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Some Advanced Experience of the Development of Teachers' Digital Competence

Abstract

The article deals with digital competence, which is one of the main components of the professional competence of future teachers, as well as discloses the foreign experience of the development of future teachers' digital competence. European standards for the determination of digital competence are analysed – in particular, the digital competence profile of the teacher *Digital Competency of Educators (DigCompEdu)*, which includes six areas of teachers' digital competences. The article outlines approaches to the description of educational outcomes concerning the digital competence of teachers. The analysis of the experience of foreign countries (Lithuania, Estonia, Austria, Norway, the Netherlands, Western Australia, Slovenia on the problem of developing the digital competence of teachers in the process of their professional training in higher education institutions and professional development of practising teachers) has been carried out taking into account the scope of digital competence. The reforms in the education of foreign countries concerning the digitalisation of education and the development of teachers' digital competence are considered. Academic courses, foreign educational platforms, communities for teachers' professional training and professional development on digital technologies are described and analysed. The analysis of the work of foreign researchers allows to make conclusions about the approaches to classification and description of the types of teachers' digital competence.

Key words: digital competence, information and communication technologies, digital competence profile, training courses, on-line platforms

Introduction

Problem of Research

Informatisation of education, the development of digital technologies in the world actualises the need for informational training of future teachers, which involves the development of their digital competence. Digital competence allows a person to be successful in modern information space, to manage information, to make decisions quickly, to develop important competences. According to foreign researchers, today the content of school, higher education, and adult education requires considerable attention. If, when developing programmes for adults, one needs to take into account the context of the application of digital tools in the life of a society, which is mainly related to the field of services, then school education is an invariant component which will allow a school-leaver to be successful in any profession in the future. The potential of information and communication technologies (ICT) and digital tools develops and expands, and thus teachers are required to possess additional knowledge and skills.

The content of digital education is under the watchful eye in all the developed countries. The notions of “digital didactics,” “digital literacy,” and “digital education” are widely discussed in the professional environment (Kroksmark, 2015). The issues of the development and application of educational technologies in school in a digital learning environment are of particular interest. Therefore, the problem of teacher training is given a special attention.

Teaching profession, especially nowadays, requires continuous learning and improvement, as society changes and new technologies requiring new competences appear. In a digital environment, it is the teacher who determines the pace of learning and the order of acquiring knowledge, and who is responsible for student progress. One of the areas of research that is actively developing in the field of studying the professional activity of a teacher is the discovery, description, formation, and development of professional competencies that reflect the content of a teacher’s work in digital learning environment.

The purpose of the article is to analyse foreign standards for determining teachers’ digital competence, and to describe foreign experience and modern approaches to the problem of developing the digital competence of teachers in the process of their training in higher education institutions and improving the qualifications of teachers in the field of ICT use as well as the creation of digital educational content.

Methodology of Research

In the process of research, we have used a set of theoretical and practical methods. The theoretical methods are analysis, generalisation, comparison, and systematisation of foreign experience in the formation and development of teachers’

digital competence. Empirical methods are content analysis of programmes and on-line courses on the development of teachers' digital competence.

Prerequisites for Research

Many Ukrainian and foreign researchers consider the problem of the development of teachers' professional and digital competences as well as the effective use of ICT in education in their research. Thus, R. Gurevych, A. Gurzhii, M. Zhaldak, N. Morse, and O. Spirin examine the essence and structure of the digital competence and digital culture of future teachers (Zhaldak, Ramsjkyj, & Rafaljsjka, 2009). R. Gurevych, N. Morse, and O. Spivakovskiy research the problems of developing future ICT teachers' professional competences. M. Spodarets and S. Gushchyna emphasise the importance of training teachers under the conditions of the informatisation of education (Morze, 2010).

However, the research of foreign experience in the development of teachers' digital competence needs a separate study.

Results of Research

The problem of the development of teachers' digital competence and the formation of their digital literacy is highlighted in international documents, educational standards, and publications of scientists from many countries. There is no unified term for determining the professional competence of a teacher in the field of ICT. Foreign scientists use the following terms: digital competence, digital literacy, competence in the field of ICT use, information and communication literacy.

In 2006, the European Parliament and the Council of the European Union stated that the digital competence was a key component of human learning throughout life.

In 2017, the European Union developed a profile of teachers' digital competences, *Digital Competence of Educators (DigCompEdu)*, which includes six areas of teachers' digital competences (Põldoja, 2016):

- the use of digital technology in professional pedagogical environment;
- the development of the professional skills of searching, creating, and sharing digital education resources;
- the development of necessary skills for using digital tools in learning and teaching;
- the availability of digital instruments for the assessment of learning outcomes;
- using digital tools for expanding students' educational opportunities.

Foreign researchers G. Ottestad and M. Kelentric introduced and justified three areas of the competence of a modern teacher: universal digital competence, digital competence in didactics, and professional competence (Ottestad, Kelentric, & Gudmundsdottir, 2014).

The system of the development of teachers' digital competence has been introduced in Norway, Estonia, Lithuania, Austria, and Slovenia. Its analysis and main approaches are described further.

