

MANAGING DIGITAL COMPETENCIES TO IMPROVE THE QUALITY OF INFORMATICS TEACHING IN PRIMARY SCHOOLS

DOI: 10.5937/EMC26321V

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ABSTRACT

The development of digital society has changed the role of teachers and increased the importance of digital competencies in primary education. This paper examines how primary school teachers use digital technologies in teaching practice, administrative work, cooperation with colleagues, and communication with parents. The study is conceptually based on selected areas of the DigCompEdu framework, especially professional engagement, digital resources, teaching and learning, assessment, and empowering learners. Data were collected through an online questionnaire completed by 88 primary school teachers from Belgrade. The research has a descriptive character and focuses on the frequency and purpose of technology use in educational practice. The results show that most teachers regularly use digital technologies in teaching activities. Digital tools are most often used for assigning student tasks, preparing and delivering learning content, motivating students to develop digital competencies, and supporting assessment. The findings also show that teachers use digital tools for cooperation with colleagues and communication with parents, although traditional communication channels remain important. The paper concludes that digital competencies represent an important condition for improving informatics teaching practice, but further research with a larger sample and more detailed statistical procedures is needed to examine deeper relationships between teacher competencies, teaching quality, and student learning outcomes.

Keywords: digital competencies; teachers; primary education; informatics teaching; digital technologies

INTRODUCTION

Teachers must possess a high level of digital competence, meaning they are able to effectively use digital tools and technologies in their teaching practice. Digital competencies include digital literacy, experience in using educational software and platforms, and the ability to seamlessly integrate information and communication technologies (ICT) into the organization of educational activities.

Primary school teachers should also have pedagogical digital competencies, which involve the integration of digital tools into pedagogical practice and training students to use technology for learning (Starkey, 2019). The most common practice for digital integration is the use of digital storytelling, which has been shown to improve language development, creativity, and digital literacy (Hwang et al., 2023).

This study uses the European Framework for the Digital Competence of Educators, DigCompEdu, as a conceptual basis for examining teachers' use of digital technologies in primary school practice. The paper does not aim to validate the full DigCompEdu framework. Instead, selected areas of the framework are used to structure the research focus and interpret teachers' reported practices. These areas include the use of digital tools in teaching, assessment, collaboration with colleagues, communication with parents, and support for student learning. In this way, the study provides descriptive insight into how teachers apply digital technologies in everyday educational activities and how these practices may contribute to the quality of informatics teaching in primary schools.

LITERATURE REVIEW

Contemporary society requires teachers with digital competencies in order to effectively apply digital technologies in the teaching and learning process (Reisoğlu & Çebi, 2020). Digital technologies have the potential to improve learning outcomes and encourage new teaching strategies that support the development of students' critical skills. However, there is still a lack of consensus regarding the appropriate age and approach for introducing digital technology concepts in primary schools (Springer et al., 2022). Key stakeholders are informatics teachers and their teaching competencies. The rapid development of information technologies presents significant challenges for teachers in terms of their professional training and appropriate curricula (Urem, Ban & Jureković, 2018).

Possessing a high level of digital competence enables teachers to use digital tools and resources to improve their teaching practices. They can create interactive and engaging learning materials, access various online educational resources, and facilitate collaborative learning through digital platforms. The use of digital technologies not only increases student engagement but also promotes critical thinking, creativity, and problem-solving skills.

The reviewed literature shows that teachers' digital competencies cannot be observed only through technical skills. They also include the ability to select appropriate digital tools, adapt them to students' needs, use them for assessment and feedback, and communicate effectively in a digital environment. For this reason, the DigCompEdu framework is useful for organizing research on teachers' digital practices. In the context of this paper, the framework supports the classification of questionnaire items into several practical areas: teaching activities, student assessment, cooperation with colleagues, administrative work, and communication with parents. This approach allows the research to remain focused on observable teaching practices, while avoiding claims that go beyond the descriptive nature of the collected data.

