FUTURE TEACHERS AND THE DIGITAL AGE, APPROVAL OF THE TEACHER EDUCATION PROGRAM AND STUDENTS' DIGITAL LITERACY LEVELS

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Abstract
The study aims to analyze the relationship between the study program and the level of digital competences of students in teacher education programs. Five categories of digital competence in student teacher education programs were analyzed to determine the extent to which the focus of the teacher education program, the approbation, can be significant in terms of the quality of individuals' digital competences. The theoretical framework is based on current concepts of digital literacy, European standards of digital competences and pedagogical readiness for technology-supported teaching.

Key words
digital literacy, digital competencies, teacher education programs, preparation of future teachers, pedagogical readiness, competency framework

Introduction

The Slovak Republic ranks among Currently, several fundamental shifts in the field of education can be observed, which are conditioned not only by technological progress, but also by changing social expectations towards educational institutions and pedagogical workers themselves. Digitalization penetrates all levels of the educational system, which changes the nature of teaching, forms of communication between the teacher and the student, as well as the learning strategies themselves. In this dynamic and constantly changing environment, digital literacy is becoming a fundamental competence that goes beyond technical skills and includes the ability to critically reflect on digital content, use technologies ethically and effectively integrate them into pedagogical practice. The digital literacy of future teachers is gaining strategic importance not only in terms of their professional readiness but also in terms of the quality of education that they will convey to future generations. European frameworks such as DigCompEdu (European Framework for the Digital Competence of Educators) define teachers' digital competences as a multidimensional construct covering areas such as professional development, pedagogical use of technologies, assessment, inclusion, digital safety and facilitation of digital citizenship. These standards also serve as a reference point for the creation of curricula for teacher education programs, which should reflect the need for systematic development of digital competences already during higher education. Given this fact, the question arises as to what extent the study program is a determining factor in the development of digital competences of students in teacher education programs. The diversity of study plans, the varying degrees of integration of digital technologies into teaching, and different pedagogical approaches can significantly influence the level of digital competencies of individuals. At the same time, it is necessary to investigate whether there are structural differences between individual types of studies (e.g., bachelor's vs. master's study programs, single-discipline vs. combined studies, etc.) that could affect the readiness of graduates for technologically supported teaching. The presented study focuses on the analysis of the level of digital competencies of a specific sample of students of teacher education study programs comprehensively and isolatedly in five categories: Information and data literacy, Communication and collaboration, Digital

content creation, Security, Problem solving. The aim of the research is to identify potential correlations between the type of study and the level of achieved digital competencies, relying on quantitative data obtained through the Europass measurement tool. The study's results can contribute to the optimization of curricular structures in teacher education programs, enhance the effective integration of digital technologies into the training of future teachers, and inform the formulation of recommendations for creating educational policies in the field of digital education. The current fundamental transformation of the educational environment, driven by the rapid development of digital technologies and their ever-deeper integration into pedagogical practice, reflects that the digitalization of education is not just a technological innovation, but a fundamental paradigm shift that redefines the role of the teacher, the student and the learning process itself. In this context, digital literacy is becoming a key competence without which it is impossible to function effectively in a modern school system. For future pedagogical employees, it represents not only technical skills, but also the ability to reflect critically, use digital tools creatively and adapt to the changing requirements of the educational process.

Digital competence of an individual

The education of qualified teachers who are prepared for technologically supported teaching requires the systematic building of digital competences already during their university studies. The study program, its content structure, methodological approaches and the degree of integration of digital elements into teaching can significantly influence the level of digital literacy of students. This raises the question of whether the type of study is a determining factor in the development of digital competences of future teachers. The European Commission has proposed two frameworks for digital competence: 1. a framework for citizens; 2. a framework for teachers, professional associates, school leaders and administrative staff (European Commission, Council Recommendation – Key competences for lifelong learning. [online], 2006). The frameworks have emerged as a result of the rapid pace of technology development and the need to keep up with it. The Digital Competence Framework for Citizens was developed to identify existing knowledge and identify ways to further enhance it. The Digital Competence Framework for Teachers is a set of knowledge, attitudes, and skills considered essential for performing tasks using digital technologies in educational institutions. Digital competence is divided into five areas: 1. information – identifying, locating, retrieving, storing, organising, analysing and verifying digital information; 2. communication – communicating in a digital environment, sharing digital content through online tools, connecting and collaborating with others; 3. content creation – creating, editing, integrating and developing digital content, expressing creatively while respecting licenses and copyrights; 4. security – personal and data protection, digital identity and taking security measures; 5. problem solving – using appropriate digital tools to solve problems. According to the manual for using the digital competence framework in schools, a digitally competent teacher has: 1. awareness of the use of digital technology integration, as well as the ability to manage the process of integrating digital technologies into the educational process; 2. the ability to actively use digital technologies in their educational work and for their own professional development through lifelong learning; 3. the ability to choose the most appropriate digital technology for designing and managing teaching and learning processes in a digital environment; 4. the ability to implement planned educational outcomes; 5. the ability to use digital technologies for communication and cooperation, to participate in projects in professional communities through teamwork, the ability to recognize and solve problems using digital technology; 6. the ability to self-assess their own digital competences and manage their development (Vuorikari et al., 2016, pp. 8-9). In