Norway

Norwegian Ministry of Education and Research developed "Programme for Digital Competence 2004–2008." According to the curriculum of Norwegian secondary education, the use of digital tools is included in the five main competences which should be developed while teaching pupils.

In Norway, the educational reform of knowledge advancement came into force in 2012. The working group developed a frame for five key competences according to which digital competence includes the following skills: receiving and processing digital data, creating and processing digital data, digital communication, digital solutions. These skills are developed in the course of learning Norwegian and a foreign language, mathematics, physics, chemistry, biology, history, and geography.

As a result of implementing the programme in 2010, the Norwegian Centre for ICT in Education was created. Its main task is observation of the development of students' and teachers' digital competence in educational institutions, and the development and implementation of the strategies of using ICT into different levels of education and future teachers training programmes.

Norwegian researcher R. Krumsvik proposed a model of teachers' digital competences, which includes (Krumsvik, 2008):

- basic ICT skills, which include basic skills in working with information and communication technologies;
- didactic ICT competencies, which include the teacher's ability to choose and use ICT within the discipline of teaching in terms of didactic expediency;
- training strategies, that is, understanding how one can best use ICT in the educational process;
- digital competences, which indicate the teacher's attitude towards the use of ICT in an educational context and adherence to ethical rules.

The assessment of the digital competence of teachers is important in Norway. The Norwegian Centre for ICT in Education developed online tools for monitoring the use of digital technology by administrative staff and teachers, the results of which are taken into account during their professional development.

Lithuania

Considerable changes in the development of digital society are taking place in Lithuania, which since 2009 has been holding a leading position in the world in: data transmission over the Internet, the development of the network of fiber-optic Internet (FTTH), the penetration of mobile telephone communications, the active position of the youth in using ICT. The development of the digital competence of the citizens of Lithuania and the digitalisation of education began with the adoption of “Lithuanian Information Society Development Programme for the period of 2014–2020.” This programme aims at developing a successful informational society, creating opportunities for the development of Lithuanian digital literacy, digital content, and ICT infrastructure. The main objectives of the programme are the following: developing the skills of using ICT, reducing the digital divide in Lithuania; creating open and secure access to electronic resources for citizens; ensuring the development, reliability, and functional compatibility of the infrastructure of information and communication technologies (McKnight, O’Malley, & Ruzich, 2016).

The process of developing the digital competence of Lithuanian teachers takes place according to the ECDL framework and on the basis of teacher professional development centres, including the Centre for School Improvement and the Centre for Modern Didactics.

On the initiative of the Ministry of Education and Science of Lithuania and the Centre for Information Technologies in Education, an educational portal “Open Information and Consultation System” was created, which offers courses for improving teachers’ digital competence.

These courses provide for the formation of beginner, intermediate, and advanced levels of digital competence and include digital tasks for teachers: developing and planning lesson notes, training projects with the use of cloud services, including the service Learning Designer.

Estonia

Considerable attention is being paid to the formation of teachers’ digital competences in Estonia. Estonia’s Ministry of Education and Science in cooperation with the Estonian Information Technology Foundation, the Tiger Leap Foundation, and the Estonian Educational Research Network created the Fund of Information Technologies Education. Its purposes are to provide e-learning and training on ICT usage by school leaders in management and the development of digital competence of teachers, which will improve the quality of education in Estonia and increase its competitiveness in the world (Ottestad, Kelentric, & Gudmundsdottir, 2014).

At the initiative of this fund, important programmes for the education system were adopted. One of them is the programme of reforming education in relation to the development of digital competence of citizens “Education Strategy for 2012–2020.”

An important aspect in implementing this programme is solving the ways of developing teachers' digital competence, the creation of their electronic educational environment and digital tools, filling the educational material with digital content in order to disseminate progressive pedagogical practices.

For teachers in Estonia, professional development is compulsory in the sphere of ICT. It is carried out every 3 years at the universities chosen by the Ministry of Science and Research. For this purpose, courses "European Computer Driving Licence," ECDL, and "International Computer Driving Licence" (ICDL) have been created. They include 40 academic hours and witness a certain level of teachers' digital competence.

Certification tests cover the material from the following modules: the basics of information technologies; work with computers and file management; text editor; spreadsheets; creating presentations; application of databases; data transmission with the help of information technologies. The ICDL certificate provides for the successful completion of one test on the basic theoretical knowledge in the field of information technologies and six practical applications on the use of applications. This testing is recognised in the information society of Europe. The result of the successful passing of the test for obtaining the ICDL certificate is, in fact, the certificate itself and the certificate of the European sample which lists the tests passed by the teacher.

The development of teachers' digital competence in Estonia is also carried out while participating in various national projects. Among them, the Estonian Foundation for European Union Education, European Schoolnet, and the research programmes Archimedes and Open Estonia Foundation should be pointed out.

Digital learning ecosystems occupy an important place in the educational process in Estonia. The concept of digital ecosystems appeared in the mid-2000s. In one of the last publications on digital ecosystems, Chang and West (2006) identified common criteria for natural and digital ecosystems, namely: interaction and engagement; balance; self-organisation. Ecosystem thinking has inspired the definition and interpretation of various types of digital systems: the ecosystem of e-learning (Chang & Guetl, 2007; Uden et al., 2007), the digital learning ecosystem (Ficheman & de Deus Lopes, 2008; Laanpere, Pata, Normak, & Põldoja, 2012), and the ecosystem of digital teaching and learning (Reyna, 2011).

