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TEACHERS' VIEWS ON THEIR DIGITAL COMPETENCE AND PROFESSIONAL DEVELOPMENT

Abstract

In the last few decades, the number of empirical studies focusing on teachers' digital competence, preparedness and ability to use information and communications technology (ICT) devices has increased. The present study comprises recent pedagogical results on teachers' digital readiness with special emphasis on its role in their own professional development in an international context. The different views on digital competence are also described. Teachers need a complex set of digital skills (including cognitive, motoric, social and emotional skills) in order to improve their educational practices in the digital environment. A teacher needs to be able to estimate and recognize the consequences of how the use of ICT devices changes the process of education and learning strategies. Adapting new methodological practices leads to teachers' continuous professional development.

Keywords: professional development, teacher, pedagogue, digital competence

1. INTRODUCTION

The number of empirical papers concentrating on the digital preparedness of teachers and teacher trainees has grown in the last few decades, as it is vital to see how and on what level they are capable of using information and communications technology (ICT) during their teaching practices. Teachers' ICT competences remain a key element for educational development. Teachers are expected to be proficient in their use of ICT during the processes of teaching and learning. New technologies offer new potential in teaching, which could possibly increase the quality of education. Digitally competent teachers are expected to have more than instrumental and operational skills; they should also make adequate choic-

es about when and how to integrate technology into pedagogical processes. They should possess a good conceptual understanding to explain why something works or does not work under given educational circumstances. In the current situation, there is a shortage of properly trained proficient teachers whose digital skills meet national or international expectations (*Vázquez and Montoya*, 2015).

The aim of this paper is to review and summarize the results of recent pedagogical studies on teachers' digital competences and to give hints on how to integrate these findings into teacher training courses. This study will allow us to make decisions in policy formation concerning teacher education in terms of initial, in-service or pre-service training courses.

2. DIGITAL COMPETENCE

As a result of the educational significance assigned to digital competence in the present-day educational system, ICT competences as crucial learning tools are included in legislative documents. Several definitions of digital competence are used in pedagogical studies. First, it is worth looking at the definition of the Hungarian National Core Curriculum (Ministry of Human Resources, 2012), which is the main legal document issued as an annex of a government decree defining Hungarian public education and serves as a framework for local school-level curricula regarding the contents of subjects and examination requirements. This document indirectly defines what kinds of competences teachers have to possess in order to be able to improve children's digital competence and to facilitate their learning while also fulfilling the requirements of the National Core Curriculum.

The National Core Curriculum (Ministry of Human Resources, 2012) specifies what kinds of approaches schools have to adopt; in addition, the social and ethical challenges of technologies are also mentioned. The section titled "Competence development, the dissemination of general knowledge and knowledge acquisition" describes the key competences that should be improved during the years of public education 1–12 in ten curricular areas. One of these areas concentrates on information technology (IT); however, because of the interdisciplinary characteristics of this field, other curricular areas may be included, such as "Man and society", including ethical considerations. Video culture and media literacy are listed under the "Arts" category, while the "Way of life and practical skills" group may also include the practical technological skills needed in everyday life. In this document, digital competence implies the confident, critical and ethical use of technology and all the contents created by technology. The necessary skills belonging to this competence also

imply information processing skills, the ability to find necessary information and critically interpret it, ethical and responsible communication skills, and the ability to cooperate on the Internet. Figure 1 compares the key competences defined by the Hungarian National Core Curriculum (Ministry of Human Resources, 2012) and the key competences for lifelong learning recommended by the European Union (2006).

Key Competences Framework	Hungarian National Core Curriculum
Communication in the mother tongue	Hungarian language and literature
Communication in foreign languages	Foreign languages
Mathematical competence and basic competences in science and technology.	Mathematics
	Man and society
Digital competence	Man and nature
Learning to learn	Earth
Social and civic competences	Arts
Sense of initiative and entrepreneurship	*IT studies*
Cultural awareness and expression	Way of life and practical skills
	Physical education and sports

Figure 1
The Key Competences Framework (European Union, 2006) and the Hungarian National Core Curriculum (Ministry of Human Resources, 2012)

Digital competence is one of the eight indispensable competences defined by the European Union as needed in the 21st century. Under this approach, digital competence includes the use of devices and information processing skills, with a focus on critical and ethical use (*Szegedi*, 2016). The competences listed above are transversal (i.e. they can be transferred from one specific area to another), which is why digital competence affects

mathematical and technological competences, as the use of technology is listed under this category. The aim of the strategic framework of Education and Training 2020 is specifically to develop the reference framework of these transversal skills. From the point of view of teacher education, the competence of learning to learn is also important, as organizing independent learning and inserting new information into old knowledge is part of this competence.

