT in Education with the initiative to increase the efficiency of ICT implementation into teacher training programs launched the pilot project of the institution-focused curriculum. The main idea of the project is to create a real design of a curriculum as an institutional document, meeting the demands not only of the society as a whole but also of higher education institutions. This document is called an institutional curriculum contract. In this way, Norwegian teacher education chooses Danish and Swedish trajectories of transformations. Taking into account new national regulations and new national guidelines for teacher education, pedagogic university colleges receive the right to include into the curriculum contract some important module elements and competence areas that they want to develop.

The conducted study demonstrates that today academic staff of education colleges in Norway posses an extensive understanding of the great necessity of teachers' digital competences formation in an active process of teaching and learning. So considering the experience of other Nordic countries, Norwegian Oslo University College, for example, brings adjustments into curriculum contract and introduces interrelated modules of ICT in pedagogic context.

To facilitate and encourage a more systematic approach into the teachers' professional digital competence development Norwegian Government in its turn formulated Strategy "Teacher Education 2025" where educators' digital competence is organized into three main groups or levels:

- first - practice or tools competence (being able to acquire skills in ICT);
- second - interpretative competence (being able to organize, integrate and evaluate ICT);
- third - creative, adaptive and development competence (being able to work with ICT in a creative way to find solutions for unfamiliar problems) [13].

We think that this competence area represents the strategic goal of future ICT-related teacher education in Norway. These three suggested competence levels may be regarded as that way in which all the transformations in teacher education of Norway should be directed.

It is a matter of fact that teacher education in Ukraine has similar problems with Norway. Our analysis of weak sides of ICT introduction in Norwegian teacher education on the one hand and the

advanced features of ICT-related pedagogic education systems in Denmark, Sweden, and Finland on the other makes it possible to formulate our own effective strategy bringing transformational changes into all the components of Ukrainian teacher education through profound ICT incorporation.

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

Thus, the conducted study allows us to make the following conclusions:

1) the recent Knowledge Promotion reform in Nordic dimension shows that information and communication technologies are incorporated into all the components of teacher education system from initial to in-service training;

2) three stages of ICT implementation into the system of teacher education in the Nordic environment were substantiated, they are the following: induction stage (1970-1990), infusion stage (1990-2005), incorporation stage (2005-2018);

3) for the efficient use of ICT it should be integrated into teacher training policy on the national, regional and, in most cases, at the institutional level;

4) it is important to define main teacher competence areas as a strategic goal of ICT-related pedagogic education.

The analysis of Nordic experience may be used in reforming pedagogic education in Ukraine, especially its transformation from traditional to innovative type by means of overall implementation of information and communication technologies.

This research is not exhaustive. We see the prospects for further comparative investigation in the design of the content and methods for the formation of ICT competencies for the student teachers of various educational programs both in Nordic and Ukrainian dimensions.

REFERENCES (TRANSLATED AND TRANSLITERATED)

[1] V. Bykov, *Models of the Open Education Organizational Systems*, 1st ed. Kyiv: Atika, 2009. (in Ukrainian)

[2] R. Hurevych, M. Kademiia, M. Koziar. *Educational information technologies: an integrated approach,* 1st ed. Lviv: "SPOLOM", 2011. (in Ukrainian)

[3] M. Kademiia, L. Shevchenko, O. Shestopaliuk, Preparing of future teachers to ICT use: an educational-methodic guide, 1st ed. Vinnytsia, 2009. (in Ukrainian)

[4] N. Morze and A. Kocharian, "ICT competence standards for higher educators and quality assurance in education", *Information Technologies and Learning Tools*, no. 5, 2014. (in Ukrainian)

[5] S. Sysoieva., N.Balovsiak, *Specialist's information competence: theory and practice of formation: an educational-methodic guide*, 1st ed. Chernivtsi: Technodruk, 2006. (in Ukrainian)

[6] UNESCO, *Information and Comunication Technologies in Teacher Education: Planning Guide*, 1st ed. Paris: Division of Higher Education, 2002. (in English)

[7] Tj. Plomp, W. Pelgrum, N. Law, "SITES 2006 – International Comparative Survey of Pedagogical Practices and ICT in Education", *Education and Information Technologies,* no.2, vol.12, pp. 83-92, 2007. (in English)

[8] T. Ahlqvist, H. Carlsen, J. Iversen, & E. Kristiansen, *Nordic ICT Foresight. Futures of the ICT environment and applications on the Nordic level,* 1st ed. Helsinki: VTT Publications 653, 2007. (in English)

[9] G. Ottestad, "Innovative Pedagogical Practice with ICT in Three Nordic Countries-Differences and Similarities", *Journal of Computer Assisted Learning,* no 26 (6), pp.478-491, 2010. (in English)

[10] J. Grunfelder, L. Rispling and G. Norlén (eds.), *State of the Nordic Region. Theme 2: Labour Force,* 1st ed. Copenhagen K, 2018. (in English)

[11] Eurydice*, ICT@Europe.edu: Information and Communication Technology in European Education Systems,* 1st ed. Brussels: European Unit, 2001. (in English)

[12] *Nordic@BETT 2016: Survey: How far are the Nordic countries in using ICT to teach students in primary and lower secondary school 21st Century Skills?* [online]. Available: https://www.emu.dk/sites/default/files/Nordic%40BETT%20Final%202.0.pdf (in English)