Scientists Chang and Guetl (2007) suggest that the concept of an educational ecosystem can be used to describe physical or virtual environments and to narrow them down to a particular sphere, for example, e-learning. In this context, they use the concept of e-learning ecosystems (ELES). This allows identifying and studying specific characteristics of ELES, such as community education and other stakeholders, digital learning tools, and conditions peculiar to e-learning.

Laanpere, Põldoja, and Normak state that digital learning ecosystem (DLE) includes e-learning ecosystems, but special attention is given to communication technologies. In their interpretation, DLE is the third learning system. The

autonomous educational systems, software (application software), and the virtual learning environment (LMS, computer assessment tools) are previous generations of educational systems (Laanpere, Põldoja, & Normak, 2013). They describe the software architecture, the pedagogical foundations, the approach to content management, and the availability of all the three generations of educational systems.

On the basis of these studies, M. Laanpere and G. Poldoy have developed a digital system for teachers' digital competence development (Laanpere & Põldoja, 2013). It includes a combination of cloud services and information technologies, and consists of software and various Internet platforms that provide content creation for the visualisation of training. The following tools are included:

- advanced templates PILOT – software and Internet platforms with the help of which one can create and store videos, slides, and pictures to visualise the educational topics. For 4 years, teachers have created 32 educational PILOT resources. The method of progressive inquiry is particularly suitable for subject areas that involve students in an in-depth study;
- the LeMill web community for searching and sharing open educational online resources that covers four sections for the implementation of learning in the cloud. LeMill's design includes common platforms and services of Wikipedia and social networks. The goal is to find a community of teachers who can work together on the creation and improvement of educational resources. The LeMill software is divided into four sections: content, methods, tools, and communities;
- LeContract (an educational contract) is an interactive tool with the help of which students carry out educational projects and which enables them to stay connected with teachers and other students. LeContract has been developed to encourage the usage of the project method while studying in open online courses in blogs. Students have the opportunity to develop educational projects to determine their personal learning goals, the resources they plan to use, the strategy for achieving their goals, and the expected outcomes of their learning;
- EduFeedr (using blogs in teaching and learning) is an online tool for managing open-course learning where students and teachers create and manage their blogs, diaries of educational projects. EduFeedr supports two most widely used blog services – WordPress²⁶ and Blogger²⁷;
- The DigiMina system is a web-based tool for the assessment and self-assessment of the digital competence of teachers.

With the use of PILOT and LeMill, the problem of the improvement of the search, exchange, and creation of open educational resources in the context of school education is being solved. LeContract and EduFeedr have been developed in the context of teacher training in Estonia and are aimed at creating open online courses.

The participation of Estonian teachers in international projects also significantly influences the development of their digital competence. In 2014, the online 4 EDU

project which involved Estonia, Lithuania, Latvia, and Germany started under the Erasmus+ programme. The main emphasis in this project is on: creating online tools for teachers to work together; the development of their digital competence; the improvement of pedagogical practice with the use of information technologies. The implementation of the Online 4 EDU project involves the creation of professional training courses for teachers with a mixed form of training, continuous improvement of the abilities to use informational technologies in their work.

Participants of this project, researchers N. Warbers, K. Schubers, and J. Lambertts, based on the results of the testing of teachers within the framework of the Online 4 EDU project, developed the curriculum and programmes for the development of teachers' ICT competence in accordance with the level of knowledge and their skills in the sphere of ICT usage (Warbers, Schubers, & Lambertts, 2015). Two training groups were formed: teachers who do not use online tools in their work and are beginners in the field of using ICT, and teachers who have the experience of using online tools in their work and are willing to improve their knowledge and skills in using ICT. The teachers were offered a graduation course which consists of three modules: "Technical aspects," "Methodological aspects," and "Practice." During the course, the teachers were offered to use various tools for different activities (Figure 1).

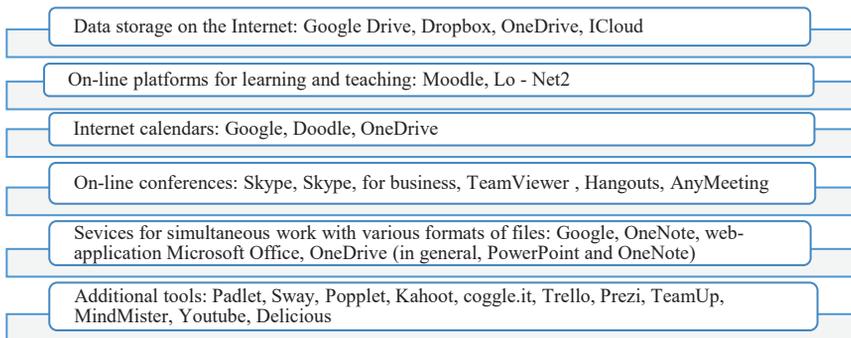


Figure 1. The Online4EDU course tools.

