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Łukasz Tomczyk
Laura Fedeli *Editors*

Digital Literacy for Teachers

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Chapter 1
Introduction—On the Need for Research on the Digital Literacy of Current and Future Teachers

Łukasz Tomczyk and Laura Fedeli

The development of the information society forces a reflection on how the next generation of teachers are prepared for work in the school and non-formal education system. Current models for the education of pedagogical staff all over the world require the challenges posed by the convergence of analogue and digital media to be met, as well as for the continuous and intensive process of digitization to be taken into account, especially when that process is accelerated by circumstances beyond the control of the teachers themselves (e.g. pandemic situation, the accelerated development of e-services, the creation of new educational policies, and the informatization of the state, to name just a few). Facing these challenges requires an attempt to organise the existing knowledge on digital competences among current and future teaching staff. The aim of the study is to show the multidimensionality of the concept of digital competence among future generations of teachers. The individual chapters are based on a systematic review of research findings (from the last two decades) in order to outline the trends that relate to changes in the measurement and level of digital competence.

The digitisation of education has now become a priority in many countries as never before. Effective digitisation requires not only knowledge of how ICT can be used in education, but also skills in handling new technologies. Currently, before our very eyes, there is an incredible "leap" in the process of retrofitting schools with new media, as well as the spread of e-learning. These processes mean that the focus is increasingly shifting from the technical layer to soft areas, i.e. the skills of educational stakeholders. Teachers have become the cornerstone in the process of the effective implementation of ICT (Tomczyk & Fedeli, 2021). Simply equipping schools without

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developing the teachers' skills is insufficient. Therefore, it is necessary to take stock of what has been done so far in the area of the digitization of education from a global perspective. Such an ambitious goal is outlined in this publication.

Reflection on the level of the digital competence of stakeholders among future generations of teachers has been evident in the literature for more than two decades. In this book, authors from twenty-five countries have undertaken the complex task of showing the level of preparation of new teaching staff for the teaching profession in the information society. Authors from North America, South America, Asia, and Europe set out to accomplish the very complex task of summarising the existing research on digital literacy among those who will soon be transforming the school environment. Using a systematic analysis of documents, the results of quantitative and qualitative research, and references to global and regional strategic documents related to the digitization of education, the authors have sought to bring home to their readers the complexity of conditions for the digitization of education in individual countries and regions. The whole study consists of twenty-five chapters. In the first text Jacek Pyżalski and Natalia Walter from the Adam Mickiewicz University in Poznań, Poland, introduce readers to the notion of digital competence through the prism of changes that have taken place over the last several months. This text is crucial for understanding the instability of the theoretical concept and the operationalisation of the notion of digital competence, which has been transformed due to the pandemic situation. The second chapter, by Nazmi Xhomara from Albania, is not only a review of research but also an empirical reference to the earlier text. Xhomara makes it clear that digital competences nowadays should be strongly combined with e-learning. In chapter three, Vladimir Costas-Jauregui, Sonia Manzur, and Violeta Costas-Jauregui provide a critical-constructive analysis of the digitisation of schooling in Bolivia. In chapter four, the authors from Bosnia and Herzegovina—Elma Selmanagić Lizde, Amina Đipa, Izela Habul Šabanović, Jasmina Bećirović Karabegović—attempt a constructive-critical review of the literature in relation to vocational preparation in an increasingly digitalised reality. Due to the geographical breadth involved, the authors from Brazil had a very difficult task ahead of them. Maria Amelia Eliseo, Cibelle Albuquerque de la Higuera Amato, and Ismar Frango Silveira present the directions of research on digital competence and how this skill is shaped in the largest country in Latin American. The sixth chapter, by Plamen Zlatkova and Ivanka Kirilova, is an attempt to show the level of digital competence of teachers and future teachers against the background of national strategies in Bulgaria with reference to strategic documents of the European Union, as well as the challenges presented in the pandemic period. In the next chapter, Helen J. DeWaard from Canada highlights the role that the institutions responsible for the professional preparation of future teachers should adopt and are adopting in an ICT-based society. The chapter by Juan Silva, Roberto Canales, and José Garrido highlights the variety of ways in which ICT literacy is assessed by pedagogical students in Chile. In the ninth chapter, two authors, Jiafeng Gu and Rui Ding, use a systematic document analysis to present the complexity of the concept of digital competence in China. The next text, by Milan Kubiatko, is a typical analysis of found documents relating to Czech research on the digital competence of future teachers in the Czechia. In the eleventh chapter, Darwin Munoz, Rita