addition to general digital competences, the framework also includes a competence dimension for the application of digital technologies in education. The dimension is elaborated through three areas: 1. Teaching and learning using digital technologies; 2. Working in the school environment, 3. Professional education and lifelong learning. The dimension focuses on the knowledge, skills and attitudes needed to use digital technologies. The third dimension is called "Digital competences for school management" and is elaborated through the dimension of planning and management. It concerns the knowledge, skills and attitudes towards the use of digital technologies and digital resources for application in planning and managing work in school (Zuvić, 2016, pp. 55-70). Each of these dimensions is interpreted through three levels of complexity. The initial level refers to the knowledge area for the simple use of digital technology tools, the skills area for the use of basic functions of the tool and the attitudes towards the use of digital technology tools. The intermediate level in the knowledge area requires deeper knowledge of the use of digital technology tools in terms of application. In the skills area, the individual has a greater scope for using the functionality of the digital technology tool. In the attitudes area, a deeper application of digital technologies is promoted through regular use, enabling individuals to successfully perform more complex tasks. The advanced level in the knowledge area means the independence of the individual in the organization and the ability to innovate. In the skills area, performing more complex tasks is a matter of course, while in the attitudes area, the individual is responsible, self-sufficient and self-confident in the application of digital technologies (Vuorikari et al., 2016, pp. 9-16).

2. Research in the field of digital technologies

In 2016, a study was conducted at the University of Rijeka on the psychological aspects of the use of information and communication technologies in primary school education. The research showed that the majority of teachers use ICT daily in the classroom and privately, and the reason for its use is a requirement defined by the workplace. In terms of attitude, teachers had a rather negative attitude towards the use of tablets in teaching. A positive relationship was identified between self-assessment of the quality of their own digital literacy and completing a higher number of workshops. The use of iPads was perceived by teachers as a new and interesting approach to maintaining the educational process and encouraged teachers to further professional development, i.e., exposure to new technologies, which means more regular education and training (Jelaca, Bosiljka et al., 2016, pp. 1-5). A study on opinions, feelings and attitudes towards digitalization and competence development was conducted in Lahti, Finland (Pani University of Applied Sciences – LUAS). The research showed that only 7.4% of teachers believe they have poor digital skills, while 58% believe their skills are excellent or good. Regarding training in digitalization, most teachers responded that they had attended training less than five times. The identified training needs primarily focused on creating and editing digital content, utilizing various technologies in the classroom, and tools for assessing student success in a digital learning environment. The research found that digitalization is not sufficiently incorporated into teacher education and that further training is needed; however, participants perceived the problems as organizational barriers (Koskinen, 2015, pp. 90-98). In Malta, research focused on how teachers use technology in practice and how training can contribute to better technology integration. It was carried out in 118 primary schools. In the category of information management, teachers generally proceed by designing lessons and looking for resources. They advocated collaboration and its benefits when working with students who do not know how to use technology. Most teachers reported using platforms only to share ideas and resources, finding resources online for content creation and using videos, PowerPoint presentations and interactive games. Most teachers feel safe using the internet in schools (Spiteri et al., 2017, pp. 521-534). Zhao et al. conducted a study

with 536 higher education teachers in China. The instrument was based on the European DigComp framework, which measured four components: 1. digital skills; 2. communication and collaboration; 3. digital content creation; 4. safety and problem solving. The results revealed medium to high levels of perceived skills, while male teachers reported higher scores than female teachers in all DigComp components (Zhao, Yu et al., 2021).