While teaching a course, the analysis and correction of content modules and topics was carried out in accordance with the problem situations which arose among teachers while using ICT in their professional activity.

The Netherlands

Active informatisation of education in the Netherlands began in 2001. At first, study in the sphere of using information technologies in education was carried out by the research agency Kantar TNS. Later, this problem was studied by the Kennisnet Foundation. The Kennisnet Foundation proposed the model "Balance of Four," which was a step towards the implementation of information

and communication technologies in education. In this model, informational technologies are used to organise the educational process and the professional work of teachers. Their effective implementation can be carried out in case of balanced and consistent interaction of the four components: pedagogical approach; professional knowledge, which is a component of information and communication competence and includes IC skills, the ability to use them for solving various tasks; educational digital materials, which include all digital educational content; infrastructure of information and communication technologies, which provides computer access support, the quality of the Internet network, their support, and maintenance. By introducing this model, each educational institution can choose pedagogical methods and determine the purpose, tasks, and ways of their implementation. The role and communication of all the participants of the educational process are important in the implementation of the model since they have to balance all the four components.

In 2009, on request of the Advisory Board of the heads of the pedagogical faculties of the Netherlands, "Knowledge Base on ICT" was created, which defined the structure and content of the digital competences of future and practising teachers. In 2013, it was improved and it received the new title "National ICT Competency Framework for Teachers." According to the ICT Competency Framework, ICT competency of a teacher includes:

- personal attitude,
- main digital skills,
- digital media and information literacy,
- pedagogical behaviour.

In addition to the advisory board of heads of pedagogical faculties, the Kennisnet Foundation in the Netherlands, taking into consideration the results of monitoring and research, proposed in 2013 an updated version of the framework of IC-competence of a teacher, which included three areas of the professional development of teachers (Table 1).

The results of reforming educational policy carried out by the government of the Netherlands are outlined in the document Dutch Platform Education 2032.

Since 2015, the Netherlands have analysed and improved curricula for secondary education, which, according to government, should be future-oriented. In this respect, it is important to create conditions for the training and further work of future citizens in the digital society, to prepare future teachers for the formation of students' digital competence, and to develop the digital competence of future teachers.

As a result, training platforms for teachers have been created in the Netherlands: "People as Educational Architects," "People Create Schools," "Surfspace: Collaboration on ICT Innovations in Education and Research" (Redeker & Poonie, 2017).

Table 1.
Framework of the ICT-competence of a teacher (developed with the support of the Kennisnet Foundation)

Areas of professional development	Competences
Professional activities	A teacher: - skilfully organises his/her activity and demonstrates its results by using ICT; - uses ICT tools to organise his/her activity, communicate with pupils and colleagues via e-mail, social networks; - is able to substantiate expediency of the selected ICT tools and ways of their usage; - is able to trace, detect, and resolve administrative matters with the help of the Internet or local computer networks; - monitors and visualises the results of students' achievements.
Professional development	A teacher: - develops his/her skills using ICT tools; - searches and selects digital resources and the latest inventions in the professional field in accordance with educational content; - exchanges knowledge and experience with his/her colleagues through blogs, virtual platforms, and social networks.
Pedagogical approach	A teacher: - relies on the acquired knowledge in the field of ICT; - is able to assess the possible effective use of ICT, combine knowledge and skills with educational content, pedagogical technologies, teaching methods using ICT tools; - is able to analyse the effectiveness of the use of ICT and to substantiate their use in the professional activity.

For the professional development of teachers in the field of ICT use in the Netherlands, the online platform Leraar 24 was created, which includes files and videos from various educational subjects developed by researchers and teachers. With the help of this platform, teachers can also share their experience and teaching methods, and discuss difficulties in the usage of information and communication technologies.

With the help of the platform “People as Educational Architects,” graduate students can create virtual school and imagine themselves as teachers or representatives of the administrative staff. It is important that in this virtual environment teachers can monitor and give advice on the improvement of a student as a teacher, create problem situations, and help the students solve them.

The educational platform “Surfspace: Collaboration on ICT Innovations in Education and Research” is a platform for experiments in the field of ICT that enables future teachers to learn at their own pace and whenever it is convenient for them.

In 2017, the Kennisnet Foundation issued the recommendations “Technology Compass for Education,” where it is suggested to use Strategic Technology Maps

for the introduction of digital technologies into the educational process. According to the foundation experts, they will promote the development of the educational environment through the use of digital technologies, the choice and application of the necessary digital technologies for accomplishing educational objectives.

Austria

Austrian teachers are offered a wide range of opportunities for constant professional development, including the development of digital competence. In the new Austrian law on pedagogical education adopted in 2017, media education and the development of student digital skills are components of a teacher's professional competence.

In 2013, Federal Ministry of Education, Science, and Research introduced the digitalisation strategy programme "School 4.0," which encompassed school and higher education.