Licelot Cruz, Leipzig Guzmán, and Laura Reyes Alardo introduce readers to the ways in which digital competence is understood and measured in the Dominican Republic. Another chapter, by Magali Arteaga and Esteban Valdiviezo, covers not only general analyses related to the digital competence of teachers, but also research findings related to foreign language educators. These Ecuadorian authors thus highlight the fact that digital competences may differ somewhat in their definition and means of measurement not only in different professional groups but also in different teaching specialisations. Laura Fedeli, using an analysis of previous research articles published in Italy, makes it clear that in her country there is a multiplicity of methodological approaches related to the measurement of digital competences, but that this topic, despite its relevance, has not translated into a large number of studies. In the fourteenth chapter Hasan Saliu and Arberore Bicaj present the concept of digital competence through the lens of academic programmes of preparation for the teaching profession. The voices of the authors from Kosovo shift the focus of discussion not only to how digital competences are defined and measured, but above all to the methodology of their formation. Ramunė Kasperė and Vilmantė Liubinienė in their chapter pose a reasonable question—is Lithuania ready for the effective digitization of education? They answer this question similarly to the authors of the previous chapter by referring to the professional education of teachers and to the surveys conducted among all the actors who are focused on the school sector. A classic systematic document analysis is carried out by the authors from Mexico—Claudia Blanca González Calleros, Josefina Guerrero García, Yadira Navarro Range, Juan Manuel González Calleros and Cesar Alberto Collazos Ordoñez. This is a chapter that allows for an in-depth understanding to be reached of the role of higher education in the process of shaping the digital competences of future teachers through institutions assigned to higher education. In the seventeenth chapter, Nils Christian Tveiterås and Siri Sollied Madsen from Norway, in reviewing the research from their own country, have sought to show not only the level of preparation of teachers to use ICT in the process of education and subject didactics, but also to draw attention to the fact that the digitisation of education extends beyond the simple matter of the software tools in use and requires systemic thinking about the use of cyberspace resources. In the next chapter, Vivencio O. Ballano, Nicolas T. Mallari, and Raul Roland R. Sebastian from the Philippines stress that the understanding of digital competence should be firmly rooted not only in the historical background of the development of the information society, but above all in the real challenges of today (related to the COVID pandemic, among others). In the nineteenth chapter, Łukasz Tomczyk shows how research tools measuring digital competences among future pedagogical staff in Poland are shaped in different ways. On the one hand, this diversity contributes to an increase in the number of indicators defining digital competences, while on the other hand it introduces methodological inconsistencies. In the subsequent text, Gabriela Neagu from Romania makes it clear that research on digital competences is linked to pedagogical practice. Thus, the research process is not only a way to describe the level of preparation of future teachers, but also allows for the improvement of existing professional education programmes. The twenty-first chapter, by Olga Fedotova, Alla Belousova, and Mariya Vyshkvyrkina in Russia, clearly emphasises

that digital competence is one of the most important areas of research exploration in the field of media pedagogy within their country. These researchers repeatedly underline that the formation of digital competences cannot be separated from the school reality. Alena Hašková and Ján Záhorec from Slovakia, who like some of the aforementioned researchers employ a systematic literature review, show how the measurement and level of digital competence has been changing in one of the Visegrad countries. The Slovak researchers also note that the difficulties that have occurred most recently (at the stage of crisis e-learning) are the result of the earlier education of pedagogical staff in the area assigned to media pedagogy. The twenty-third chapter, by Antonio-José Moreno-Guerrero, José-Antonio Marín-Marin, Jesús López-Belmonte, and Prathamesh Churi in Spain, presents the results of an analysis of almost three hundred articles dedicated to the indicated topic, which were affiliated by authors from the Iberian Peninsula. Another text, compiled by Larysa Lukianova from Ukraine, is a review of promotion studies (e.g. doctoral dissertations) devoted to the topic of the digitization of education in Ukraine. Larysa Lukianova developed her chapter using the technique of the triangulation of different types of expert sources, which is a unique technique compared to the other chapters, which were prepared using the most popular scientific databases (EBSCO, CEOOL, Google Scholar, Scopus, Web of Science). The last chapter, by Mariana Porta, Regina Motz, and Daniel De Queiroz Lopes in Uruguay, emphasises the importance of the theoretical framework used in the measurement of digital competence, which types of research tools are used, and the systemic conditions of the development of digital competence in Uruguay.

All twenty-five chapters constitute extended and in-depth studies on the characteristics and means of measuring digital competence. Regardless of the methodology adopted (qualitative or quantitative), it is currently difficult to provide a clear and complete definition of digital competence (Tomczyk, 2021b). The richness of approaches and the diversity of measurement methods is not a characteristic of a single country but is present in all twenty-five texts. Looking at the research results of the last several years through the prism of the richness of views, clashing paradigms, and the multiplicity of indicators, one can observe how dynamically media pedagogy is developing all over the world. On the one hand, the wealth of theories, tools, and research directions is a resource, while on the other hand that very same wealth does not allow for longitudinal research or the development of a common theoretical framework or tools. Therefore, the present publication should be regarded as an attempt at in-depth and systematic reflection, something that is particularly necessary at the current (strategic) stage of the development of the information society and the digitization of education (Stosic, 2015).

The creation of this book was inspired by a number of events and discussions, as well as the challenges that the authors and editors of the publication have faced of late. The first of these was the research on media pedagogy paradigms conducted by Jacek Pyżalski (2012, 2017, 2019). It was through Prof. Jacek Pyżalski that one of the editors of this publication attempted to systematically organise and understand the current research directions on the digitalization of education and the competences of future and current pedagogical staff (Tomczyk, 2021a). Using Pyżalski's paradigm

of risks and opportunities of media pedagogy (Pyżalski, 2012), an attempt was made to perform a longitudinal analysis of the phenomenon of digital competences, as well as of the opportunities and limitations associated with the digitization of didactics and the process of education. Therefore, at this point I would like to express my great thanks to Professor Jacek Pyżalski not only for his inspiration, but also for his support in conducting the research and guiding me towards innovative solutions, fostering the discovery of truth by means of the available theories and tools in the intensely developing media pedagogy.