3. Information literacy as a key competence of education at Slovak universities

If we understand education as a process of transmission, we must also understand it as a process of receiving knowledge, the primary goal of which is the sharing of cultural values between generations, starting with the birth of a person and continuing throughout their life. School education must then be viewed as a formalized, institutionalized and, last but not least, an essential part of this long-term process. Integration and globalization processes at the European and global labor market levels are leading to closer cooperation between educational institutions, coordination of curricula, and student exchanges. This trend is particularly strong at the university level. Achieving a certain standardization of higher education in terms of its structure (bachelor's study programs; master's study programs), content (joint programs of several universities) and technology (credit system) to maximally facilitate student mobility within the created sphere of European higher education has been a goal in Europe for several years, through the so-called Bologna Process. The concept of information literacy also comes to the fore as a complex of abilities that clearly determine the information behavior of an individual in the present era. Information literacy can be simply characterized as the ability of an individual to search for, identify, use, and evaluate information, as well as one of the basic aspects of a person's civilizational literacy today, related to the requirements of the current modern society, which is specified as an information society. According to the material of the ACRL (American Association of Academic and Research Libraries), information literate people are prepared for effective decision-making, full participation in a democratic society and freedom of choice. Such an understanding goes beyond the framework of library work and suggests and also indicates that the issues of increasing information literacy are directly related to the education system. Thus, one of the conditions for success in this area can clearly be considered the restructuring of the educational process (*A Progress Report on Information Literacy*, 1998). In Slovakia, there are several official documents dedicated to informatization and the knowledge society (e.g. the Competitiveness Strategy of Slovakia by 2010; the Strategy for Informatization of Society and the Action Plan for the Strategy for Informatization of Society in the Conditions of the Slovak Republic; the Global Information Society Project; Information for All, etc.), almost all of which discuss information and communication technologies and ICT literacy or ICT education, but do not deal with information literacy. One of the tools for increasing the information literacy of university students can be systematic information education. In 2000, the Information Literacy Competency Standards for Higher Education were adopted in the USA. The proposal was created within the ACRL (Association of College and Research Libraries), an organizational part of the ALA (American Library Association), which is why they are generally called ALA standards. These standards are a framework for assessing an information-literate individual. They also emphasize the need for a systematic process in which both educators and librarians are involved. They consist of 5 standards and 22 performance indicators. They can identify not only skills and knowledge related to information retrieval and processing, but also the basics of scientific research work; work with professional text and critical thinking, scientific communication and professional publishing. The term "information acquisition" is often understood in a broader sense - not only as information obtained

from an information source (e.g. monograph, article, etc.), but also through one's own research. The first extensive survey of information literacy of university students was conducted in 2007 by the ad hoc working group for information education of the academic libraries section of the Slovak Academy of Sciences. It was carried out in the form of a questionnaire survey under the name IGPAK - information literacy of academic library users. 2231 respondents were involved. 1964 questionnaires were included in further processing. The results can be considered representative, although the evaluated sample was relatively small in relation to the current number of students at Slovak universities. It may also appear as a problem that not all questions were answered in full by the respondents - the problem was mainly overly specific questions regarding the use of electronic information resources. The second extensive survey, IGPAK 2, was conducted in 2009. It logically followed on from the first, and was again carried out by the ad hoc working group for information education of the AK section of the Slovak Academy of Sciences. The aim of the survey was to determine whether, over the course of two years, there have been qualitative changes in the areas of students' acquired competencies in the area of searching for and using professional information (i.e., the level of their information literacy), with a focus on the use of electronic information resources. The individual questions of the questionnaire were purposefully adjusted and specified so that the obtained results could be applicable and, in particular, relevant for the "design of an information education model", which was the main ideological intention of the survey, in all its stages. This time, 2,737 respondents were involved in the survey. At the same time, the survey was able to uncover weaknesses in the higher education system. Based on it, it can be stated that a practical and effective tool for supporting information literacy is information education. Using the most advanced information and communication infrastructure is only the beginning in achieving ironclad quality requirements. A more fundamental approach is linked to supporting students, including research workers, in the use of information. Managing a complex information flow is, in turn, an essential aspect of the higher nature of the cognitive process. Studies have shown that students not only enter, but also leave the university environment without having basic information skills, including the ability to formulate a research question, effectively search, evaluate, synthesize information, complete research assignments, or participate in problem-based learning. New research and educational paradigms provide a strong argument for placing information at the core of research and academic activities, thereby also enhancing the research potential of higher education staff and students. Information literacy should be accepted as a critical aspect of student and staff development, which should also lead to the adoption of important measures for quality assurance, especially because information literacy is necessary for students and higher education staff to be able to operate in a global knowledge society; improves overall institutional capacity; accelerates learning and improves the quality of academic work; also increases the potential of students, especially those at the beginning of their academic and research careers; last but not least, increases the quality of research documents and research in general; improves students' self-confidence in finding and using information and overall student performance. The lack of information literacy policies at the national level and inadequate or absent education/training programs and activities related to information literacy in higher education institutions, as indicated by the results of the IGPAK survey, also points to a serious threat to educational outcomes. Information literacy should be accepted as a critical aspect of student and personal development. On this basis, important and necessary measures should be taken to guarantee its quality (Dzuganova, 2011, pp. 77-86). Further education of teaching staff should focus on enhancing the quality of teachers. According to Prucha, Walterova and Mares (2013), the quality of teachers is one of the decisive factors affecting the overall quality of schools, teaching, the effectiveness of education and the educational results of pupils and students. This

quality is closely related to the evaluation of the teaching itself (Melechovska, Dytrtova, 2025, pp. 14-16).