During the development of this programme, a lot of studies were conducted to determine: the technical condition of educational institutions, the level of the introduction of digital technologies into the educational process, and the level of digital competence of teachers of various disciplines. Based on the research data, a community of Austrian pedagogical higher education institutions developed a strategy for preparing future teachers for the use of digital technologies and e-learning. It was called "White Paper on the Development of the Potential of Teachers for the Transition to Using Digital Media and Technologies." This strategy is a strategy of the development of Austrian education which identifies ways to prepare teachers to work in a digital school environment.

The goal of the strategy of digitising the learning process is not only to create and develop the digital skills of all Austrian students and the critical skills to work with digital content, but also to develop all the components of the digital competence of students and teachers: media literacy, critical processing of information and data, network security, knowledge of technologies, and problem solving.

The assessment of the digital skills of Austrian school teachers showed a low level of competence in the development and distribution of their own content with the use of digital technologies and their safe online work. As a result of this study, new curricula for preparing bachelor's degree and master's degree teachers at Austrian educational institutions were developed.

During the first year of study at colleges and universities, testing future teachers to determine the formation of their basic digital skills is compulsory. The level of the skills is determined according to the criteria of the Austrian Information Framework – the programme "Digital Competences for Students." Students with the low level of basic digital skills are obliged to undergo the basic training course "E-Learning-Strategiegruppe der Pädagogischen Hochschulen Österreichs: Weißbuch zum Kompetenzaufbau von Pädagoginnen und Pädagogen für den Umgang mit digitalen Medien und Technologien."

Future teachers must undergo the course “Digital Educational and Administrative Environments,” the aim of which is to develop their digital competence.

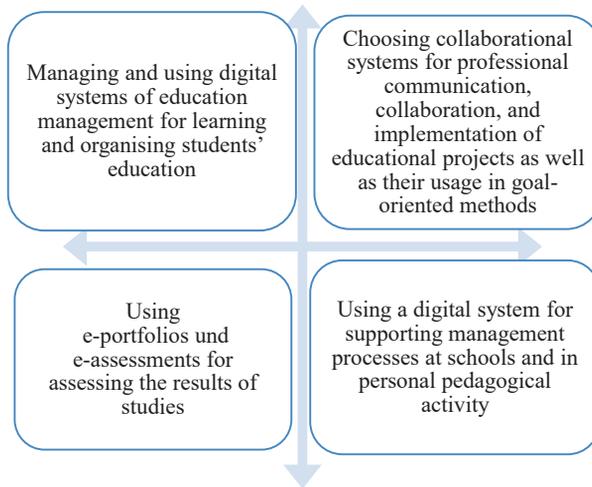


Figure 2. Digital competence in “Digital Educational and Administrative Environment” course.

In addition, during the training, future teachers in Austria are given the opportunity to conduct research using digital technologies, in particular:

- search, selection, and evaluation of information;
- writing scientific articles;
- data analysis for scientific purposes using digital tools.

Slovenia

Systematic implementation of information and communication technologies in education in Slovenia began in 1994. The aim of the project “Computer Literacy” was to provide Slovenian education with computer software (systemic and didactic) and prepare teachers for the use of ICT in education, development, and research projects. Training teachers, students, and headmasters as well as providing Slovenian universities with ICT and other types of activities have been attracting large investments since 1994.

One of the major breakthroughs in the digitalisation of Slovenia’s education was the implementation of the project “E-learning” (2009–2013) in public institutions at the expense of the European Social and Regional Fund for the development and implementation of e-learning, the development of the digital competence of a teacher and a headmaster. The project “E-education” included two components: “E-competent teacher” and “Electronic support.” According to the results of the first component, thousands of teachers (about 8,000 per year) attended various seminars on e-learning, 50% of which participated online in international

conferences SIRIKT, collected and created digital learning materials, shared their experience on the use of ICT in education and management with colleagues. A model of an e-competent teacher, which contained 6 competences, was proposed.

As a result of the "Electronic Support" component, each school received a consultant who assessed the resources of the school and its information and communication environment. This evaluation made it possible to create a plan of informational and technical support of the establishment and to give recommendations on managing the school and professional support of teachers on the use of information technologies in the educational process.

A powerful educational reform of Slovenia's digital society began with the adoption of the strategy "Digital Slovenia 2020," which outlines the development of the informational society and the digital competence of the next generation until 2020, and highlights the strategic documents on cybersecurity. One of the key components of the strategy "Digital Slovenia 2020" is a scientific and innovation strategy of Slovenia which outlines guidelines for the creation of an innovative society based on the knowledge combined in the Strategy of Smart Specialisation (SSS) in which the scope of the information society and IT is emphasised.

One of the key areas for achieving the goals is education. With this in mind, in 2016, the Ministry of Education, Science, and Sport of Slovenia adopted the document "Strategic Guidelines for the Further Implementation of ICT in Slovenian Educational Institutions until 2020."

The starting point for educational policy is to create favourable conditions for the functioning of an open educational environment oriented towards innovative pedagogical strategies and the opportunities of using ICT in the learning process.

