

PAPER

Teacher Educators' Attitudes Towards Using Digital Technologies for Learning and Teaching: The Case of Slovenia

Sonja Čotar Konrad()
Tina Štemberger

Faculty of Education,
University of Primorska,
Slovenia

[sonja.cotarkonrad@
puf.upr.si](mailto:sonja.cotarkonrad@puf.upr.si)

ABSTRACT

This study aimed to identify teacher educators' attitudes towards using digital technologies in teaching and learning and their self-reported proficiency in using digital tools. It also explored whether and how attitudes towards the use of digital technologies in education predict self-reported proficiency in the use of digital technologies. Sixty-one teacher educators completed a "teachers' attitudes towards the use of digital technologies in education" questionnaire. The results point to the fact that the teacher educators self-reported being more proficient in using digital technologies that do not demand an advanced level of competence; a lower level of proficiency was reported in using digital technologies that included the co-construction and co-creation of teaching and learning materials.

KEYWORDS

attitudes, digital tools, teacher educators, student teachers

1 INTRODUCTION

Digital technologies have become an important, if not vital, part of teachers' daily pedagogical practices [1]. Therefore, digital competence is now a key element of teacher education worldwide [1–3]. However, research findings indicate that digital technology is often under-used by student teachers and novice teachers and that student teachers and novice teachers predominantly express positive attitudes towards using digital technology [1, 4–6].

These results raise an important issue regarding the role of teacher education. Ottestad et al. [7] stressed that although teacher educators in initial teacher education (ITE) are expected to prepare student teachers for digital technological practices and provide them with necessary professional digital competence, poor levels of professional digital competence among student teachers relate to its status in teacher education. Despite the fact that the digital transformation is a long-term

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process—going through many stages, requiring many resources to participate and the support of regulatory agencies, institutions and policies [21]—in many teacher education programmes, the level of treatment can depend on enthusiastic teacher educators and no systematic approach to developing digital competence; digital competence is often neglected or reduced to shallower and more instrumental activities.

Research regarding approaches to digital technologies (DT) integration within ITE [8] has focused mostly on general reviews of macro- or meso-level analyses of how DT programmes organise their student teachers' DT training. They emphasised a programme's technological infrastructure, policies and barriers and enablers, versus a micro- or interactional level that focuses on showcasing daily teaching practices and activities with DT. Consequently, there is a significant gap in the research on higher education teachers' digital competences or empirical data of different theoretical models of technology acceptance (e.g., technology acceptance model—TAM [23]). The current paper specifically focuses on developing student teacher digital competence in ITE in Slovenia.

2 TEACHER EDUCATION IN SLOVENIA

In Slovenia, as in all European countries, teaching is a regulated profession, which means that minimum qualifications are required to become a teacher [9]. According to [10, 11], Slovenian primary and secondary school teachers need to obtain a master's level of formal education; they can choose different educational paths to acquire appropriate qualifications. Future teachers can engage in ITE and concurrent programmes that are offered by faculties of education and certain other multidisciplinary faculties (e.g., arts and mathematics).

Higher education institutions that deliver ITE usually have much autonomy in developing programme content [9]. However, each ITE study programme first undergoes an internal evaluation performed by the Slovenia's Ministry of Education. Then, during the process of accreditation, the programmes are evaluated by a group of at least three trained, licenced experts assigned by the Slovenian Quality Assurance Agency for Higher Education (SQAA); they review the composition and content of a study programme and the concept of its delivery [12].

The report [13] categorises Slovenia as a European country in which teacher digital competence is included in general teacher competence frameworks (as opposed to countries in which there is a specific digital competence framework). Furthermore, teacher-specific digital competences are not subject to ITE regulations issued by top-level authorities; this results in higher education institutions that deliver ITE being autonomous in deciding whether to include digital competence in an ITE curriculum. Specifically, for university teachers, there are only general academic requirements for working in higher education contexts.

According to [14], teacher educators need to have appropriate professional education, conduct research and publish findings regularly; have an educational qualification; and be fluent in at least one world language. Nonetheless, developing teachers' digital competence has been the aim of several projects that were issued and controlled on a national level by the Slovenian Ministry of Education and on the European level by the *Digital Education Action Plan (2021–2027)*.

3 DIGITAL COMPETENCE WITHIN THE FRAMEWORK OF TEACHER EDUCATORS' COMPETENCES

Teacher educators should be able to deploy competences on two levels [15]: (1) *first-order competences*, which link to the knowledge base about learning and teaching that teacher educators co-construct with student teachers as related to subjects or disciplines and (2) *second-order competences*, which concern the knowledge base about how teachers learn and how they become competent teachers. According to [16], other key areas of competence can include knowledge development, research and critical thinking competences; transversal competences (critical and innovative thinking, interpersonal skills, intrapersonal skills, global citizenship, media and information literacy and others); leadership competences; and competences in collaborating, communicating and making connections with other stakeholders.