4. Level of digital competences of students of a specific study program

Nowadays, digital competences are becoming an integral part of the professional profile of a teacher. Education systems across Europe reflect the need for systematic development of digital skills, which are essential for the effective use of technology in the teaching process, as well as for supporting digital inclusion and critical thinking of students. In this context, research was carried out aimed at mapping the level of digital skills of student teachers of academic subjects who are preparing for the teaching profession. Students were tested using the Europass tool, a tool enabling a comprehensive mapping of digital competences in the categories: Information and data literacy; Communication and collaboration; Digital content creation; Security; Problem solving. In each category, an individual could reach a level of 1-6 (1 lowest, 6 highest) and by summing all categories, the measurement tool determined the individual's overall level of 1-6 (1 lowest, 6 highest) in the area of their own digital skills. The research was conducted within the subject Methodology of Educational Research on a sample of 111 respondents, selected from among students of the study program Teaching of Academic Subjects. The sample consisted exclusively of students of the 1st year of the 2nd level of university studies. After applying the criteria of a satisfactory answer, 91 respondents were included in the final analysis, which represents 81.98% of the original sample. The research set was homogeneous in terms of study focus, which allowed for a targeted analysis of the specific needs and level of digital competences of future teachers of academic subjects. The primary objective of the research was to determine the level of digital competences of future teachers, as well as to identify areas in which students show insufficient competences or potential for further development, and to provide an empirical basis for the design of interventions and curricular adjustments within teacher training. Data collection was carried out electronically, with students completing the *Europass* evaluation form independently. Subsequently, the data was processed by quantitative analysis, focused on identifying the level of competence in individual areas and comparing results within the group.

Tab. no. 1: Obtained data

Level	Jointly	Female students	Male students
Level 1	45	38	7
Level 2	24	21	3
Level 3	7	6	1
Level 4	7	5	2
Level 5	8	4	4
Level 6	0	0	0
Jointly	91	74	17

Source: Processing by the authors of the study, 2025.

91 respondents – students met the inclusion criteria in the research set. The research sample consists of 17 male students (18.7%) and 74 female students (81.3%). The composition reflects the typical predominance of women in teacher education study programs. Level 1 was achieved by a total of 45 respondents, of which 7 were male students and 38 were female students. They achieved the lowest possible level within the Europass testing, i.e., they only had basic digital competencies in individual categories. Level 2 was achieved by a total of 24 respondents, of which 3 were male students and 21 were female students. They achieved the second lowest possible level within the Europass testing, i.e., they only had basic digital competencies in most categories in individual categories. Level 3 was achieved by a total of 7 respondents, of whom 1 was male and 6 were female students. They achieved an average level of digital competencies in the testing. A total of 7 respondents reached Level 4, of which 2 were male and 5 were female. A total of 8 respondents reached Level 5, of which 4 were male and 4 were female. They achieved a very good level of digital competence in most categories within the digital competence testing. A total of 0 respondents reached Level 6. None of the respondents in the research sample reached the highest level of digital competence.

Conclusion

The research results provide valuable information for pedagogical practice, especially in the area of planning teachers' professional development. Based on the identified shortcomings, it is possible to design targeted educational modules that will support the development of digital competencies in the context of didactic transformation. At the same time, the research points to the need for systematic integration of digital tools into teacher training, not only as technical aids, but also as means to support pedagogical innovation. The results presented in the study point to shortcomings in the area of digital skills of a specific sample of students in teacher education programs, which also represents a significant challenge for modern pedagogical education. Despite the fact that digital technologies are an integral part of the current educational environment, many future teachers do not have sufficient competencies for their effective and critical use. The shortcomings obtained mainly relate to the insufficient ability to create and adapt digital content for teaching needs; a low level of critical evaluation of online resources; a passive approach to technologies as a tool for pedagogical innovation; and limited awareness of digital safety and ethics. These findings also point to the need for systematic inclusion of digital competences in the curriculum of teacher education programs. Based on the results, it is possible to recommend strengthening the practical training of students in the field of digital skills, ensuring access to modern technologies, and supporting the development of a reflexive approach to their use in education. Without targeted intervention, there is a risk that future teachers will not be able to fully exploit the potential of the digital environment, which will also widen the technological gap between the school reality and the needs of 21st-century students.

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