Digital Literacy in Transversal Competences of Future Teachers

Digitalization of Education

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Abstract

Digital literacy has been a much-discussed topic in the context of Czech education in recent years, both the concept of digital literacy itself and especially the way of its development in pre-primary, primary and secondary education. The paper presents and analyses the didactic aspects of the implementation of the European Framework of Digital Competences for Teachers in teacher education programmes. Particular attention is paid to transversal competences in the competence model of the teacher, optimized for achieving digital literacy, enabling the subsequent development of digital literacy in learning individuals. The definitions and conclusions are discussed in the context of foreign sources and the currently addressed concept in the Czech Republic.

1   Introduction

Today's society is dominated by digital technologies and their use will continue to expand. However, this is not matched by the level of digital literacy of students. In the Czech Republic, the introduction of digital technologies into education was promised by the 2020 Strategy. However, the tasks set out in this strategy are being put into practice very slowly. Schools acquire digital aids, tools and devices within the framework of European Union projects, but there are not many teachers who are able to operate them. Teachers are often far behind their pupils in digital competences. They have not been taught any of this in the faculties of education and are afraid of further training in this area. The digital age is not the future, it is happening in the present. Neither pupils nor teachers can do without digital skills today. A teacher today could teach very creatively if he or she uses the possibilities of modern technology. Many teachers teach creatively, they teach by project, but without digital tools. The Czech School Inspectorate stated in a document that 70% of schools are equipped with digital technologies, not only in computer science classrooms, but also in other classrooms, but this material equipment does not have much impact on innovation or the actual digitalisation of teaching. The Czech School Inspectorate states that the most frequently used information source in primary schools is printed text or image sources. Children thus come to school with the obvious ability to use a computer or tablet and often encounter teachers who are not as familiar with digital technologies and also encounter opinions that mobile phones and tablets do not belong in school. However, a tablet or mobile phone are only tools, what is important is the content and their didactic grasp. School education cannot and must not remain on the sidelines, because then it would not prepare pupils for real life (Krpálek, Kadaňová, 2014; Hrmo, Krpálková-Krelová, 2010).

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2 Digital literacy in the context of the European framework of digital competences for teachers

For a decade now, there have been calls in the Czech Republic for the need for a major overhaul of education in the use of digital technologies in the context of education. The concept, which is applied in practice, is already significantly outdated and does not fully reflect the development in the field of digital technologies, but also the needs that society puts (will put) on the student, the future graduate = employee. This concerns not only the skills in controlling technology, which is currently the dominant content of education, but above all the acquisition of competences for safe and effective functioning in the digital world, both in personal and professional life. Education in digital literacy needs to be addressed as a cross-cutting theme across all educational disciplines across educational levels. This, of course, entails achieving a solid level of digital competences among the educators themselves, i. e. teachers, as this is the only way to ensure that digital competences are adequately reflected in the style of their pedagogical work in direct teaching.

The issue of digital education solutions was opened in the Czech environment as early as 2005, when it was becoming clear that digital skills would become a key competence, essential for success in employment, socialisation and personal development of each individual. By their nature, we can say that these are transversal competences, as they permeate the educational curriculum in a cross-cutting manner. They include not only the ability to use the computer as a tool for work, information skills and media literacy, but also significantly include creativity, independent thinking, presentation and communication skills, teamwork skills, and the whole domain of attitude formation toward personal integrity, moral attitudes, acceptance and practice of ethical principles and tolerance. The modification of the official curriculum documents is therefore on the agenda and with it the requirement to equip teachers with the necessary competences. Their task is to prepare students to live and work in a digital society (Redecker, 2018).

Digital Literacy as a concept has been used for many years and it could be said that it is already firmly embedded in the family of literacies such as mathematical, financial, reading, technical, etc. Recently, however, it has become a concept that dominates the field of professional terminology and is very often used in strategic and conceptual materials. This term has very broad content. Like Digital Competence, it integrates relevant knowledge, skills and attitudes and is seen as a concept that is permeated to varying degrees by other literacies. The term Digital Skills or Digital Knowledge is also used in conjunction with Digital Literacy.