According to the Digital Competence in Teacher Education (PEAT) model [2], which engages technical and pedagogical competences and ethical and attitudinal dimensions, openness and a positive attitude towards digital technology use in education appear to be important dimensions of teachers' digital competence. As [22] claims, "the development of new digital learning materials and teaching aids, interactive learning software, and virtual learning environments all require teachers to have a certain level of didactic-technological competences." Therefore, in the context of teacher education and the use of DT for teaching and learning and/or recognising the importance of teacher education in shaping student teachers' and teachers' attitudes towards using DT in teaching and learning [7, 8], it is important to address teacher educators' attitudes towards the use of DT for teaching and learning and their self-reported proficiency in using DT. Developing positive attitudes towards using DT in education should thus be a key priority in planning and implementing teacher education programmes.

4 INTEGRATING TEACHER EDUCATORS' DIGITAL COMPETENCES INTO TEACHING PRACTICE

When introducing innovations into teaching practice, as [17] pointed out, it is necessary to have "pedagogical wisdom" to ensure that a teacher maintains "learning by understanding" in the classroom rather than "learning for learning's sake." If we apply this to notion of meaningfully integrating digital tools into learning and teaching, this can be realised only when a teacher develops a broader and more sophisticated set of additional (specific) competences. To more clearly define a set of digital competences that would enable teachers to cope successfully with new demands, the DigCompEdu model [18] has been internationally developed and scientifically validated under the auspices of the European Commission [18]. Therefore, the DigCompEdu model constitutes a common European framework for defining teachers' digital competences [18]. The main objective of the DigCompEdu model is to provide a common frame of reference for the design of digital competences across higher education in member states of the European Union.

The DigCompEdu model [18] envisages a close interconnection of three core competences in the teaching and learning process (i.e., educators' professional competences, educators' pedagogical competences and learners' competences). With 22

competences organised in six areas, this model focuses not on technical skills but rather presents a pedagogical framework that supports the use of digital tools to enhance innovative teaching and learning.

The DigCompEdu model takes teachers' professional engagement as a starting point for the development and use of digital tools. This means using digital tools for (i) communication within and outside an organisation, (ii) professional collaboration between teachers, (iii) reflection and critical evaluation of their pedagogical practices and (iv) continuous professional growth. Teachers' professional engagement is closely linked to their pedagogical competences. The latter refers to the use of digital tools for (i) finding and selecting relevant digital resources, (ii) learning and teaching, (iii) assessment and (iv) empowering students. Pedagogical competence marks a transition to the last digital competence of teachers educators, which covers the use of digital tools to facilitate students' digital competences.

As can be seen in the DigComEdu model described above, the achievement and development of students' digital competences is possible only if teacher educators mindfully develop and implement their digital competences. Therefore, it is important that university teachers expose student teachers during their studies to this model and the appropriate and meaningful use of digital tools.

5 PURPOSE AND AIMS OF THIS STUDY

Student teachers' experiences with using technology, both through their use and observing teacher educators' use, are key factors in the development of their professional digital competences and attitudes [19]. The extent to which teacher educators choose to use digital technology in their teaching practices can thus directly influence students' attitudes and inclinations towards integrating technology into their future teaching practices [3]. Successfully integrating digital technology into education has been an area of interest for researchers and educators for almost as long as digital technology has been available for educational purposes. However, most research has focused on primary and secondary education rather than on tertiary education [3]. The results of studies show that teachers' attitudes towards the use of DT, their digital competence and access to digital technology influence the integration of digital technology into learning and teaching. Christensen and Knezek [19] argued that positive attitudes towards the use of digital technology can be associated with increased use of digital technology. As teacher educators' attitudes towards using DT is an under-researched topic, the main focus of this present study was to identify the attitudes that Slovenian teacher educators have towards the use of DT in learning and teaching within ITE and how an attitude towards the use of digital tools relates to self-reported proficiency in using DT.

The first aim was to identify teachers' attitudes towards (i) the integration of digital tools in their teaching, (ii) the integration of digital tools to support student learning, (iii) the use of digital tools to support assessment and critical thinking, (iv) the use of digital tools to personalise learning and teaching and (v) the use of digital tools to support collaborative learning.

The second aim was related to teacher educators' self-reported proficiency in using digital tools, which were divided into four groups: (i) digital resources, (ii) communication tools, (iii) digital tools and (iv) online learning tools.