In this document, a lot of attention is paid to the role and importance of ICT in modern society, to the role and importance of ICT in education and training of specialists, to the overview of the current state of education informatisation in Slovenia, and to outlines of the most important tasks the accomplishment of which contributes to the digitisation of education:

- the development of educational content using information and communication technologies;
- the creation of electronic educational resources: dictionaries, textbooks, teaching materials, manuals;
- the development and use of modern educational platforms for training;
- the formation and development of the digital competence of students, readers, heads of educational institutions;
- providing educational institutions with modern equipment and software, digitisation of educational materials;
- the use of automated education management systems;
- the introduction of e-learning into secondary and higher education.

Since the 8th grade, the subject "Engineering and Technology" is compulsory in secondary school. The subjects "Computer," "Technology," and "Robotics" are

offered for a deep study. For effective organisation of the educational process and creation of educational content for learning these subjects, teachers need proper knowledge and skills in the field of ICT.

In view of this, adult education and teacher training are also important issues in Slovenia. Each year, the Ministry of Education, Science, and Sport of Slovenia selects the best curricula, which are included into “Priority Professional Teacher Training Programmes.” Over the past years, applications have been gathered to develop ICT skills and competences (Figure 3).

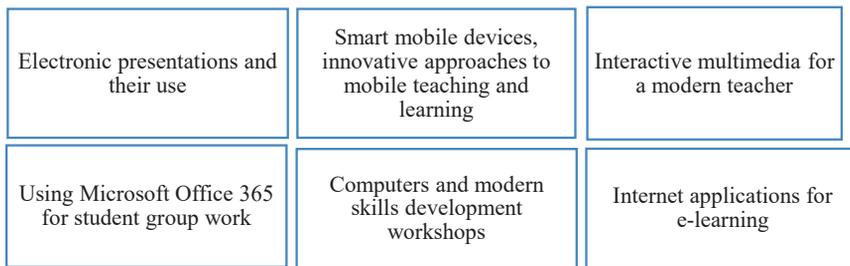


Figure 3. Applications for the development of ICT skills and competences.

National Institute of Education in Slovenia is implementing the project MENTEP – system support of digital teaching experience and practice. It was developed in accordance with the European School Network and 30 ministries in Europe. The project implements the strategy of European policy in the field of ICT in education, in particular the improvement of teachers’ professional skills and their ability to create innovations in the use of ICT and their digital literacy. The participation in the project promotes the use of ICT in learning and teaching, but also helps to establish connections between European and national policies and tools used to achieve the set goals, improving the professional development of teachers to be able to use ICT.

The main areas of the project implementation in Slovenia are cooperation in developing web tools for the assessment and self-assessment of pedagogical digital competencies, national coordination of interstate experiment, and ecosystem development to support the professional development of teachers.

System Support of digital pedagogical experience MENTEP was implemented in Slovenia from 2015 to 2018. An online tool for the assessment and self-assessment of pedagogical digital competences (POT-OS, TET-SAT) and an ecosystem (portal) for supporting the professional development of teachers in this field were developed.

The innovative international project on educational policy experiments ATS 2020 is also worth mentioning. It is funded jointly with the European Commission (Erasmus +) which consists of 17 partners from 11 EU countries. It is a comprehensive learning model that facilitates the formation of the necessary communication

skills among students within the framework of the curriculum, including the development of modern approaches to teacher training and the use of innovative tools for the development and assessment of teachers' professional competences, such as digital competence.

Western Australia

The Department of Education in Western Australia conducted a survey of teachers regarding their professional level in the field of ICT, the results of which identified three levels of the use of information technologies in education: basic, intermediate, and advanced. Professor Graham Davis clearly describes the skills that a teacher needs to possess for each of these levels. The main factors influencing the level of digital competence of a teacher are gender, experience, age, ICT available at an educational institution, internal motivation, and professional self-development of a teacher. The list of skills allows a teacher to determine his/her level in ICT use. Davis, under the support of the European Commission, has developed and is constantly updating the ICT4LT website, which is a set of educational modules for teachers on information and communication technologies. The ICT4LT site has a gradation of levels with the skills described, test assignments for determining the level of ICT skills, as well as additional teaching materials for teachers.

Conclusion

An overview of the revealed foreign practices in the field of the development of teachers' digital competence proves that a modern teacher should have a fairly high level of skills in the use of information and communication technologies. The description and structuring of the digital competences of a teacher proves the expansion of the content of his/her professional activity, changes in the requirements for training, and conditions of a teacher's professional development.

The article deals with the profile of digital competences of a teacher *Digital Competence of Educators (DigCompEdu)*, which includes six areas of digital competences of a teacher.

The analysis of the experience of developing digital competence of teachers has revealed the fact that in some countries much attention is paid to the distance development of teachers' digital competence, the creation of websites and portals for self-education, and the search for the necessary ICT to be used in teachers' professional activity. However, scientists from other countries state that the development of the digital competence of a teacher involves the creation of an educational environment in which innovation is encouraged and ICT is integrated

into education. In many countries, much attention is being paid to the improvement of the skills of teachers in developing their digital competence. To accomplish this, many training programmes and courses have been developed.

The prospect of further research lies in the study of the experience of foreign countries on the assessment of the digital competence of teachers, the development of assessment tools, and the strategic model of the development of teachers' digital competence.