We would like to extend our sincere thanks to the reviewers from Italy (Prof. Gigliola Paviotti, Prof. Valentina Pennazio), Slovakia (Prof. Miriam Niklova), Poland (Prof. Nataliia Demeshkant, Prof. Katarzyna Potyrała), Romania (Prof. Sebastian Toc, Prof. Alexandru-Mihai Carțiș), and Spain (Prof. Francisco David Guillen-Gamez) for their help in the quality control of the texts. Thanks to the involvement of eight reviewers, we were able to significantly increase the quality of the study. The insight of external experts allowed the authors as well as the editors to eliminate shortcomings and thus increase the readability of the texts.

Separate thanks are due to the Polish National Agency for Academic Exchange. This monograph, which we are thus presenting to our readers, is mainly the result of the project "Teachers of the future in the information society-between risk and opportunity paradigm" (Bekker programme Grant number: PPN/BEK/2020/1/00176). Without institutional support, it would be difficult to find adequate time and organisational resources to foster this type of comparative research.

The present publication may prove to be particularly valuable for researchers educating future generations of teachers in the use of new media. Taking into account the content of the monograph, the book seems to be particularly valuable for people trying to measure the stage of development of the information society, as well as for specialists conducting research in the field of comparative pedagogy (including the transfer of the most effective solutions in the field of media pedagogy).

The main benefit for readers familiarising themselves with individual chapters is access to a systematic analysis of research results from the last two decades concerning the preparation of teachers for the use of new media in selected Asian, North and South American, and European countries. The publication is in line with the needs of the academic community and is intended to be of use in the modernisation of academic courses such as media in education, information technology, and pedagogical innovations.

Considering the multifaceted analysis undertaken by authors from twenty-five countries, the book contains research results of use for the development of several disciplines, namely: (1) general pedagogy in terms of showing how to measure and perceive digital skills, which are one of the main key competences; (2) media pedagogy as an intensely developing sub-discipline, which includes issues of improving the skills of implementing new media in the process of learning, teaching, and upbringing; (3) comparative pedagogy, in which comparing the achievements of learners contributes to the development of the whole discipline; (4) higher education pedagogy, where research results are used to improve curricula, in this case teacher

education; (5) pedagogical diagnostics, which focuses on the development and standardisation of new measurement tools, including those measuring key competences; (6) media sociology, which shows the changes occurring in society due to the intensive implementation of information solutions; and (7) educational policy, where research results are used to define new directions for education, teacher training, and lifelong learning.

Considering the multi-sectoral nature of this study, we hope that the book will also contribute to the global reflection on universal processes in education. We wish the readers a pleasant reading, and we thank the authors and reviewers for their fruitful cooperation.

Łukasz Tomczyk.
Laura Fedeli.

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Chapter 2
Lessons Learned from COVID-19 Emergency Remote Education. Adaptation to Crisis Distance Education of Teachers by Developing New or Modified Digital Competences

Natalia Walter and Jacek Pyżalski

Abstract Emergency remote education caused by the COVID-19 pandemic brought numerous challenges to both educational systems and educational professionals. All teachers, including those reluctant to use ICT in their classrooms, had to implement it under specific social and psychological circumstances. That situation brought a variety of challenges and demanded from teachers appropriate skills to carry out effective educational activities. All of this put a new light on the problems connected with e-education such as digital inequalities, digital well-being, or development of digital skills by students and teachers. The text analyses in a coherent way the commonly accepted European Framework for the Digital Competence of Educators (DigCompEdu) in the context of its usefulness for the specific situation during school closure. We refer to the research data pointing out which teacher competences are significantly more important or which should be defined in a different way or adjusted based on the pandemic experience. The text confirms the adequacy of the European Framework for the Digital Competence of Educators (DigCompEdu) but brings attention to important details that may be important for its implementation after the COVID-19 period.

Keywords e-Education · Remote education · COVID-19 pandemic · Emergency remote education · Digital inequalities · e-Learning · Digital teacher competences

2.1 Introduction

It is often said that the Internet has not brought new social (also educational) phenomena but reinforced and sometimes made more visible the old ones. We acknowledge, based on the research conducted during the pandemic, that the same

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can be said about the period of remote education during school closure due to the COVID-19 pandemic. From the perspective we use in this text, we observe that remote education during the COVID-19 pandemic has not brought demand for entirely new digital competences of teachers. It has rather confirmed and sometimes modified widely acknowledged models and lists of competences elaborated before the pandemic, such as the European Framework for the Digital Competence of Educators (DigCompEdu) (Redecker, 2017). The modification means here bringing new dimensions or a new understanding of initially defined competences as well as underlining the importance of certain aspects that, although discussed before, have not been properly addressed.

The period of remote education during the COVID-19 pandemic is commonly defined as the crisis or emergency remote education in the scientific literature (Bozkurt & Sharma, 2020; Murphy, 2021; Pyżalski, 2020). Those terms clearly underline the unique characteristics and difficulties experienced by educational institutions and professionals. Educational systems around the world have not been sufficiently prepared to change from traditional to remote education. Many unexpected pitfalls and challenges emerged during the process of providing education mediated by digital tools (Doucet et al., 2020). Many of them transcended obvious issues like teachers' technical competence and covered other issues such as the need to build online relationships vital for education (mainly peer and teacher-student relationships), the need to protect and maintain well-being and mental health of students and teachers, as well as digital well-being related to an extensive use of information and communication technologies. On the other hand, the closer look reveals not only the problems but also the educational potential of technology in education. Such a salutogenic approach is visible not only in purely didactic aspects but also in areas connected to relationships, social support, and psychological needs of students. Additionally, the remote crisis education period sheds light on groups of students that need specific attention when participating in online education. This attention should be focused on both vulnerable groups and those groups for which this period was clearly beneficial.