The concept of digital literacy has become established in the minds of the professional community thanks to Paul Gilster and his book Digital Literacy, published in 1997, in which the author draws attention to the need to acquire new literacies for life in the age of the Internet. Gilster (1998) defines digital literacy both in a broader sense and in a narrower sense. In a broad sense, it is "the ability to use computer networks to access resources and the ability to work with those resources" (Rosado et al., 2006, p. 5). In a narrower sense, it is "the ability to work in an online environment and to assess online information" (Rosado et al., 2006, p. 5). Gilster understands digital literacy as the ability to understand and use information in multiple formats coming from different sources, not only digital. He stressed that digital literacy requires more critical thinking than technological competences, as this is the only way to make informed decisions in the media world. However, technological competencies are absolutely necessary to acquire content. From the above, it is evident that digital literacy is an ever-present need to be able to constantly adapt and develop skills in using new media (Kabel, 2012).

A digitally literate person should be able to (Bawden, 2008):

– critical thinking, making informed decisions about the content of the information found, and distinguishing between content and form of presentation when evaluating it;
– extract information and build knowledge from a variety of hypertext and hypermedia-oriented information sources;
– manage incoming information;
– be vigilant in assessing the validity and completeness of material retrieved from electronic sources;
– develop a personal information strategy;
– use contact and communication with and get help from other people;
– understand the problem and address relevant information needs.

In 2000, the concept of digital literacy is described in the eEurope document, Information Society for All, where it is characterised as the ability to work with the Internet and multimedia resources, the ability to use these

resources to learn and acquire new knowledge and skills, and the mastery of key competences such as competences for collaboration, creativity, adaptability or problem solving (eEurope, 2000). In a somewhat narrower sense, reflecting only the technological aspect and the skills related to the use of the Internet, this concept is reflected in some European Commission documents, where it is understood as the basic skills in the use of information and communication technologies, computers for obtaining, evaluating, storing, creating, publishing and exchanging information, for communicating and engaging in collaborative (social) networks via the Internet (European Commission, 2008). On the other hand, Covello (2010) presents digital literacy as a concept integrating several specific literacies into one (information literacy, computer literacy, media literacy, communication literacy, visual literacy and technological literacy).

In 2008, Bawden (2008) published a model of digital literacy in which he distinguished components of four levels:

- A foundation made up of literacy in the traditional sense, i.e. reading and understanding text and knowledge and skills on how to use a computer;
- Existing knowledge and experience as the ability to understand today's diverse forms of information and the ability to integrate it into the digital world;
- Central competencies, i.e., reading and understanding information, both in digital and non-digital formats, completing and compiling knowledge;
- Attitudes, opinions, knowledge and skills formed and acquired in the previous levels set in a socio-cultural framework.

According to Martin (2008), digital literacy also includes the ability to perform digital activities successfully in the context of everyday life, i. e. involving work, learning, leisure, etc. Calvani, Fini and Ranieri (2009) summarise digital literacy as a combination of concrete and unquantifiable skills - "digital literacy is being able to explore and face new technological situations in a flexible way, to analyse, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one's own personal responsibilities and the respect of reciprocal rights/obligations".

The current conception of digital literacy is related to the concept of digital competences as a set of knowledge, skills and attitudes, including relevant competences in using digital technologies to solve problems, communicate, collaborate, create, share and acquire knowledge effectively, critically, creatively, flexibly and ethically see. DigComp (Ferrari, 2012). Thus, digital literacy (Ala-Mutka, 2011) is conceptualized as encompassing three areas:

- Instrumental knowledge and skills to use digital tools and resources effectively.
- Advanced knowledge and skills for communication and collaboration, information management, learning, problem solving and meaningful participation.
- Attitudes to use skills strategically in an intercultural, critical, creative, responsible and autonomous manner.

Thus, digital literacy is currently seen as a broad concept that overlaps to varying degrees with other literacies that incorporate sub-components of information technology and digital literacy.