Finally, we wanted to find out whether and how attitudes towards the use of DT in education predict self-reported proficiency in their use of DT in education.

6 METHODS

6.1 Sample

Sixty-one teacher educators participated in this study, of whom 49 (80.3%) were female, 10 (16.4%) were male, and two participants did not respond to this inquiry. The participants' average length of service as a teacher educator was 18.91 years (SD = 10.57; 0–40 years); they had been in the teaching profession for an average of 11.04 years (SD = 7.99; 0–40 years). The sample is representative of the Slovenian context because it included 19.6% of all Slovenian teacher educators, and it reflects its structure in terms of gender and average length of service.

6.2 Data collection

The data were collected using the questionnaire “Teachers’ Attitudes Towards the use of DT in Education,” which was previously validated on a sample of Slovenian teacher educators [20]. The questionnaire’s items were derived from the European Framework for the Digital Competence of Educators [18]. The questionnaire measures two core dimensions: (i) *attitudes* towards using DT and (ii) *self-reported proficiency* in using DT. The first dimension, attitudes towards using DT, was measured by a cluster of 32 statements, which respondents were asked to rate on a four-point Likert scale: 1 - I completely disagree, 2 - I disagree, 3 - I agree and 4 - I completely agree. Based on a factor analysis, the statements were grouped into five subdimensions: (1) using DT for teaching, (2) using DT to support students’ learning, (3) using DT to support assessment and critical thinking, (4) using DT for personalised learning and teaching and (5) using digital to support collaborative learning of students. The second dimension, self-reported proficiency in using DT, was measured by a cluster of 17 statements. The respondents were asked to self-assess their proficiency in using various DTs on a five-point scale: 1 - I am not familiar with the tool, 2 - I am familiar with the tool, but I do not use it, 3 - I use the tool on a basic level, 4 - I use the tool on an advanced level and 5 - I am an expert in using the tool. The 17 statements were grouped into four subdimensions: communication tools, digital resources, digital tools and online learning tools.

6.3 Data analysis

Based on the model proposed by [20], we first, by computing individual items, formulated five subdimensions of attitude in using DT: (1) for teaching, (2) to support students’ learning, (3) to support assessment and critical thinking, (4) for personalised learning and teaching and (5) to support collaborative learning of students. We then formulated four subdimensions of self-reported proficiency in using DT: (1) communication tools, (2) digital resources, (3) digital tools and (4) online learning tools. The results of the Cronbach’s α test revealed that all the subdimensions showed good or satisfying internal consistency ($\alpha_{A1} = 0.921$, $\alpha_{A2} = 0.809$, $\alpha_{A3} = 0.775$, $\alpha_{A4} = 0.718$, $\alpha_{A5} = 0.735$, $\alpha_{p1} = 0.956$, $\alpha_{p2} = 0.902$, $\alpha_{p3} = 0.823$ and $\alpha_{p4} = 0.760$). To determine teacher educators’ attitudes towards using DT and their self-reported proficiency in using digital tools, we performed descriptive statistics. To test how attitudes towards the use of digital tools predict self-reported proficiency in the use of DT, we performed multiple regressions using the stepwise method.

7 RESULTS

The first aim was to identify teachers' attitudes towards using DT (i) for teaching, (ii) to support students' learning, (iii) to support assessment and critical thinking, (iv) for personalised learning and teaching and (v) for supporting collaborative learning.

7.1 Teacher educators' attitudes towards using DT

Table 1. Descriptive statistics of the five dimensions of teacher educators' attitudes towards DT

Dimension	n	M	SD	Skew	Kurt
Attitudes towards using DT for teaching	52	3.02	0.51	-0.06	-0.07
Attitudes towards using DT to support students' learning	51	2.65	0.40	-0.78	3.14
Attitudes towards using DT to support assessment and critical thinking	49	2.26	0.78	0.05	-1.08
Attitudes towards using DT for personalised learning and teaching	51	3.38	0.76	0.42	0.03
Attitudes towards using DT for supporting collaborative learning	51	2.94	0.91	-0.45	0.36

Note: n = numerus, M = mean, SD = standard deviation, Skew = skewness, Kurt = kurtosis.

As shown in Table 1, the highest value (M = 3.38, SD = 0.76) for teacher educators showed the most positive attitudes towards using DT for personalised learning and teaching, followed by attitudes towards using DT for teaching (M = 3.02, SD = 0.51). Additionally, the average value for attitudes towards using DT for supporting collaborative learning (M = 2.94, SD = 0.91), and the average for attitudes towards using DT to support students' learning (M = 2.65, SD = 0.40), indicate an indifferent attitude of teacher educators. The average for attitudes towards using DT to support assessment and critical thinking (M = 2.26, SD = 0.78) indicates that teacher educators are disinclined to this dimension.