METHODOLOGICAL CONCEPT OF THE STUDY

The study examines how primary school teachers use digital technologies in their professional practice, with special attention to informatics teaching and related educational activities. The research was conducted as a descriptive survey study. Data were collected through an online questionnaire completed by 88 primary school teachers from Belgrade. The questionnaire was designed to identify the frequency, purpose, and areas of digital technology use in teaching, assessment, cooperation with colleagues, administrative work, and communication with parents. The study does not test causal relationships. Instead, it provides an overview of teachers' reported digital practices and discusses their relevance for improving the quality of informatics teaching in primary schools.

Research Problem and Subject

The research problem refers to the need to better understand how teachers use digital technologies in primary school teaching practice and how these practices are connected with the development of students' digital competencies. Although digital technologies are increasingly present in schools, their educational value depends on teachers' ability to integrate them into teaching, assessment, communication, and student support. Therefore, the subject of this research is the use of digital competencies and digital technologies by primary school teachers in everyday educational practice. The study focuses on teachers' reported activities, including the use of digital tools for learning content, student tasks, assessment, cooperation with colleagues, and communication with parents.

Research Objectives

The main objective of the study is to examine how primary school teachers use digital technologies in teaching and related professional activities. More specifically, the research aims to identify how often teachers use digital technologies, for which teaching purposes they use them, which digital tools they apply in cooperation with colleagues, and which communication channels they use with parents. The study also aims to discuss how these practices relate to the development of teachers' digital competencies and the improvement of informatics teaching quality. Since the research is based on descriptive survey data, the objective is not to prove causal effects, but to provide a clearer empirical overview of current digital practices among the surveyed teachers.

Expected Results and Hypotheses

Based on the research objective and the descriptive character of the study, the following research questions were formulated:

RQ1: How frequently do primary school teachers use digital technologies in teaching activities?

RQ2: For which purposes do teachers most often use digital technologies in teaching practice?

RQ3: Which digital tools do teachers use for cooperation with other teachers and administrative activities?

RQ4: Which communication channels do teachers use when communicating with parents?

In addition to these research questions, one general hypothesis was formulated:

H1: Primary school teachers use digital technologies in several areas of professional practice, including teaching activities, assessment, cooperation with colleagues, and communication with parents.

This formulation is aligned with the descriptive nature of the empirical analysis. The hypothesis is examined through frequency distributions and percentage shares obtained from the questionnaire responses.

Research Methods

The research was conducted using the survey method. Data were collected through an online questionnaire created for the purposes of this study. The questionnaire included items related to demographic characteristics, work experience, subject area, frequency of using digital technologies, purposes of using digital technologies in teaching, tools used for cooperation with other teachers, and communication channels used with parents. The questionnaire structure was conceptually informed by selected elements of the DigCompEdu framework. The area of professional engagement was reflected in items related to cooperation with colleagues and communication with parents. The area of digital resources and teaching was reflected in items related to the use of digital technologies for preparing and delivering learning content. The area of assessment was reflected in items related to the use of technologies for evaluating students' knowledge and skills, providing feedback, and monitoring progress. The area of empowering learners was reflected in items related to motivating students, supporting personalized learning, and encouraging the development of students' digital competencies. Since the study presents descriptive survey findings, data analysis was based on frequencies and percentages. The results are presented through figures and short interpretative comments. No causal analysis was conducted, and the findings should therefore be interpreted as indicators of teachers' reported practices rather than as evidence of direct effects between variables.

It should be noted that the study has several methodological limitations. The sample includes 88 teachers from Belgrade, which limits the possibility of generalizing the results to all primary school teachers. The data are based on teachers' self-reported answers, which may include subjective assessment and socially desirable responses. In addition, the study uses descriptive statistical analysis, so the findings should be interpreted as an overview of current practices rather than as proof of causal relationships. These limitations are important for understanding the analytical reach of the study and for defining directions for further research.