In the European Commission's 2002 concept, among the eight key competences set for the compulsory primary education phase, the third is "Information and Communication Technology Competence" or ICT Competence. (European Commission, 2002) In the European Parliament's 2006 Recommendation on Key Competences for Lifelong Learning, the fourth competency in the system is "Digital Literacy" or DigComp. This competence is defined here as the confident and critical use of Information Society Technology (IST) in work, leisure and communication. Basic knowledge of ICT, i.e. the use of computers, is a prerequisite. Following the explicit inclusion of 'digital competence' among the key competences for lifelong learning, research activities have been carried out to specify it more precisely. One of the most important projects was undoubtedly the Digital Competence Project (DigComp), which was carried out by the Joint Research Centre's Institute for Prospective Technological Studies in 2011-2012 (Ferrarri, 2013).

In 2017, the DigComp 2.1 digital competency framework was published, redefining the levels of achievement of each digital competency that had previously been specified in 2016 within the DigComp 2.0 document (Carretero et al, 2016). This European framework updates the previous 2013 concept defined in DigComp 1.0 (Ferrari, 2013) and divides digital competences into five areas:

1. Information and data literacy
2. Communication and collaboration
3. Digital content creation
4. Security
5. Problem-solving

Each of the above areas includes several more specifically focused sub-competences. However, these competences do not include technological competences, which can be understood as the set of skills and knowledge needed to operate digital technology software and technology. While these competences can also be seen as a necessary precondition for the above competences and can thus be reflected in all five of these areas, when considering the development of digital literacy in education, it seems more appropriate to specify this area separately, as technological literacy is and should continue to be a fundamental part of education. The resulting framework of digital competences thus actually contains six main areas, complemented by sub-competences.

3 Incorporating transversal competences into teacher training

Although there has been talked for decades about the necessity of changing the style of pedagogical work in schools, and extensive research has been conducted on this topic, a transmissive style still prevails in the form of monologic verbal methods and underestimation of learner activation in direct teaching, which is manifested in the criticized encyclopedism and memorization. Thus, contemporary education does not sufficiently develop even basic key competences, and the same is/will be true of digital competences. This handicap of the Czech education system could be addressed by a higher level of use of activating methods and greater use of integrated forms of teaching. High didactic effectiveness and growth of learners' motivation have been demonstrated in the application of electronic simulations (online simulation games), research and project-based learning, etc. (Králová, Novák et al., 2014).

Effective teaching management at the level of contemporary requirements for modern teaching means for teachers to have developed digital literacy and motivation to constantly work on themselves not only professionally, but also in the field of digital literacy. Digital literacy not only gives teachers the opportunity to use digital technologies and resources to directly support teaching but also to interact much more effectively with colleagues, pupils and parents, as well as for their own professional development. The trajectory of the systematic transfer of transversal competences in the relationship between teachers and their competences can be seen in the diagram in Figure 1.
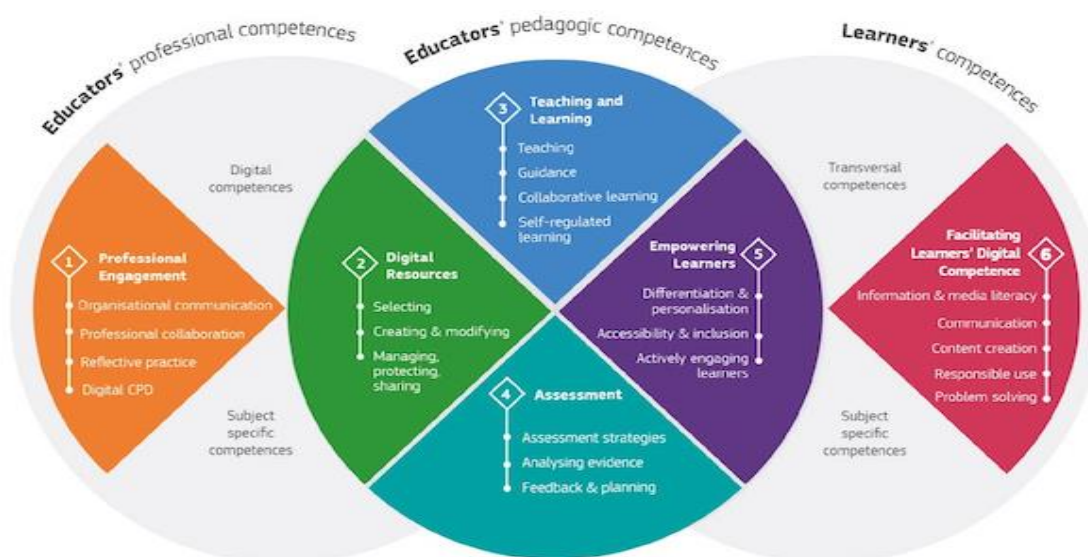

Figure 1 Digital literacy and transversal competence.