References

- Atvira Informavimo, Konsultavimo ir Orientavimo Sistema, AIKOS. Accessed 5 May 2019. Retrieved from <https://www.aikos.smm.lt/Puslapiai/Apie-AIKOS.aspx>.
- Avatud Eesti Fondi strateegia aastatel 2018–2020. Accessed 5 May 2019. Retrieved from <http://www.oef.org.ee>.
- De mensen maken de school. Accessed 5 May 2019. Retrieved from <https://www.zinmag.nl/zinmag-editie-02-2017/de-mensen-maken-de-school/>.
- DigiMina Accessed 10 May 2019. Retrieved from <http://digimina.opetaja.ee/>.
- Digital Slovenia 2020. Development strategy for the information society until 2020. 5 May 2019. Retrieved from http://www.mju.gov.si/fileadmin/mju.gov.si/pageuploads/DID/Informacijska_druzba/pdf/DSI_2020_3-2016_picl.pdf.
- Feed reader for online courses, EduFeedr Accessed 10 May 2019. Retrieved from <http://www.edufedr.net/>.
- Hariduse Infotehnoloogia Sihtasutus, (2014). HITSA. Strategy for 2014–2020, Tallinn, Estonia. Retrieved from <http://www.hitsa.ee>.
- Information and Communications Technology (ICT) for Language Teachers. Retrieved from <http://www.ict4lt.org>.
- Kroksmark, T. (2015). Teaching competence in digital time. Vol. 6, No. 1, pp. 24–25. Retrieved from <https://www.tandfonline.com/doi/full/10.3402/edui.v6.24013>.
- Krumsvik, R. (2008). Situated learning and digital competence. *Education and Information Technology*, P. 173.
- Learning Contracts Accessed 10 May 2019. Retrieved from http://www.ucdoer.ie/index.php/Learning_Contracts.
- Leraar24. Voor leraren die willen groeien in hun vak. Accessed 6 May 2019. Retrieved from www.leraar24.nl.
- McKnight, K., O'Malley, K., Ruzich, R. (2016). Learning in the digital age: how educators use technology to improve student learning. *Journal of Research in Technology in Education*, 48(3), pp. 194–211.
- Morze, N. V. (2010). Informational competence of students may be higher than the competence of those who teach them? (on the basis of the materials of the monitoring research on the competence of graduates in Ukraine). *Computer at school and family*, 8, 3–8. Retrieved from http://nbuv.gov.ua/UJRN/komp_2010_8_2.

- Morze, N. V., Kocharjan, A. B. (2014). Model of the standard of ICT competence of university teachers in the context of improving the quality of education. *Information technology and teaching aids*, 5, 27–39.
- Ottestad, G., Kelentric, M., & Gudmundsdottir, G. B. (2014). Professional digital competence in teacher education. *Nordic Journal of Digital Literacy*, 9(4), pp. 243–249.
- PILOT – Progressive Inquiry Learning Object Templates Accessed 10 May 2019. Retrieved from <http://fle3.uiah.fi/pilot/>.
- Pöldoja, H. (2016). The Structure and Components for the Open Education Ecosystem Constructive Design Research of Online Learning Tools, doctoral dissertation, Aalto University publication series Doctoral dissertations. p. 208. Retrieved from <https://aaltodoc.aalto.fi/bitstream/handle/123456789/23535/isbn9789526069937.pdf?sequence=1&isAllo wed=y>.
- Redeker, C., Poonie, J. (2017). European framework for the digital competence of teachers: DigCompEdu. Brussels: Joint Research Center, European Union, Retrieved from <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-framework-digital-competence-educators-digcompedu>.
- Samenwerken aan ict- innovatie in het onderwijs en onderzoek. Accessed 6 May 2019. Retrieved from <http://www.surfspace.nl/>.
- Schule 4.0. – jetzt wird's digital Accessed 6 May 2019. Retrieved from <https://www.schule40.at>.
- Sistemska podpora digitalne pedagoške prakse MENTEP. Accessed 6 May 2019. Retrieved from <https://www.zrss.si/mentep/>.
- Strateške usmeritve nadaljnega uvajanja IKT v slovenske VIZ do leta 2020. Accessed 6 May 2019. Retrieved from http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/StrateskeUsmeritveNadaljnegaUvajanjaIKT1_2016.pdf.
- Technology compass for education 2016–2017. Kennisnet Trend Report 2016–2017. Accessed 6 May 2019. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/corporate/algemeen/Kennisnet_Trendreport_2016_2017.pdf.
- The Norwegian Centre for ICT in Education. (2006). Accessed 6 May 2019. Retrieved from <https://iktsenteret.no/english>.
- Vier In Balans Monitor (2017). Accessed 19 May 2019. Retrieved from <https://www.kennisnet.nl/fileadmin/kennisnet/publicatie/vierinbalans/Vier-in-balans-monitor-2017-Kennisnet.pdf>.
- Wolbers, N., Schubert, K. and Lambertz, J. (2015). Training curriculum for blended learning course. Retrieved from: <http://online4edu.eu/index.cfm/secid.181>.
- Zhaldak, M. I., Ramskyj, Ju. S., & Rafaljsjka, M. V. (2009). Model of the system of social and professional competences of the teacher of informatics. *Scientific journal of the National Pedagogical University named after M.P. Dragomanov. Series 2. Computer-oriented learning systems*, 7, 3–10.