We believe that the analysis of how institutions and stakeholders adapted to the new scenario created by the COVID-19 pandemic may be beneficial to improving the concepts of teacher digital competence and the curricula of high schools that are aimed at supporting the development of digital skills for emerging teachers.

Before undertaking the main topic—teacher digital competences needed for good quality education, we analyze contemporary concept of digital competences. It is understood in our rationale as the aim that teachers want to achieve in the area of digital competences in students. In other words, teachers aim at supporting their students in achieving the wide set of digital competences needed for successful social, occupational, and educational life in the digital age (Brolpito, 2018).

Then we move to the main topic—teacher digital competences. We analyze selected groups of competences from European Framework for the Digital Competence of Educators (DigCompEdu) (Redecker, 2017), presenting what research data and experiences from the crisis remote education period may add to this model. Based on this we provide reflection and set forth suggestions for modifying or extending

DigCompEdu conceptualization. For a better understanding, we start from a cohesive summary of DigCompEdu framework presenting its main conceptual aspects.

2.2 Digital Competency Frameworks

As stated above we start our analysis with presentation of man conceptual issues on general digital skills and competences framework.

Acquisition of relevant competences that are a valid combination of knowledge, understanding, evaluation, and efficient use of new information technologies is also an essential issue from an educational perspective. A person possessing these competences is able to categorize and assess information, deal with excess information, and make analyses and comparisons. Researchers suggest different definitions and classifications of digital skills and competences (DSC). The emerging EU classification identifies three main DSC categories for citizens: (1) Digital competences: also referred to as digital literacy, which includes a set of basic digital skills, including information and data literacy, online communication and collaboration, digital content creation, security, and problem solving. Digital competences relate to the ability to apply these digital skills (knowledge and attitudes) in a certain, critical, and responsible manner in a specific context (e.g., education). Digital competence has been one of the eight key competences in the EU within lifelong learning since 2006; (2) occupational-specific digital skills: a set of specific digital skills for those involved in tasks, including the use and maintenance of digital tools. (3) Digital skills for ICT professionals: a set of advanced and highly specialized digital skills for those involved in ICT professions, for example, programmers (Brolpito, 2018).

While competence can be understood as the ability to use knowledge, skills, and personal, social, and/or methodological abilities in various work or study-related situations and in professional and personal development, skills are the abilities necessary to apply knowledge and use know-how to complete tasks and solve problems. According to UNESCO (2018b), digital skills can be defined as a range of "abilities to use digital devices, communication applications, and networks to access and manage information. They enable people to create and share digital content, communicate and collaborate, and solve problems for effective and creative self-fulfillment in life, learning, work, and social activities at large". Helsper and Eynon (2013) identified four broad categories of skills: technical, social, critical, and creative skills. The concept of digital skills by van Laar et al. (2018) includes: technical, information management, communication, collaboration, creativity, critical thinking, and problem solving.

The European Union in 2013 referred to digital literacy as digital competence (DigComp) and included it in its standard of eight key competences for lifelong learning: "Digital competence can be broadly defined as the confident, critical, and creative use of ICT [Information and Communications Technologies] to achieve goals related to work, employment, learning, leisure, inclusion, and/or participation in society. Digital competence is a key transversal competence that enables us to

acquire other key competences (e.g., language, mathematics, learning-to-learn, and cultural awareness). It is related to many of the skills of the twenty-first century that should be acquired by all citizens to ensure their active participation in society and the economy (Ferrari, 2013). This EU report offered a self-assessment tool to evaluate digital literacy competences in five areas (information retrieval, evaluation, and management; communication; content creation; safety in the digital environment; and problem solving) with three proficiency levels. A, foundation level; B, intermediate level; C, advanced level (Ferrari, 2013). DigComp 2.0 and 2.1 are another complemented and extended version of the Digital Competence Framework for citizens. Based on the conceptual model published in DigComp, they identify the key components of digital competence in five areas: (1) Information and data literacy: To articulate information, one needs to locate and retrieve digital data, information, and content. To evaluate the relevance of the source and its content. To store, manage, and organize digital data, information, and content; (2) Communication and collaboration: To interact, communicate, and collaborate through digital technologies while being aware of cultural and generational diversity. Participate in society through public and private digital services and participatory citizenship. Manage one's digital identity and reputation; (3) Digital content creation: Create and edit digital content to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licenses are to be applied. Know how to give understandable instructions for a computer system; (4) Safety: Protect devices, content, personal data, and privacy in digital environments. Protect physical and psychological health, and be aware of digital technologies for social well-being and social inclusion. To be aware of the environmental impact of digital technologies and their use, and (5) Problem solving: Identify needs and problems, and resolve conceptual problems and problem situations in digital environments. To use digital tools to innovate processes and products. To keep up-to-date with the digital evolution (Carretero et al., 2017; Vuorikari et al., 2016).