[13] C. Tømte, E. Hovdhaugen, N. H. Solum, *ICT in Initial Teacher Training. Norway. Country report.* [online]. Available: https://www.oecd.org/norway/45128319.pdf (in English)

Text of the article was accepted by Editorial Team 22.05.2018 p

ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНІ ТЕХНОЛОГІЇ В СИСТЕМІ ПЕДАГОГІЧНОЇ ОСВІТИ: СКАНДИНАВСЬКИЙ ВИМІР

Роляк Ангеліна Олексіївна
кандидат педагогічних наук, доцент кафедри соціально-гуманітарних дисциплін
Подільський державний аграрно-технічний університет, м. Кам'янець-Подільський, Україна
ORCID ID 0000-0002-0283-6157
rolyakangel@gmail.com

Анотація. Стаття присвячена порівняльному аналізу основних етапів розвитку та втілення інформаційно-комунікаційних технологій у професійну підготовку вчителів освітніх систем чотирьох розвинених країн Скандинавського регіону: Данії, Норвегії, Швеції та Фінляндії, які крізь призму впливу ІКТ в освіті та суспільстві вважаються передовими у світі. Скандинавські країни отримали позитивний досвід у створенні власних траєкторій розвитку та стратегій реформування всіх важливих ланок педагогічної освіти, що базуються на широкому використанні сучасних інформаційно-комунікаційних технологій. Автор вважає, що одним із ключових факторів, що пояснює ефективність інноваційних процесів у педагогічній освіті держав Північної Європи, полягає в тому, що використання ІКТ у системі професійної підготовки вчителів відбувалось послідовно й паралельно з процесами інформатизації, комп'ютеризації, технологічних змін з визначенням пріоритетів розвитку вмінь 21-го століття в усіх країнах Північного регіону. У представленій авторській періодизації обґрунтовуються три основні етапи втілення інформаційно-комунікаційних технологій в освітнє середовище Скандинавських країн. Перший етап індукції (вступний) пов'язаний із поступовим впровадженням комп'ютерних технологій у навчальний процес. Другий етап інфузії (часткового використання) відрізняється приєднанням усіх навчальних закладів до світових інформаційних систем. Третій етап інкорпорації (системного включення) визначається впровадженням концепції «педагогічної освіти, пов'язаної з ІКТ». Характеристика цих трьох етапів надається через наскрізний аналіз спільних та відмінних особливостей використання сучасних технологій у системах педагогічної освіти держав Скандинавського регіону. Результати дослідження можуть допомогти реалізувати стратегію реформування системи української педагогічної освіти через ефективне впровадження інформаційно-комунікативних технологій.

Ключові слова: інформаційно-комунікаційні технології; ІКТ-компетентність; педагогічна освіта; скандинавський вимір; впровадження; освітнє середовище; цифрове мислення.

ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫЕ ТЕХНОЛОГИИ В СИСТЕМЕ ПЕДАГОГИЧЕСКОГО ОБРАЗОВАНИЯ: СКАНДИНАВСКИЙ РЕГИОН

Роляк Ангелина Алексеевна
кандидат педагогических наук, доцент кафедры социально-гуманитарных дисциплин
Подольский государственный аграрно-технический университет, г. Каменец-Подольский, Украина
ORCID ID 0000-0002-0283-6157
rolyakangel@gmail.com

Аннотация. Статья посвящена сравнительному анализу основных этапов развития и внедрения информационно-коммуникационных технологий в профессиональную подготовку учителей в образовательных системах четырех развитых стран Скандинавского региона: Дании, Норвегии, Швеции и Финляндии, которые сквозь призму влияния ИКТ на образование и общество считаются передовыми в мире. Скандинавские страны имеют положительный опыт в создании собственных траекторий развития и стратегий реформирования всех важных звеньев педагогического образования, основанных на широком использовании современных информационно-коммуникационных технологий. Автор считает, что одним из ключевых факторов, объясняющих эффективность инновационных процессов в педагогическом образовании государств Северной Европы, является то, что использование ИКТ в системе профессиональной подготовки учителей во всех странах Северного региона происходит последовательно и параллельно с процессами информатизации, компьютеризации, технологических изменений с усилением приоритетов на развитии навыков 21-го века. В представленной авторской периодизации обосновываются три основные этапы использования информационно-коммуникационных технологий в образовательной среде Скандинавских стран. Первый этап индукции (вступительный) связанный с постепенным внедрением компьютерных технологий в учебный процесс. Второй этап инфузии

(частичного использования) отличается присоединением всех учебных заведений к мировым информационным системам. Третий этап инкорпорации (системного включения) определяется внедрением концепции «педагогического образования, связанного с ИКТ». Характеристика этих трех этапов предоставляется через сквозной анализ общих и отличительных особенностей использования современных технологий в системах педагогического образования государств Скандинавского региона. Результаты исследования могут помочь реализовать стратегию реформирования системы украинского педагогического образования через эффективное внедрение информационно-коммуникационных технологий.

Ключевые слова: информационно-коммуникационные технологии; ИКТ-компетентность; педагогическое образование; скандинавский измерение; внедрение; образовательная среда; цифровое мышление.

This work is licensed under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.