Source: https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

Functional integration of digital technologies into teaching implies a change in teaching style from executive to facilitative, where the teacher becomes the facilitator, as learners are more independent in their use of digital technologies and need more guidance, indirect guidance and support. A digitally competent teacher must be able to implement digital technology-supported learning activities aimed at developing learners' independent learning as well as group work. Digital technologies enable the optimisation of existing strategies for reflective practice and assessment of teaching, both in the area of formative and summative assessment, including systematic access to evidence for evaluating teaching processes.

The digital competence levels of the teacher seek to determine the level of achievement of competence in terms of skills, knowledge and attitudes. These three aspects can be characterized as (Ala-Mutka, 2011):

1. instrumental knowledge and skills for effective use of digital tools and resources;
2. advanced knowledge and skills for communication, learning, problem-solving and participation;
3. attitudes to use relevant knowledge and skills.

The level of digital competence of teachers has been the subject of much research worldwide, with varied results. For example, according to Mahmud and Ismail (2010), research on teachers in Malaysia found that most teachers have average knowledge and skills in information and communication technologies, while in Ukraine, on the other hand, research has shown that teachers have above-average levels of digital competence (Kuzminska, Mazorchuk, Morze, Pavlenko, & Prokhorov, 2018). According to Jirkovska et al. (2019), 42% of teachers consider themselves to be less advanced users of information and communication technologies. Research in New Zealand has yielded findings that the use of digital technologies in teaching correlates with the level of digital competence (Madsen, Thorvaldsen, & Archard, 2018). In contrast, there is research that demonstrates that proficiency with digital technologies does not automatically imply the ability to use these technologies to support learners' learning and development (Suárez-Rodríguez, Almerich, Orellana, & Díaz-García, 2018) and needs to be linked to psychological-pedagogical and other technical h aspects (García Martín, & García Sánchez, 2017).

4   Methodology and aim of the research investigation

The development of digital competences can therefore be fully considered as one of the general objectives of education. Although many teachers - unlike today's students who have already been born into the digital age - cannot be considered 'digital natives', it is essential to ensure that teachers actively participate in the general objectives of education. The research, which was conducted in the early 2020s, focused on future teachers of the Faculty of Education and aimed to identify certain knowledge and user specificities in their digital competences. In the research, we addressed the areas of:

− Applications used by future teachers to communicate
− Digital services and software used for teaching
− Use of digital technologies for didactic purposes
− Assessing the level of knowledge in software and hardware
− Assessment of the level of knowledge in the field of digital communication
− Assessment of knowledge in the area of digital security

A self-constructed questionnaire was developed for data collection. The content of the questionnaire was developed on the basis of the analysis of research studies, strategic documents of the Ministry of Education, Youth and Sports of the Czech Republic and the European Commission concerning the creation of the necessary framework of digital competences of the citizens of the European Union. In terms of structure, the questionnaire consisted mainly of multiple-choice items, some of which use Lickert-type scales, while others allow the answers to be selected or sorted. Some items could also be supplemented with the opinion of the respondents themselves. The questionnaire was implemented in an online form using Google Forms. At the end of data collection, the total number of respondents was 215. Data were analyzed using the chi-square test of independence, chi-square test of goodness-of-fit, ANOVA, T-tests for two independent samples, and paired T-tests. All data received were processed using ISPSS Statistics.

5   Conclusions of the research investigation

In the area of applications used by prospective teachers for communication, questions were asked about the means -applications and the frequency of their use for communication. The response options were on a four-point scale with grades of 'always', 'often', 'sometimes' and 'never'. Of the answers obtained on the type of application, the following were mentioned by the respondents: e-mail, Internet telephony services (Skype, Messenger, WhatsApp...) and discussion forums (chat rooms, blogs). Of these tools, Messenger was the most frequently used by respondents - 82% in total. Other communication tools are used only occasionally in about 10% or less. Following these responses, a question was asked about the use of social networking sites (Facebook, Twitter, Instagram, Yammer, Google+ and WhatsApp). Facebook was the most frequently used network (47% use it several times a week). The second most used network was Instagram, with 32% of respondents coming into contact with it several times a week. The use of other social networks was then mentioned by respondents as a minimum.