Halyna Henseruk

Zaawansowane doświadczenie w rozwijaniu kompetencji cyfrowych nauczycieli

Streszczenie

W artykule rozważa się jeden z głównych elementów kompetencji zawodowych przyszłych nauczycieli – ujawnia się kompetencje cyfrowe i zagraniczne doświadczenie w rozwijaniu kompetencji cyfrowych przyszłych nauczycieli. Analizowane są europejskie standardy określania kompetencji

cyfrowych, w tym Digital Competence of Educators (DigCompEdu), profil kompetencji cyfrowych obejmujący sześć obszarów kompetencji cyfrowych nauczyciela. W artykule przedstawiono podejścia do opisu wyników edukacyjnych dotyczących kompetencji cyfrowych nauczycieli. Przeprowadzono analizę doświadczeń nauczycieli zagranicznych (Litwa, Estonia, Austria, Norwegia, Holandia, Australia Zachodnia, Słowenia) w zakresie rozwoju kompetencji cyfrowych nauczycieli w procesie ich szkolenia zawodowego w instytucjach szkolnictwa wyższego oraz poprawy kwalifikacji zawodowych praktykujących nauczycieli w zakresie kompetencji cyfrowych. Przeanalizowano reformy edukacji obcych krajów w zakresie cyfryzacji edukacji i rozwoju kompetencji cyfrowych nauczycieli. Opisano i przedstawiono charakterystykę kursów szkoleniowych, zagranicznych platform edukacyjnych, społeczności na potrzeby szkoleń i zaawansowanych szkoleń nauczycieli technologii cyfrowych. Analiza pracy zagranicznych naukowców sugeruje podejście do klasyfikacji i opisu rodzajów kompetencji cyfrowych nauczyciela.

S ł o w a k l u c z o w e: kompetencje cyfrowe, technologie informacyjne i komunikacyjne, profil kompetencji cyfrowych, szkolenia, platformy internetowe

Halyna Henseruk

Передовой опыт развития цифровой компетентности учителей

А н н о т а ц и я

В статье рассмотрено одну из основных составляющих профессиональной компетентности будущих учителей – цифровую компетентность и раскрыто зарубежный опыт развития цифровой компетентности будущих учителей. Проанализированы европейские стандарты определения цифровой компетентности, в частности профиль цифровых компетенций учителя Digital Competence of Educators (DigCompEdu), который включает шесть областей цифровых компетенций учителя. В статье выделены подходы к описанию учебных результатов по цифровой компетентности учителей. Проведен анализ опыта зарубежных стран (Литва, Эстония, Австрия, Норвегия, Нидерланды, Западная Австралия, Словения) по проблеме развития цифровой компетентности учителей в процессе их профессиональной подготовки в учреждениях высшего образования и повышения квалификации практикующих учителей учитывая рамки цифровой компетентности. Проанализированы реформы образования зарубежных стран по цифровизации образования и развития цифровой компетентности учителей. Рассмотрены и дана характеристика учебных курсов, зарубежных образовательных платформ, сообществ для подготовки и повышения квалификации учителей с цифровых технологий. Анализ работ зарубежных исследователей позволяет сделать вывод о подходах к классификации и описания видов цифровых компетенций учителя.

К л ю ч е в ы е с л о в а: цифровая компетентность, информационно-коммуникационные технологии, профиль цифровой компетентности, учебные курсы, онлайн платформы

Halyna Hensseruk

Experiencia avanzada en el desarrollo de la competencia digital de los docentes

R e s u m e n

El artículo trata sobre la competencia digital, que es uno de los componentes principales de la competencia profesional de los futuros docentes, y revela la experiencia extranjera del desarrollo de la competencia digital de los futuros docentes. Los estándares europeos para la determinación de la competencia digital se analizan, en particular, el perfil de competencia digital del profesor Competencia digital de educadores (DigCompEdu), que incluye seis áreas de las competencias digitales de un profesor. El artículo describe los enfoques para la descripción de los resultados educativos relacionados con la competencia digital de los docentes. El análisis de la experiencia de países extranjeros (Lituania, Estonia, Austria, Noruega, Países Bajos, Australia Occidental, Eslovenia sobre el problema del desarrollo de la competencia digital de los docentes en el proceso de su formación profesional en instituciones de educación superior y el desarrollo profesional de la práctica profesores) se ha llevado a cabo teniendo en cuenta el alcance de la competencia digital. Se consideran las reformas en la educación de los países extranjeros con respecto a la digitalización de la educación y el desarrollo de la competencia digital de los docentes. Se describen y analizan cursos académicos, plataformas educativas extranjeras, comunidades para la formación profesional de docentes y desarrollo profesional en tecnologías digitales. El análisis del trabajo de los investigadores extranjeros permite sacar conclusiones sobre los enfoques de clasificación y descripción de los tipos de competencia digital de los docentes.

Palabras clave: competencia digital, tecnologías de información y comunicación, perfil de competencia digital, cursos de capacitación, plataformas en línea