3. TEACHERS' DIGITAL COMPETENCE

It is of primary importance to emphasize that teachers' digital competence differs from the digital competence interpreted in other professions. Although teachers now have increased access to digital tools (mainly personal computers, laptops, tablets and interactive whiteboards), media and resources, both teachers and children have access to various digital resources and social media networks during the teaching process. *Røkenes* and *Krumsvik* (2014) highlight that digital competence means much more in the case of teachers than the ability to use various programs or operate digital devices. In this case, digital competence should include the more-complex (e.g. cognitive, motoric, sociological and emotional) skills that contribute to making pedagogical procedures more efficient in the digital environment. During the pedagogical process, teachers need to be able to estimate how the use of ICT devices will modify the process of education, as well as the effects on learning approaches and strategies. The efficient use of ICT devices and digital learning resources should complement traditional teaching methods and organizational forms. Learning new teaching methods and educational practices meets the demand for continuous professional development, which is in accordance with the principles of lifelong learning.

A similar approach is discussed by *Krumsvik* (2012), who also states that the digital competence of teachers is different from that of other technology users. His model (see Figure 2 below) of the formation of teachers' digital competence is based on theoretical conceptions and represents the digital competence in teacher education on an abstract level; however, it is inspired by practical realities.
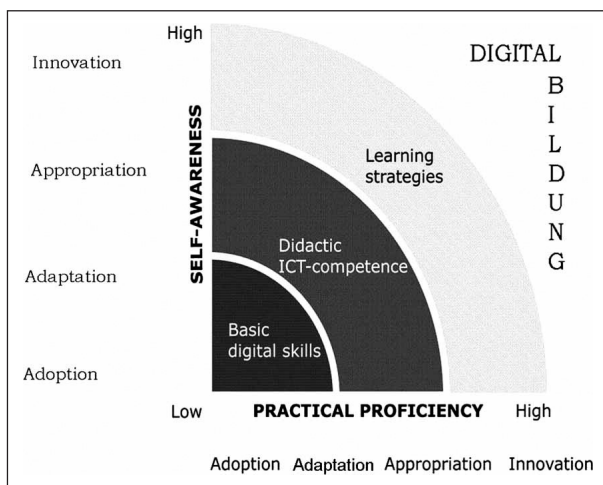
Figure 2
Teachers' digital competence (Krumsvik, 2012: 274)

He uses the metaphor of a "competence journey", which starts with the relatively unaware stage of adoption in the mental part of the model, and teachers follow the stages of adaptation, appropriation and innovation over time, which denotes a high level of digital competence. The practical part of the model is realized in a parallel way, first acquiring basic digital skills and then improving didactic ICT competence, which refers to being able to use ICT in different subjects. The learning strategies component concentrates on the pedagogical implications of digital competence. In an ideal framework of teacher education, the development of teachers' digital competence leads to the "digital bildung", which includes a high level of self-awareness and practical proficiency.

4. TEACHERS' DIGITAL COMPETENCE IN INTERNATIONAL CONTEXT

The following section reviews studies in different countries focusing on the development of the digital competence of teachers. In the Latin American context, *Hernandez-Carranza et al.* (2015) reviewed didactic digital competences in terms of the knowledge and skills needed to teach, in addition to combining media and ICT skills, more precisely, to plan and design learning settings that facilitate students' learning. This approach emphasizes the development of the skills inherent to teaching and the acquisition of strategies

for implementing such skills in the context of digital competences for planning and design, communication and interaction, instruction and learning, management and administration, and ICT use. The complexity of these skills is summarized according to the abovementioned components in Figure 3.