Among the models and classification of digital competences and skills, there are those that explicitly include aspects of emotional intelligence. To illustrate this, let us consider a concept proposed by Park (2016) during the World Economic Forum in 2016. It presented eight digital competences that we should provide contemporary children with: digital identity, digital usage, security, protection, digital emotional intelligence, communication, digital literacy, and digital rights. They all make up the so-called DQ (digital intelligence quotient, by analogy to the intelligence quotient), which are social, emotional, and cognitive skills that enable people to face challenges and adapt to the requirements of digital life.

The Eurydice report (2012) shows that national strategies on digital competence have been defined and are available in almost all European countries. At the time of the preparation of the report, digital competences were taught through the application of the cross-curricular approach at the basic level in all EU countries (except for two) and in all countries at the secondary school level, in addition to other approaches used in a dozen other countries, such as integrating ICT with other subjects or teaching IT as an independent subject. The key element of success is to provide teachers with adequate digital competence: the OECD (2014) TALIS 2013 study shows that 18%

of teachers consider it essential to develop their ICT skills they use during class, while 16% think the same for the competences in the workplace.

The main document that is also a basis of our analysis is European Digital Competence Framework for Teachers (DigCompEdu), which is a descriptive framework mandating teachers to possess digital competences required for successful education of their students in the digital age. DigCompEdu is targeted at teachers at all levels of education, from early childhood up to higher and adult education, including general and vocational education, special education and the context of non-formal learning. DigCompEdu describes in detail 22 competences organized into six areas. What is particularly important is that it is not focused on technical skills. Instead, this framework aims to determine how digital technologies can be used to improve and innovate in education and training. The areas are as follows: Area (1) focused on the professional environment; Area (2) related to acquiring, creating, and sharing digital resources; (3) on the management and coordination of the use of digital tools in teaching and learning; (4) on digital tools and strategies to improve evaluation; (5) on the use of digital tools to strengthen the position of students and (6) on facilitating the digital competences of students (Redecker, 2017). A digitally competent teacher is one who has knowledge and skills in areas such as: (1) focused on the professional environment; (2) related to the acquisition, creation, and sharing of digital resources; (3) concerning the management and coordination of the use of digital tools in teaching and learning; (4) on digital tools and strategies to improve assessment; (5) using digital tools to empower learners, and (6) improving learners' digital competences (Redecker, 2017).

Based on the DigCompEdu typology, we will look at teaching competences that have changed or become particularly relevant in the context of the crisis e-learning experience during the COVID-19 pandemic.

2.3 Professional Environment

DigCompEdu (Redecker, 2017) defines competences related to the professional environment of educators primarily through the lens of communication. This communication is on the one hand connected to communication with the main actors, learners, and parents. However, it is also the area of horizontal communication with other teachers (from the same organization) as a basis for collaboration. This extends also to other educators (e.g., those present in online communities) who can be partners for sharing and exchanging professional communication and reflect and assess educational practices. Competence in this area should also be a basis for continuous professional development with the help of digital resources (Redecker, 2017). This should be a central issue, since teachers' collaboration is regarded as a dimension of school quality and is a prerequisite for teacher and school development (Huber, 2018). This was in many cases negatively affected during the remote emergency education period (Huber & Helm, 2020).

As communication is a basis for important educational relationships, we observed changes in this respect during the period of remote education when mediated communication was only possible or at least the main mode of contact. This was caused primarily by the limited social presence frequently discussed in the literature during the remote education of COVID-19 (Carrillo & Flores, 2020). What is interesting is that those changes were not the same in the whole population. For example, in Polish teachers, about one-third indicated that the quality of relations and communication with teachers in their schools decreased. At the same time, 20% experienced such a decrease in relations with parents/guardians of students. The same is interesting from the perspective of parents—18% communicated with teachers less frequently than before the pandemic, while 23% were doing this more often (Ptaszek et al., 2020). Analyzing this result, one may conclude that mediated communication may both improve and spoil the quality of communication. Surely, the actual situation and the outcomes depend on the competences of the involved parties. This confirms that competences concerning digital communication based on a deep understanding of its characteristics and psychological processes involved are vital for contemporary teachers. It is particularly true in situations where digital communication becomes a main platform for communication with the main actors in education.

It should be noted that during the COVID-19 pandemic, the role of online communities and support groups became more important than before. They have been used not only to exchange experience and pedagogical ideas and methods, but also to support other teachers on issues concerning their health and well-being (impacted negatively by new stressors brought about by remote education) (Baker et al., 2021; Klapproth et al., 2020). This means that teachers' digital competences should include being able to provide and receive digitally social support effectively in not only their own institutions but also in wider online communities. This means on one hand knowledge of possibilities in this respect, but more importantly the communication competences needed for such activities.

A professional environment also means providing an organization of work that is supportive of the health of the teacher. The forced remote education period has shown that, although not included in DigCompEdu, the aspect of digital well-being in the context of work environment should be involved in the typology of teacher digital competence.

Although digital well-being has been explored mainly among students during the remote education period, there were also studies showing that problems in this area were also experienced by teachers, sometimes to greater extent than in young people. A large-scale study conducted in Poland confirmed that more than 85% of teachers declared that they were often or very often ready to receive calls and notifications or that they were often or very often tired of sitting at the computer screen. Three-quarters felt tired and overloaded with the information present in the media. Additionally, the majority of teachers indicated many health complaints that they attributed to the extensive use of ICT. It is worth underlining that most of those indicators were higher in teachers compared to their students (Ptaszek et al., 2020).