RESEARCH RESULTS AND DISCUSSION

This section presents descriptive results obtained from the questionnaire. The results are organized according to the main research questions and show the structure of respondents, their work experience, subject areas, frequency of using digital technologies, purposes of technology use in teaching, tools used for cooperation with colleagues, and communication channels with parents. The interpretation is limited to the observed frequency distributions and percentage shares. Therefore, the discussion focuses on identifying dominant patterns in teachers' reported digital practices.

The sample was predominantly composed of female teachers, who accounted for 75% of the respondents (66 teachers), while male teachers represented 25% of the sample (22 respondents). Respondents represented a relatively balanced distribution across different levels of professional experience. The largest group consisted of teachers with 21–30 years of experience (27.27%, 24 respondents), followed by those with 0–5 years (25%, 22 respondents) and 11–20 years of experience (23.86%, 21 respondents). Teachers with 6–10 years of experience accounted for 13.64% (12 respondents), while those with more than 30 years of professional experience represented the smallest group (10.23%, 9 respondents).

As shown in Figure 1, the sample was dominated by teachers of informatics, information technology, and mathematics, who accounted for 52.27% of respondents (46 teachers). Teachers of humanities represented 18.18% of the sample (16 respondents), followed by primary school teachers of other subjects with 15.91% (14 respondents). Teachers of natural sciences accounted for 11.36% (10 respondents), while art teachers represented the smallest group, comprising 2.27% of respondents (2 teachers).

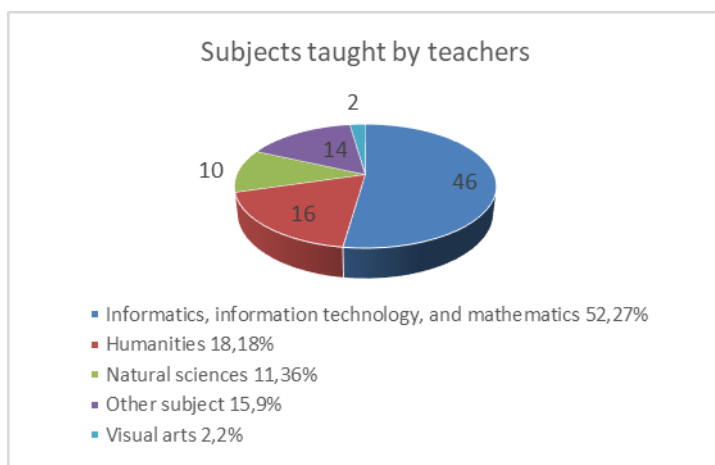


Figure 1: Subjects taught by teachers

Figure 2 shows the frequency of digital technology use in teaching activities. Respondents who always use digital technologies represent the largest share (54.55%, 48 teachers), followed by those who often use them (39.77%, 35 teachers). Only 2 teachers reported that they never use digital technologies (2.27%), while 3 respondents indicated that they rarely use them (3.41%).