Digital didactic competence	Actions
1. Planning and design	• Adaptation to new learning modalities as both user and designer of learning scenarios using ICT. • Integration of digital resources as didactic instruments, contents and materials in curricula. • Selection and objective assessment of digital resources for their use in pedagogical practice contexts: design, implementation and use of technology.
2. Instruction and learning	• Design and production of digital resources for didactic use. • Development of assessment plans using ICT. • Use of ICT to advise, orientate and monitor students. • Initiating interactive debates and maintain them. • Understanding for collaborative, constructive, reflective, active and authentic learning.
3. Communication and interaction	• Understanding the impact and function of ICT in including them in the knowledge society. • Knowledge of the basic concepts and tools of communication and consulting information on the Internet. • Collaboration in virtual academic communities with actors in the teaching–learning process. • Developing learning among equals and social links.
4. Management and administration	• Understanding the legal and ethical aspects associated with ICT through networks: licences, privacy, intellectual property and security. • Self-management for continuous learning and incorporating technologies in the teaching–learning process. • Acquisition of skills for applying the advantages of ICT to teaching/administrative tasks. • Knowledge management.

5. ICT use	• General knowledge associated with ICT. • Managing the basic functions of computing and electronic communication devices and operating systems. • Handling basic production tools: word processors, spreadsheets, presentations and multimedia elements.

Figure 3
Classification of digital didactic competences
(Hernandez-Carranza et al., 2015: 82)

In terms of an international comparison, the study of *Røkenes* and *Krumsvik* (2014) is essential, as it gives an overview of papers published online between 2000 and 2013 focusing on students' digital competence participating in teacher education. Their research method was to select keywords to limit the studies considered in the overview: digital competence + teacher, digital education + teacher, computerised education + teacher, and media education + teacher. In total, 42 articles published in ten different countries met these requirements; these papers were then categorized and analysed. The following eight approaches were identified in the course of their literature review concerning the elements of teacher training programmes on the micro and interactive levels:

- Metacognition: in these studies, participants in teacher training programmes had to comment on and critically analyse how different technological solutions could be applied in the classroom setting. This approach concentrated on teachers' decisions and resolutions.
- Multimedia instruction or blended learning: combinations of classroom education and online teaching methods are discussed in these papers, which employ a wide range of electronic devices and multimedia solutions.
- Modelling: in this approach, the best practices and practical methods of training instructors, mentors and peer students are investigated, and the actual software or other technical methods are presented.
- Authentic learning: learning takes places in real situations, in the actual context of the future use, while the participants create, discover and evaluate how they will be able to use digital technologies in the classroom.
- Student-active learning: in these studies, the participants develop their digital competence using a 'learning-by-doing' method based on experiencing and practising.

- Assessment: the focus is on how different technological solutions can be used in classroom assessment and evaluation.
- Differences between theory and practice (bridging the theory and practice gap): the articles outlined here summarize how technology can be employed to overcome the gap between the theoretical knowledge gained during university years and classroom practice.

The areas listed above can serve to designate the cornerstones of a theoretical framework focusing on the development of digital competence in teacher training.

A recent study by *Spiteri* and *Chang Rundgren* (2017) investigated the digital competence of Maltese teachers. The educational policy in Malta lays strong emphasis on the development of digital proficiency; in this country, schools are well equipped with a range of digital devices. The teachers participating in the study all use interactive boards and are provided with separate laptops. In state schools, each classroom has four personal computers, and BeeBots robots are also used. In church schools, children have their own tablets. Maltese teachers use a separate online platform (Frontier) which makes online communication possible among colleagues, students and parents. *Spiteri* and *Chang Rundgren* (2017) aimed to investigate how Maltese primary school teachers use technology in the practicalities of teaching processes and how teacher training could contribute to the efficient integration of technology. Semi-structured interviews were conducted with a total of 26 teachers to collect qualitative data on their views and experiences of using digital devices in the classroom. The findings of the research point to the necessity of more focus on developing digital skills in teacher training programmes.

Eight categories were identified that need to be improved in the future, based on the interviews:
- Information management: it is necessary to know the differences between search engines and to be able to filter relevant information. In addition, all students should be involved in the use of digital technologies in order to bridge the increasing digital gap between students.
- Collaboration: interaction using digital devices should not only take place between teachers and parents but also in the classroom between students.
- Communication and sharing: according to this study, teachers were willing to communicate and cooperate with each other; however, they were not eager to share content with each other. In addition, online communication with parents also requires more.
- Creation of content and knowledge: in spite of the fact that all the teachers taking part in the research employed digital technology, not

all of them created learning resources and content themselves. The reasons were various, for instance teachers' negative attitudes or lack of creativity, which may also suggest that the use of digital technology is becoming routine among teachers.