Based on this evidence, one can claim that the digital well-being of teachers using digital media should be a part of the support system in their work environment. From

this perspective, taking care of digital well-being and the ability to take care of it should be on the list of digital teacher competences. As such, it could be understood both as an individual competence but also as the competence of educational institution headmasters who should organize the work of teachers that promotes healthy ICT use (Oberle et al., 2020; Sultana et al., 2021). We should also not forget about role modeling in this respect with the question of whether teachers who do not use technology in a healthy way themselves may effectively affect positive use by their students.

Another issue related to teacher mental health related to occupational factors is work-life balance. Although acknowledged widely and explored in the literature before the pandemic (e.g., Schonfeld & Chang, 2017) it was brought to a new dimension during remote emergency education. This was mainly caused by the fact that the entire work of teachers moved to their places of residence and substantially modified family environments. Being all time in the same physical setting makes setting boundaries between private and professional time extremely difficult. This was also connected to permanent attempts at digital communication with students and their parents/guardians. This is clearly seen in the research results. For example, high percentages of Polish teachers during remote education in crisis. complained openly about the problems of fulfilling family duties due to remote education. Furthermore, 60% had often or very often wished to be completely unavailable to online communication and almost 70% felt irritated due to the constant use of digital devices (Ptaszek et al., 2020). Furthermore, 90% of teachers indicated that they needed more time to prepare their lessons and 70% had to learn how to use new digital tools (e.g., e-learning platforms) (Ptaszek et al., 2020). From this perspective, it is important to possess competences that may be generally defined as those that support building and maintaining digital well-being. Among them, important could be planning time online. This can cover such issues as controlling and limiting professional communication and time spent on other professional activities and planning reasonable breaks from the digital mode of work. It should also include setting and implementing certain rules concerning activities and situations (like family time) when digital media are completely not used. All of this requires that educators have the ability to analyze and reflect on the way teachers use digital technologies from the perspective of their potential negative influence on mental health.

2.4 Digital Resources

The pandemic has forced teachers, despite the lack of this preparation, to implement technology in education in a way never known. Almost all education research during the COVID-19 pandemic highlights a significant increase in the use of digital solutions by teachers at all levels of education. Tools that comprehensively support distance education, that is, LMS platforms, were used most frequently. Open educational resources have become popular, especially regarding the use of reading materials (when schools and public libraries were closed), films, and recorded lectures.

In the case of younger children, interactive tasks were used, both ready-made and created by the teachers themselves (Walter, 2020).

The pandemic has clearly shown that every modern teacher must raise the level of digital competence understood in this way, but at the same time it has opened up enormous opportunities for self-development through access to online teaching support groups, enabling the sharing of experience; online courses and training (both institutional and non-institutional); open educational resources in the form of methodological instruction, guides, and electronic books. This widespread use of the Internet for self-education (also in the context of functioning in online communities of other learners) has been confirmed in many studies, e.g., qualitative studies on the functioning of Polish English teachers teaching preschool and younger school-age children.

Teachers provided various types of support, especially informative and emotional support, during the pandemic. Many teaching groups have been established or developed on social networks. They have provided many educators with the feeling that they are not alone in this difficult situation. The pandemic and the distance education it enforced have shown teachers that it is worth cooperating with each other. It enabled contact between people from different parts of the world and exchange of experiences. Many inspiring teacher projects were created, such as the Polish idea "Invite me to your lesson", which was based on the fact that some teachers invited others to their lessons. Among the benefits, it is noted that lessons are often more interesting when the material is provided by an unknown person or someone who is a specialist in the field, and the teachers themselves can learn from each other by observing the lessons given by invited guests and interacting with each other, long-term cooperation with them (Przybysz-Gardyza, 2020). When we described the competency framework, we mentioned the concept of Park (2016), because in the pandemic, issues related to digital emotional intelligence turned out to be particularly important. Many teaching initiatives resulted from altruistic premises.

In addition, many didactic materials, lesson plans, and other solutions were developed. Tools and applications that support student activation were also popularized. Teachers also had opportunities for self-development and access to numerous resources that facilitate remote improvement of skills. It was especially appreciated by educators living in small towns, far from large professional development centres.

The most desirable competences in the field of developing digital resources for teachers were not only content selection, but most of all creating their own resources and sharing them with others.

2.5 Assessment

Formative and summative assessment is a crucial part of education. According to DigCompEdu, teachers should master their skills to enhance the diversity and suitability of assessment formats and approaches and to analyze evidence on learners'

activities and progress through digital tools. Important in this respect is also the provision of assessment feedback to students and their parents/guardians (by digital technologies) (Redecker, 2017). Since remote assessment methodology became during crisis and remote education the only possible assessment, it brought a few important aspects to consider and analyse (Daniel, 2020).

The first important issue was the competence of teachers to decide which aspects included in the curriculum should be assessed. As mediated assessment is difficult and in many cases time-consuming, it is necessary to define priories and reduce the scope of assessment. Another issue was of ethical nature and is also related to teacher-student communication. The challenge of online assessment is connected to wider potential opportunities to cheat during digital assessment processes. Therefore, the competences of teachers may on the one hand mean using technologies and processes that minimalize cheating, but, on the other hand, the communication with students that is based on trust. This may cause conflicts, but it remains a challenge, since there is a substantial risk that online assessments will be less accurate and valid than traditional ones.