As these are future teachers, we asked about the digital services and software they would use for teaching. Respondents' answers included cloud services, OneNote, graphic editors, presentation software, QR codes, videos, animations and other digital learning tools (e-publications and e-learning resources, webinars, online educational courses, virtual labs, e-learning). Most respondents then reported that they would use presentation software for teaching (92%), but 69% would also use other digital tools in combination such as videos, animations and graphic editors, electronic publications and e-learning resources (56%). E-learning, for example, would be used by 34% of respondents. We did not find a correlation between the ability to communicate online and the use of software and online applications for learning.

Following on from the previous questions, questions were then asked about the use of digital technologies in teaching for didactic purposes, as this is an area that future teachers should be guided in by their training. The results of the survey showed that the respondents mainly see digital technologies in teaching as an opportunity to better understand the subject matter (89%), to create an overall picture of the subject matter (82%) and to better remember the material (81%). The least frequent response was the reason for analysing problems related to the curriculum (69%). Here, however, we could see a link with the use of digital services and software for conducting lessons.

Finally, we were concerned with assessing the level of knowledge of software and hardware. The cumulative frequencies of positive responses from software are as follows: the most confident of all respondents in terms of being able to explain what file and document sharing means (79%), MS Office applications (74%) and learning applications (71%). Just over 50% can explain what cloud services mean (51%). 45% of respondents could explain the term LMS - e.g. Moodle. However, only 21% could explain what an RSS feed means. In terms of hardware knowledge, the cumulative frequency of positive answers in this area is as follows: 97% of respondents could explain what an e-reader means, 86% could explain a convertible laptop, 48% a visualiser, 43% a voting device. 68% could explain a phablet, 65% an interactive table. Looking at these results, a pretty good knowledge of software tools and hardware can be traced.

When assessing the level of knowledge in digital communication, the cumulative frequencies of positive responses show that respondents would be best able to explain terms such as social networks (89%), blogs (87%), shared documents (81%), video conferencing (75%), internet telephony - e.g. Skype, Messenger (78%). Fewer could already cope with terms such as tweets (47%) or virtual assistant (31%). Overall, the responses appear to be very balanced in terms of digital communication and the ability to explain. The concept of social networking is then quite dominant.

The last point of our research was then to assess knowledge in the area of digital security. The cumulative frequencies of positive responses show that respondents would have the least difficulty explaining the concepts of spam (91%), computer viruses (87%), and cyberbullying (85%). They are less familiar with terms such as open license and content (76%), hoax (75%) and digital footprint (60%). They are least likely to be able to explain the content of the term phishing (57%). Interestingly, however, in this important area, subjective understanding ratings for none of the terms fell below 55%.

6   Conclusion

The issue of digital literacy in the context of education has been actively addressed for many years in various ways in terms of the breadth of competences, intersection with related concepts and, last but not least, in terms of regional or national concepts. An integral part of this issue is the definition of digital literacy in terms of transversal competences reflecting disciplinary diversity, which is particularly important in the preparation of future teachers for school practice.

The present paper presents data from a larger research study aimed at identifying the digital competencies of secondary school teachers, with an emphasis on human and social science teachers.

In the presented paper, our research has shown that prospective teachers have an awareness of issues related to digital literacy, use digital resources, and have some insight into the didactic and methodological application of digital and information communication tools in teaching. Nevertheless, many areas related to cloud services, e-learning, or virtual labs are perceived significantly less. It also emerged that although respondents have a positive view of the pedagogical potential of digital technologies, they are relatively less familiar with the forms and means of digital learning. Thus, a certain discrepancy can be noted between the expectation of pedagogical effects of the application of digital technologies and only moderately developed knowledge and user aspects of their application in teaching.

The results described in this article capture a certain state of development of digital competences among future teachers, practically before the outbreak of the COVID-19 pandemic. These data can thus also serve as a certain frame of reference for comparison, to determine whether the forced transition of schools to online teaching has brought about a more fundamental change in this area.

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