- Ethical and responsible use of technology: this area was mentioned relatively rarely by the Maltese teachers, which could reflect that this dimension of digital competence is well known by Maltese teachers; however, having continuous and up-to-date information is important.
- Evaluation and problem-solving: the participants of the research were aware of the importance of technology in pupils' lives, and they also knew this from the viewpoint of autonomous learning. More-interactional communicational patterns were observed between pupils and teachers due to immediate feedback. This improved children's' problem-solving skills, as they thought that they were able to control their own learning in a more conscious way. The authors' recommendations imply that the focus of teacher training should be on learning outcomes and problem-solving skills.
- Technical operations and innovative use of technology: only a few teachers experimented with using unusual and innovative technological solutions; most of them relied solely on interactive boards.
- Creation of modes of communication: the Maltese teachers managed to convert traditional communication methods of reading and writing into modern sound, video and text formats..

These eight problem areas identified and described by *Spiteri* and *Chang Rundgren* (2017) may also be relevant for teachers working in other countries, as these areas hide more difficulty for the Hungarian teachers presumably.

Investigating newly qualified teachers offers an excellent opportunity to draw conclusions on the efficiency of teacher education and to highlight the necessity of possible modifications. The purpose of the research carried out by *Gudmundsdottir* and *Hatlevik* (2017) was to examine newly qualified teachers' digital competence. In this study, beliefs about the content of digital development in teacher training and their preparedness and experiences in using ICT devices during teaching were gathered in a questionnaire filled out by 356 teachers. In sum, the participants reported on the low-level and inefficient digital training in the course of teacher training.

The conceptual background of this study was a PDC (professional digital competence) model that combined content, pedagogical and technical knowledge with a specific pedagogical approach. The three basic factors were as follows:

- General digital competence (the general skills, knowledge and attitude necessary for teachers, teacher trainers and students to cooperate in a digital environment).
- Subject-specific digital competence, focusing on the requirements of individual subject areas when using digital devices during training.
- Teacher-oriented competence, including didactic factors (e.g. communication between school and parents and the psychosocial characteristics of learning) and teachers' self-training and independent research.

The results indicate that nearly half of the newly qualified teachers considered the standard of ICT training in teacher education to be low and believed that it had contributed to the development of their digital competence only slightly. The participants appeared to be aware of the benefits and the disadvantages of ICT devices and reflected critically on their own use of ICT devices during teaching. In total, 80% of the teachers found using ICT devices positive; however, half of them reported on their distracting effect on the process of teaching. This is why it is especially important to improve the self-efficacy and efficiency of prospective teachers with the help of positive ICT experiences so that their commitments to this key competence have a positive effect on their professional work. The authors emphasize that the instructors of teacher training serve as serious models for future teachers, as their attitudes and ICT usage show a remarkable correlation with the responses of newly qualified teachers.

A recent large-scale research project investigated Spanish teachers' digital competence. The study of *Fernandez-Cruz* and *Fernandez-Diaz* (2016) examined 1,433 teachers who taught in 80 different schools in Madrid, and they concluded that a relevant difference can be found between the optimal ICT skills necessary for teachers to be able to develop effective teaching activities using several technological devices and the teachers' low-quality digital competence experienced in real teaching circumstances. Moreover, the study found essential generational differences between the teachers when they were assigned to categories based on age in terms of using digital technologies: Y generation (1977-94) and Z generation (born in 1990 and 2000). They used the framework suggested by UNESCO (2011), concentrating on the following focal points:

1. General curricular viewpoints.
2. Planning and assessment.
3. Methodological viewpoints.
4. Use of ICT.
5. Management of ICT resources.
6. Continuous professional development in ICT.

The Spanish teachers had a low–medium profile across these subdivisions. General curricular scores were so low that most of the teachers were not aware of what "digital competence" means in education and how it can be improved in the classroom. The teachers' classroom strategies were poor, especially in terms of complexity and collaboration. The outstandingly low score for ICT use reflects the teachers' uncertain knowledge of digital devices; in this case, the devices were not being used safely during lessons. Not surprisingly, age and specialization were found to be decisive, with the results indicating that younger teachers and teachers specialized in informatics had significantly better digital competence. A significant difference was not found between primary school and secondary school teachers, which indicates that the level of teacher training (i.e. BA or MA level) seems to have little effect on teachers' digital competence. However, in-service training was more dominant in the case of secondary school teachers, which underlines the significance of continuous training courses after graduation. Teachers who had a wider range of digital devices at home (PCs, laptops, tablets or smartphones) with independent Internet connections had a higher level of digital competence, unsurprisingly. One of the most decisive factors was a positive attitude regarding the effects of ICT use in teaching, the formation of which should be an important priority of teacher training courses. However, the teachers complained of the longer time needed to prepare for classes where ICT devices are used.