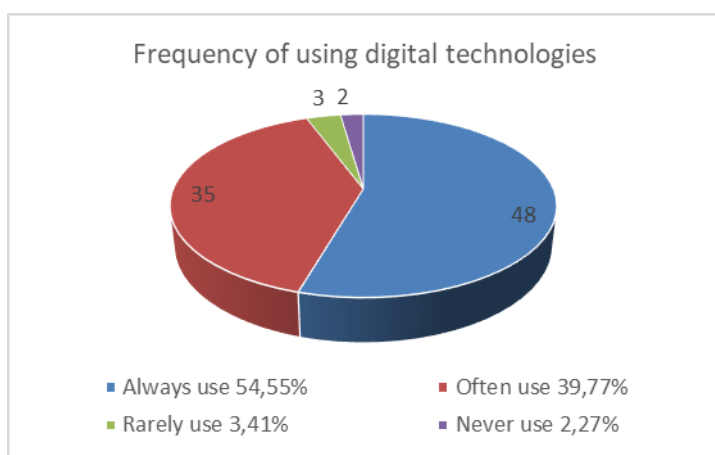


Figure 2: Frequency of using digital technologies

The largest share of teachers use digital technologies by assigning tasks that require students to apply information technologies (46.59%, 41 respondents), as shown in Figure 5. The development of students' digital competencies represents the second most common purpose of technology use (28.41%, 25 respondents). For 12.50% of teachers (11 respondents), digital technologies are primarily used for assessing students' knowledge and skills. Less frequently reported purposes include providing effective feedback (4.55%, 4 respondents), monitoring student progress (4.55%, 4 respondents), and enabling personalized learning (3.41%, 3 respondents).

The results presented in Figure 3 show that teachers most often use digital technologies for activities directly connected with teaching and student tasks. This indicates that digital tools are primarily understood as practical support for learning content delivery and student engagement. A smaller share of teachers reported using technologies for feedback, monitoring progress, and personalized learning. This finding suggests that digital technologies are still used more often for basic instructional support than for more advanced pedagogical functions. From the perspective of the DigCompEdu framework, this may indicate that further professional development should focus not only on the use of digital tools, but also on their application in assessment, feedback, student progress monitoring, and individualized support.

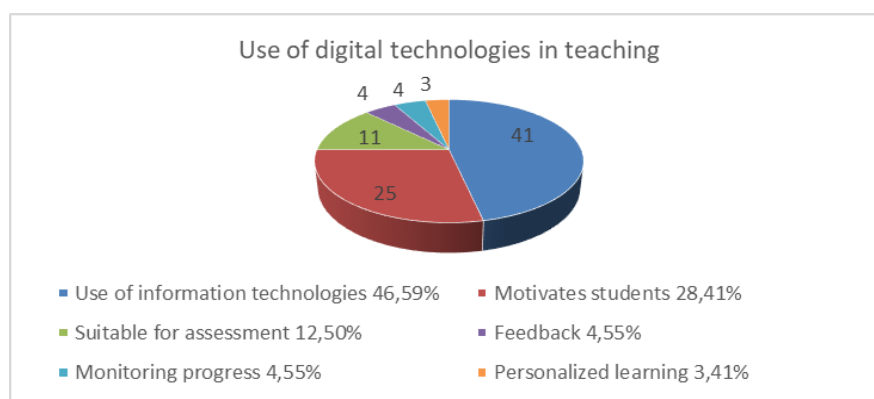


Figure 3: Purpose of using digital technologies in teaching activities

Figure 4 shows that online collaboration platforms that enable teachers to work on shared documents and access them from different devices and locations are the most frequently used digital tools, reported by 46.59% of respondents (41 teachers). Electronic calendars are used by 23.86% of teachers (21 respondents), primarily to facilitate the synchronization of administrative and teaching activities. Project management tools are utilized by 17.05% of respondents (15 teachers), indicating a moderate level of adoption for planning and coordinating tasks. Only 11.50% of teachers (11 respondents) reported not using modern digital technologies in their daily professional activities.