7.2 Self-reported proficiency in using digital technology

The second aim was related to the teacher educators' self-reported proficiency in the use of digital tools, which were divided into four groups: (i) digital resources, (ii) communication tools, (iii) digital tools and (iv) online learning tools.

Table 2. Descriptive statistics for four groups of digital tools

Digital Tool	n	M	SD	Skew	Kurt
Communication tools	47	3.34	0.65	0.679	-0.276
Digital resources	47	3.46	0.77	0.184	-0.559
Digital tools	47	2.62	0.64	0.478	0.157
Online learning tools	47	2.58	0.66	0.612	-0.100

Note: n = numerus, M = mean, SD = standard deviation, Skew = skewness, Kurt = kurtosis.

The results showed (see Table 2) that the teacher educators, on average, reported themselves to be basic-level users of communication tools (M = 3.34, SD = 0.65) and digital resources (M = 3.46, SD = 0.77). Their self-reported proficiency in digital tools

($M = 2.62$, $SD = 0.64$) and online learning tools ($M = 2.58$, $SD = 0.66$) was low, showing that the teacher educators considered themselves basic-level users or even less; they were familiar with the tools but did not use them.

7.3 Does attitude towards DT predict self-reported proficiency?

Finally, we wanted to determine whether and how teacher educators' attitudes towards the use of digital tools predict self-reported proficiency in using DT.

Communication tools. We first explored which dimensions of teacher educators' attitudes towards DT predict self-reported proficiency in using communication tools. Communication tools are those used to communicate with different stakeholders in education, such as students, teachers, head teachers, parents and local and national communities. These tools include e-mails, blogs, forums, videoconferences and various social media, which enable users to effectively communicate with others.

We calculated a multiple linear regression to predict proficiency in using communication tools based on attitudes towards the use of DT. Using the stepwise method, two predictors entered the model. We found a significant regression equation ($F(4,150) = 11.867$, $p < 0.000$), with an R^2 of 0.209. Thus, we discovered (see Table 3) that attitudes towards using DT for teaching significantly predicted self-reported proficiency in using communication tools ($\beta = 0.457$, $p < 0.001$).

Table 3. Multiple regression results for communication tools

Predictor	B	SE	β	t	p
Attitudes towards using DT for teaching	0.57	0.17	0.46	3.45	0.001

Note: Constant = 1.622, $F(4,150) = 11.867$, $p < 0.000$, $R^2 = 0.209$.

Digital resources. We continued with an analysis of the role of teacher educators' attitudes towards DT in predicting self-reported proficiency in using digital resources. These resources include the use of various webpages that contain content of interest and audio and video materials that can be used in education.

We conducted a multiple linear regression to predict self-reported proficiency in using digital resources based on attitudes towards the use of digital resources. Using the stepwise method, one predictor entered the model. We found a significant regression equation ($F(13,659) = 9.607$, $p < 0.000$), with an R^2 of 0.396. We also discovered (see Table 4) that one's attitude towards using DT for personalised learning and teaching significantly predicted self-reported proficiency in using digital resources ($\beta = 0.583$, $p < 0.001$), as did an attitude towards using DT to support assessment and critical thinking ($\beta = 0.409$, $p < 0.001$). However, attitude towards using DT for supporting collaborative learning ($\beta = -0.378$, $p < 0.005$) negatively predicted self-reported proficiency in using digital resources.

Table 4. Multiple regression results for digital resources

Predictor	B	SE	β	t	p
Attitudes towards using DT for personalised learning and teaching	0.58	0.15	0.58	3.86	0.001
Attitudes towards using DT to support assessment and critical thinking	0.40	0.13	0.41	3.10	0.003
Attitudes towards using DT for supporting collaborative learning	-0.35	0.15	-0.38	-2.38	0.022

Note: Constant = 1.668, $F(3,659) = 9.407$, $p < 0.000$, $R^2 = 0.396$.

Digital tools. Next, we determined which dimensions of attitude towards using DT predict self-reported proficiency in using digital tools or those intended to help create digital content (including digital educational resources).

We conducted a multiple linear regression to predict the use of digital tools based on attitudes towards the use of digital tools. Using the stepwise method, two predictors entered the model. We found a significant regression equation ($F(3.592) = 10.533, p < 0.005$), with an R^2 of 0.190. We then discovered (see Table 5) that attitudes towards using DT for teaching significantly predicted the use of digital tools use ($\beta = 436, p < 0.005$).