The findings of the Spanish research study by *Fernandez-Cruz* and *Fernandez-Diaz* (2016) are in accordance with the results of a Hungarian study by *Buda* (2011), which aimed to develop a characterization of Hungarian teachers in the information society. His classifications in terms of digital competence and the use of digital devices included the following categories: digital explorer, digital nomad, digital wanderer, digital settler and digital conqueror. He highlights that teachers are often motivated to use digital technology in order to fulfil students' expectations in Hungary (and not due to curricular or official expectations) because the source of teachers' authority is not seen in the depth of knowledge any more but in quick and efficient information processing. The most popular and widespread way of improving Hungarian teachers' digital competence was authentic or individual learning.

As the digital learning environment changes quickly, continuous learning is especially important for teachers, which confirms the paradigm of lifelong learning and is one of the key competences detailed above. Teachers' autonomous learning depends considerably on their existing digital competence. One of the efficient methods to develop this competence is a massive open

online course (MOOC). *Vázquez* and *Montoya* (2015) investigated the outcomes and influences of an MOOC aimed to improve teachers' digital skills. Teachers of grades 5 and 6 participated in the research after having accomplished an MOOC focusing on effective didactic skills in digital settings. The method of data collection was pre-test and post-test questionnaires; in addition, qualitative interviews were used to explain the negative issues experienced during the training and the positive effects on the teachers' methodological repertoire.

The teachers taking part in the research were investigated in the following areas, measuring the improvement of their digital competence:

- Finding relevant information on the Internet.
- Selecting relevant information on the Internet.
- Information processing.
- Communication via technological devices.
- Project planning using educational technical devices.
- Using open educational resources (OERs).
- Identifying OER materials.
- Planning and developing OERs in different formats.

Based on the findings of *Vázquez* and *Montoya* (2015), it can be stated that MOOCs are efficient ways to improve teachers' digital competences, especially in the fields of information processing, communication and project planning. The communicational competence using technical devices improved by 15%, which indicates that they had wider knowledge of communicational means on the Internet and they were able to cooperate in virtual professional communities; consequently, they had better social relationships. Their enhanced skills in employing digital resources in teaching and integrating them into pedagogical procedures also implied being able to select and assess whether the digital resources fit with the pedagogical context. The participants underlined the practical use of this MOOC, which enabled them to apply these practicalities after completing the course.

5. CONCLUSIONS

The development of ICT has radically changed our society, and these changes have resulted in serious consequences in the context of education, including what is learnt and how it is taught, as well as the roles and tools of teachers in the 21st century. During the last two decades, a special focus on learning with technology has strongly influenced the concept of digital competence. Pedagogical digital competence is related to theoretical knowledge, skills, attitudes and approaches concerning digital technology. In the

studies reviewed above, different conceptions of teaching and learning in a digital environment and the knowledge needed to improve learning are described. The main contribution of this paper is the definite focus on the pedagogical digital competence development of teachers and the emphasis on different approaches to ICT training in teacher education. Although there are similarities between the approaches described and examined, there are also some differences to highlight. Clearly, an enriched understanding of teachers' digital competence is needed, which should have consequences for teacher education programmes. Further research is needed to define how teacher should be trained in all areas of digital competence, which should be in accordance with the requirements of students' digital competence development. Logically, teachers can only help students to develop a competence that they themselves have already acquired in depth.

REFERENCES

Buda, A. (2011). Telepesek és nomádok. In: Cser. L. & Herdon, M. (szerk). *Informatika a felsőoktatásban*. Debrecen: Debreceni Egyetem, 913–918.

European Union (2006). *Key Competences for Lifelong Learning: A European Reference Framework.* Brussels: European Union

Fernandez-Cruz, F. J. & Fernandez-Diaz, M. J. (2016). Generation Z's Teachers and their Digital Skills. *Comunicar*, 46, 24, 97–105.