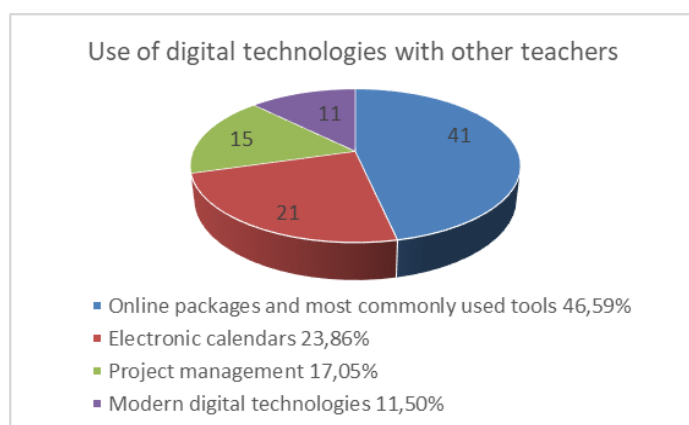


Figure 4: Digital tools used by teachers for collaboration with other teachers

The results related to cooperation with other teachers show that online packages and shared digital documents are the most frequently used tools. This finding indicates that digital technologies support professional engagement and cooperation among teachers, especially in activities that require joint preparation, document exchange, and access to teaching materials from different devices. However, the lower use of project management tools suggests that more structured forms of digital collaboration are less developed. This result points to the need for additional training focused on the use of digital tools for planning, coordination, and teamwork in school practice. The results show that the most common traditional channel of communication with parents is by phone, used by 38.63% of teachers (34 teachers). Electronic platforms with access for parents are used by 26.14% of teachers (23 teachers), followed by e-mail correspondence (12.50%), used by 11 teachers. Only a small number of teachers have the necessary skills to maintain their own websites (9.09%, 8 teachers) and blogs (6.82%, 6 teachers) for communication and information sharing with parents. Instant messaging applications (chat) are used as a preferred communication channel by 6.82% of teachers (6 teachers). The results show that communication with parents still relies strongly on traditional channels, especially telephone communication. At the same time, the use of electronic platforms and e-mail indicates that digital communication is becoming part of everyday school practice. The relatively limited use of websites, blogs, and instant messaging applications suggests that teachers may need additional support in developing more diverse and systematic forms of digital communication with parents. These findings are important because communication with parents is part of teachers' broader professional digital competence and can influence the transparency, continuity, and quality of educational support.

CONCLUSION

The results of this study show that digital technologies are present in the everyday professional practice of the surveyed primary school teachers. Most respondents reported that they always or often use digital

technologies in teaching activities. This confirms that digital tools have become an important part of teaching practice, especially in the preparation and delivery of learning content, assigning student tasks, and encouraging students to develop digital competencies. The findings also show that teachers use digital technologies for assessment, feedback, monitoring student progress, cooperation with colleagues, and communication with parents. However, these areas are less represented than the basic use of technologies for teaching tasks and content delivery. This indicates that there is still space for improving more advanced forms of digital pedagogical practice. In particular, teachers may benefit from additional training related to digital assessment, personalized learning, systematic feedback, and structured cooperation through digital tools.

The formulated hypothesis stated that primary school teachers use digital technologies in several areas of professional practice, including teaching activities, assessment, cooperation with colleagues, and communication with parents. Based on the descriptive results, this hypothesis can be accepted. The results show that teachers use digital technologies in all observed areas, although the intensity and purpose of use differ across activities. The study contributes to a better understanding of teachers' digital practices in primary education. Its contribution is mainly descriptive, since it presents empirical insight into the ways teachers use digital technologies in school practice. The findings should not be interpreted as evidence of causal relationships between digital competencies and teaching quality. Instead, they point to areas in which teachers already apply digital tools and areas in which further professional development is needed. The main limitations of the research are related to the sample size, the focus on teachers from Belgrade, and the use of self-reported questionnaire data. Future research should include a larger and more diverse sample of teachers from different regions. It should also include more detailed statistical procedures and, where possible, combine survey data with classroom observation or interviews. Such an approach would allow a deeper understanding of how teachers' digital competencies influence the quality of informatics teaching and students' digital learning outcomes.

Recommendations for Further Research

Future research should include a larger number of respondents from different schools, cities, and regions in order to provide a broader view of teachers' digital competencies in primary education. Further studies should also examine barriers that limit the more advanced use of digital technologies, especially in the areas of assessment, personalized learning, feedback, and cooperation with parents. In addition, future research should apply more detailed statistical analyses and include instruments that can more directly measure the dimensions of the DigCompEdu framework. This would make it possible to examine relationships between different areas of teachers' digital competence and the quality of informatics teaching in a more precise way.

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