Table 5. Multiple regression results for digital tools

Predictor	B	SE	β	t	p
Attitudes towards using DT for teaching	0.53	0.16	0.44	3.25	0.002

Note: Constant = 1.026, $F(3.592) = 10.533, p < 0.000, R^2 = 0.190$.

Online learning tools. Our final analysis aimed to establish the role of different dimensions of teacher educators' attitudes towards using DT as well as their self-reported proficiency in using online learning tools. Online learning tools refer to online tools that prepare learners for collaborative processes, such as co-construction and co-creation of resources and knowledge.

We calculated a multiple linear regression to predict self-reported proficiency in using online learning tools based on various dimensions of teacher educators' attitudes towards using DT. Using the stepwise method, two predictors entered the model. We found a significant regression equation ($F(4.734) = 13.809, p < 0.000$), with an R^2 of 0.235. We then discovered (see Table 6) that attitude towards using DT to support assessment and critical thinking significantly predicted self-reported proficiency in using online learning tools ($\beta = 485, p < 0.001$).

Table 6. Multiple regression results for online learning tools

Predictor	B	SE	β	t	p
Attitudes towards using DT to support assessment and critical thinking	0.41	0.11	0.49	3.72	0.001

Note: Constant = 1.674, $F(4.734) = 13.809, p < 0.000, R^2 = 0.235$.

8 DISCUSSION AND CONCLUSION

The main purpose of this study was to identify teacher educators' attitudes towards using DT in teaching and learning process and their self-reported proficiency in using digital tools. The study showed that teacher educators are inclined to use DT for teaching and, even more so, for personalised learning and teaching. Additionally, teacher educators expressed a neutral attitude towards using DT to support individual and collaborative student learning. However, the teacher educators were disinclined to use DT to support assessment and critical thinking in educational processes. Considering that the DigCompEdu model identifies all of these areas of attitude as important for the integration of digital technology into education [18], it is important to continuously develop and reinforce teacher educators' positive attitudes in all of these areas.

The results revealed that the teacher educators, on average, considered themselves as basic-level users of communication tools and digital resources. However, their self-reported proficiency in digital tools and online learning tools was low, showing that the teacher educators considered themselves to be basic-level users or even less: they are familiar with the tools but do not use them.

We also wanted to determine whether and how teacher educators' attitudes towards using DT in the teaching and learning process predict self-reported proficiency in using digital tools. The results showed that attitudes towards using DT for teaching significantly predict self-reported proficiency in using communication tools and digital tools. Furthermore, attitude towards using DT for personalised learning and teaching significantly predicted their self-reported proficiency in using digital resources. Attitudes towards using DT for supporting collaborative learning negatively predicted self-reported proficiency in using digital resources. Attitudes towards using DT to support assessment and critical thinking positively predict self-reported proficiency in using digital resources and online learning tools.

The results confirmed the importance of teacher educators' attitudes towards using DT for teaching and learning and for their self-reported proficiency in using different types of DT [7, 8]. Nevertheless, the relationship between an attitude and the use of digital technology does not go in only one direction; it is reciprocal: attitude predicts the use of digital technology and experience level shapes an attitude.

The analysis results revealed that the teacher educators reported themselves to be more proficient in using DTs that do not demand an advanced level of competence (using already prepared materials, i.e., communication tools and various webpages containing content of interest, audio and video material—digital resources). On the contrary, they reported a lower level of proficiency in using DT, which included the co-construction and co-creation of teaching and learning materials (i.e., online learning tools and digital tools).

These results were further supported by the fact that the teacher educators had less favourable attitudes towards the use of DT, which demands an advanced level of proficiency. Therefore, for future research, it is important to address the relationship between attitude and proficiency level for using DT regarding their mutual influence. Nonetheless, to effectively implement DT in teacher education, it is essential to provide teacher educators continuous professional development and various possibilities to be engaged in developing, implementing, testing and evaluating digital technology.

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11 AUTHORS

Sonja Čotar Konrad is Associate Professor of Educational and Developmental Psychology at the University of Primorska, Faculty of Education, Cankarjeva 5, 6000, Koper. She is a member of the professional group for implementing ICT in education, appointed by the Slovenian Ministry of Education, Science and Sports and she is a member of several professional committees on introducing digital technologies in schools (e-mail: sonja.cotarkonrad@pef.upr.si).

Tina Štemberger is Associate Professor of Educational Research at the University of Primorska, Faculty of Education, Cankarjeva 5, 6000, Koper. She is the Vice-dean for Research and Doctoral Studies and Vice-rector of the University of Primorska. The focus of her research is initial teacher education (e-mail: tina.stemberger@upr.si).