Gudmundsdottir, G. E. & Hatlevik, O. E. (2017). Digital Competence and Newly Qualified Teachers' Experiences of ICT in Teacher Education Programmes in Norway. *European Journal of Teacher Education*, 41, 2, 1–17.

Hernandez-Carranza, E. E., Romero-Corella, S. I. & Ramirez-Montoya, M. S. (2015). Evaluation of Digital Didactic Skills in Massive Open Online Courses: A Contribution to the Latin American Movement. *Comunicar*, 22, 44, 81–89.

Krumsvik, R. J. (2012). Teacher Educators' Digital Competence. *Scandinavian Journal of Educational Research*, 58, 3, 269–280.

Ministry of Human Resources (2012). *Hungarian National Core Curriculum*. Budapest: Ministry of Human Resources. Retrieved from
http://net.jogtar.hu/jr/gen/hjegy_doc.cgi?docid=A1200110.KOR

Røkenes, F. M. & Krumsvik, R. J. (2014). Development of Student Teachers' Digital Competence in Teacher Education – A Literature Review. *Nordic Journal of Digital Literacy*, 9, 4, 250–280.

Spiteri, M. & Chang Rundgren, S. N. (2017). Maltese Primary Teachers' Digital Competence: Implications for Continuing Professional Development. *European Journal of Teacher Education*, 40, 4, 521–534.

Szegedi, E. (2016). *Az európai oktatási szakpolitika prioritásai.* Budapest: Tempus Közalapítvány

UNESCO (2011). *UNESCO ICT Competency Framework for Teachers.* Retrieved from http://unesdoc.unesco.org/images/0021/002134/213475e.pdf

Vázquez, N. R. & Montoya, M. S. (2015). *Digital Skills Development: MOOC as a Tool for Teacher Training*. ICERI 2015 Proceedings, 2714–2721.

Tanári nézetek digitális kompetenciájukról és szakmai fejlődésükről

Az elmúlt évtizedekben megnövekedett azoknak az empirikus tanulmányoknak a száma, amelyek a tanárok digitális kompetenciáját, felkészültségét és képességét vizsgálják arra vonatkozóan, hogyan és milyen szinten képesek információs és kommunikációs technológiákat (IKT) használni. A tanulmány azzal a szándékkal készült, hogy áttekintse a legfrissebb nemzetközi kontextusban megjelent pedagógiai cikkeket a pedagógusok digitális felkészültségéről, különös hangsúllyal a szakmai fejlődésükben betöltött szerepéről. A digitális kompetenciára vonatkozó különböző nézetek is bemutatásra kerülnek. A tanároknak komplex digitális készségekre (beleértve a kognitív, motoros, szociális és érzelmi készségeket is) van szükségük ahhoz, hogy növelni tudják tanítási gyakorlatuk hatékonyságát a digitális környezetben. Egy tanárnak fel kell tudnia mérni és felismerni, hogy az IKT-eszközök használata milyen változásokat okoz az oktatás folyamatában és a tanulási stratégiákban. Az új pedagógiai gyakorlatok elsajátítása pedig hozzájárul a folyamatos szakmai fejlődéshez.

Kulcsszavak: szakmai fejlődés, tanár, pedagógus, digitális kompetencia

Ispitivanje stavova nastavnika o njihovoj digitalnoj kompetenciji i profesionalnom razvoju

Tokom proteklih decenija, povećao se broj empirijskih studija koje se bave digitalnom kompetencijom nastavnika, njihovom spremnošću i sposobnošću da koriste informacione i komunikacione tehnologije (IKT). Ova studija je nastala s ciljem da istraži u najnovijem međunarodnom kontekstu objavljene pedagoške članke o digitalnoj pismenosti nastavnika, sa posebnim naglaskom na njihovoj ulozi u profesionalnom razvoju prosvetnih radnika. Prikazani su i različiti pogledi na digitalne kompetencije. Nastavnicima su neophodne i složene digitalne veštine (uključujući kognitivne, motoričke, socijalne i emocionalne veštine) kako bi se povećala delotvornost njihove nastavne prakse u digitalnom okruženju. Nastavnik treba da

bude sposoban da meri i prepozna kakve promene se dešavaju u procesu obrazovanja i strategijama učenja tokom korišćenja komunikacionih tehnologija. S druge strane sticanje novih pedagoških praksi doprinosi neprekidnom profesionalnom razvoju.

Ključne reči: profesionalno usavršavanje, nastavnik, pedagog, digitalna kompetencija