Another reason for focusing on the competence of teachers to provide honest and accurate testing is the fact that employers and universities use educational credentials to sort applicants. In situations where teachers fail to provide fair digital assessment procedures mentioned, it would be extremely unfair.

2.6 Teaching and Learning

The use of information and communication technologies in education requires detailed planning of their inclusion in didactics. Empirical evidence on the effects of using ICT for educational purposes and improving student performance is still scarce, and the results are mixed (Bulman & Fairlie, 2016). The impact of technology on student achievement and interventions to improve teachers' communication with students and families, and students with their peers have been extensively explored. Overall, evidence shows little, if any, impact of increased access to educational hardware and software in schools on increasing learning efficiency (Escueta et al., 2017), and the improvements are comparable to other types of offline interventions, such as student feedback and peer learning (Higgins et al., 2012). There are, however, some benefits that do not relate strictly to cognitive performance but to the emotional and social functioning of students, which may translate into the so-called educational success. The use of technology can provide an innovative and stimulating learning environment, facilitate individualized learning, and increase student motivation (Blossfeld et al., 2018; Süss et al., 2013). Therefore, based on the results of previous research, the planning of didactic classes should take into account both the quantity and quality of the media, as well as the selection appropriate to the age and perceptual abilities of the students. However, such an approach requires the prior factual, methodical, and technical preparation of teachers.

The pandemic was also highlighted by the fact that it has been known for a long time that, in addition to these frequently mentioned IT (technical) competences, teachers working remotely should be characterized by competences in the field of pedagogy (including didactics) and the psychology of learning and e-learning (Walter, 2013). The simultaneous in-depth knowledge of online learning methods and the knowledge of how to adapt them to the content, objectives, effects, and methods of assessment and evaluation creates a new quality that has become a key issue during the crisis distant education. Of course, the teacher now also has to use the tools to create comprehensive online training courses efficiently, including managing any e-learning platform. However, these are not strictly IT competences, but rather related to knowledge and skills in the field of new information technologies in the field of education.

It turns out that even though teachers quickly acquired the technical competency to use remote education tools, the quality of the classes and their attractiveness to students were worse. More than half of the students surveyed in Poland indicated that remote lessons are less interesting than before the pandemic, and about a quarter was unable to understand what the teacher was saying and did not keep up with the pace of online classes (Ptaszek et al., 2020). Therefore, it is clear where the emphasis should be placed regarding the professional preparation of teachers in the area of using ICT in education and media education.

Initially, teachers struggled with the difficulties resulting from the lack of technical (operational) skills, but it soon turned out that modern e-learning solutions are so friendly and functional that mastering them does not require much effort. After several months of remote education, according to the research of Plebańska et al. (2021), teachers gained a sense of an increase in the level of their digital competence, but at the same time declared a strong need for support regarding effective methods of activating students during classes and motivating them to learn. We come to the heart of the problem here—digital competences are not only technical skills, but also social, critical, and creative skills, including the possibility of online collaboration, communication, or problem solving (Helsper & Eynon, 2013; van Laar et al., 2018).

Finally, referring to the recent experience of the pandemic, it should be clearly indicated that without the possibility of using mediated communication during school closure, maintaining essential relationships for education (with the teacher and with peers) would be completely impossible.

2.7 Empowering Learners

DigCompEdu (Redecker, 2017) underlines the need to tailor digital education to the needs of different groups of learners, particularly young people with special needs. Although the competences in this area are essential, it must be said that they have not been treated seriously enough before the pandemic (Plichta 2011, 2017).

Awareness of digital inequalities and the ability to offer internet safety and positive internet use programs are not commonly perceived as digital competences required

by teachers. The general public focuses more on technical skills regarding particular digital learning tools.

However, since the proportion of young people in school populations who, for different reasons, experience digital inequalities is high and still growing, one cannot effectively support young people without this kind of competence. This was significantly demonstrated during pandemic experiences in crisis education that made digital inequalities and their consequences more visible and extended the scope of vulnerable students who need special attention and attention, accompanied by teacher competence.

Official documents such as DigComp for educators state that empowering vulnerable learners is important and means "ensuring accessibility to learning resources and activities for all learners, including those with special needs" (Redecker, 2017, p. 22). This may be encouraged by potential negative outcomes that are higher in those groups, for instance, the possibility of digital exclusion and experiencing online risks. They reinforce traditional inequalities already negatively influencing the lives of young people with special needs and may be magnified by those brought by the Internet and ICT usage also within the educational context (e.g., Aesaert et al., 2015; Alfredsson Ågren et al., 2020; Alper et al., 2016; Borgström et al., 2019).

Some scholars (Alper & Goggin, 2017) tend to see digital inequalities as negatively affecting child rights. From this perspective, the rights of the online environment are endangered, and the measures that empower them in this context should be implemented. From this perspective, the empowerment of young people with special needs is at the center since it is recognized that "children with special needs have no supportive space to access and learn how to navigate the digital environment without adults" (Council of Europe, 2017, p. 26). This, of course, means far beyond the problems of inaccessible technology. This educational technology is often not designed to fulfill the needs of young people with a wide range of sensory, mobility, and learning abilities. Still, the knowledge and competences of teachers play a significant role here since teachers decide which technologies and how are implemented in the school environment, which is crucial in the time of forced remote education.

The significance of these competences was strongly confirmed during the remote education period. Research conducted in different groups of young people with special needs (e.g., those with mental disabilities or the deaf) has shown that these young people were particularly negatively affected and that the quality of remote education provided to them was far from sufficient (Domagała-Zyśk, 2020). This was mostly due to the use of technologies that were not tailored to the educational needs of children in those groups, as well as the frequent lack of educational support in their families. In some cases, the reason for this was the lack of digital equipment. For example, parents interviewed by Wolstencroft et al. (2021) reported that in some cases their families had difficulty accessing basic hardware and software. Furthermore, even having digital equipment was not sufficient to overcome the inequalities as the digital skills of the parents were very low.

There is also a positive side and great potential for teacher digital competences in the field of empowerment of learners. During the COVID-19 pandemic in Poland, we identified about 5% of students who, in the circumstances of remote learning, have

shown tremendous progress and benefited in many ways (Ptaszek et al., 2020). There were, e.g., students with a high level of social anxiety who started speaking in public (through computer-mediated communication tools) or some young people who felt safe and for the first time asked for teacher support (since they could have done it in private, e.g., in a chat, without being noticed by their peers). We consider the ability of teachers to recognize such students and mechanisms and methodology to support students from those groups as crucial competences of contemporary teachers. That means that when talking about competences important to support specifically different groups, we should not only focus on vulnerable groups but also on those who may benefit the most.

2.8 Facilitating Learners' Digital Competence

However, research evidence shows a significant deficit in digital skills among European children and adolescents (European Commission, 2018; 2012; European Training Foundation, 2018). The percentage of young people in Europe with a good level of computer skills (measured by Eurostat as being able to perform five or six tasks from the list of six selected computer-related activities) remained stable at around 45% (European Commission, 2016). This is a serious problem in the context of the constantly growing demand for jobs requiring ICT skills. Studies also show that simple access to ICT alone is insufficient to guarantee positive results (van Dijk & van Deursen, 2014). In addition, the support for access to and use of information and communication technologies must also take into account the pre-existing inequalities (in terms of gender, socioeconomic status, ethnicity, disability, and other factors), so that disadvantaged people do not lag behind. It is essential to pay attention to the development and testing of softer non-technical skills that enable young people to interact safely in a civil way on social media, including the ability to use critical information, and to understand the attitude of an online source of content. Children and young people should learn new skills such as problem solving, implementing creative activities, improving communication skills, and developing competences in information management (van Laar et al., 2018).

The pandemic situation after school closure definitely confirmed the situation described above. First, the students turned out to be much less digitally competent and prepared for remote education than everyone expected (Ptaszek et al., 2020). Regarding trends in the use of the Internet, they remained unchanged in the context of the time before the pandemic (Pyżalski, 2019; Tanaś et al., 2016). It was most often used to watch content (e.g., series, playing games, and communicating with teachers and family) or listening to podcasts and audiobooks is very rare, both before and during school closings, but of course, not always doing certain things online does not have to be skilled enough, because sometimes we do not do the things we can do. The context we are discussing is, however, that in many situations the lack of action and lack of skills should be treated as two sides of one coin, especially since most of the skills discussed here are acquired in practice (Table 2.1).

Table 2.1 Suggestions based on COVID-19 emergency remote education research and experiences

Group of competences from DigCompEdu	Suggestions based on COVID-19 emergency remote education research and experiences
Professional environment	– More focus on online support communities for teachers and competences connected to communication within those structures – Further recognition of competences needed for high quality digital communication among main educational actors (teachers, learner, students) – Addition of competences aim at maintaining digital well-being and usage of ICT in a way that is supportive for health – Addition of competences allowing successfully implementation of work-life balance (in the context of digital technologies use and its specificity)
Digital resources	– Particular emphasis on the role of open educational resources – The need to develop the ability to create and share your own resources, also in the form of videos – Collaboration with teachers from all over the world through mutual participation in online lessons – Developing empathy for online collaboration
Assessment	– Addition of ethical dimensions into discussion of digital assessment competences (concerning accuracy and fairness of assessment provided exclusively by digital methodology
Teaching and learning	– In addition to IT (technical) competences, teachers working remotely should be characterized by competences in the field of pedagogy (including didactics) and the psychology of learning and e-learning
Empowering learners	– The need for competences that help to identify groups that are particularly vulnerable or particularly beneficial when it comes to use of digital educational methods – More focus not only on specific groups of learners but also on their families (holistic approach required)
Facilitating learners' digital competences	– Children and young people should learn new skills such as problem solving, implementing creative activities, improving communication skills, and developing competences in information management during school activities and during online classes – The possibility of using private student devices, i.e., smartphones, should be taken into account (BYOD)

2.9 Conclusions

The main question that arises is whether experiences and conclusions from crisis remote education may be extrapolated to the "normal" times. To be more specific—to what extent what we experienced may help us to improve digital education that is additional not the only possible mode of education.

Firstly, we stand on the position that analysis we provided in the chapter may help to improve digital education in a case when a crisis situation happens again. Leaning from difficult experiences of emergency COVID-19 education may mean the next time education we provide will fulfill students' needs better and the teachers will avoid most of the mistakes we can make while providing it.

For better clarity and consistency, we decided that we provide there a table showing the list of groups of digital teacher competences from DigCompEdu (Redecker, 2017) with the shorten version of modifications and suggestions based on COVID-19 educational research.

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