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DIGITAL TEACHER COMPETENCE DIMENSIONS: EXPERIENCES OF NORWEGIAN PRESERVICE TEACHERS

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Abstract:
Most Norwegian preservice teachers are required to perform assignments relating to digital competence during their education. In this article, one such mandatory student assignment is used to explore students' interpretations of digital teacher competence. In a study programme for future primary and lower secondary school teachers, second-year social studies students were required to develop digital teaching arrangements, apply these arrangements during their teaching practice, and finally share their experiences with their peers in online presentations. In the present study, these student presentations are used to examine how future teachers understand digital teacher competence, and a model consisting of five digital teacher dimensions is suggested. This way, the article aims to provide students and teacher educators with a conceptualisation of digital teacher competence.

Keywords: teacher education, student practice, digital teacher competence, social studies

1. Introduction

Teacher education is complex and usually covers a range of different subjects. Due to the general increase in the use of digital tools in schools, digital competence has become increasingly important in teacher education. Teacher educators aim to develop the professionalism of future teachers in their use of digital tools. This kind of professionalism has different names. Among the most common designations are 'professional digital competence', 'digital teacher literacy' and 'digital teacher competence' (Aagaard & Lund, 2020; Almås et al., 2021; Almås & Krumsvik, 2007; Barton & Haydn, 2006; Bennett et al., 2008; Blikstad-Balas, 2012; Falloon, 2020 Krumsvik, 2014; Knobel & Lankshear, 2006; Potyrała & Tomczyk, 2021; Røkenes & Krumsvik, 2014; Tomczyk, 2020; Tomczyk & Fedeli, 2022; Tour et al., 2021; Wastiau et al., 2013). In this article, we will use the designation 'digital teacher competence'.

Preservice teachers often have limited opportunities to use digital tools in realistic classroom settings during their student years. Not only can it be challenging to find time

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for testing various digital tools within a hectic schedule, but it can be even more challenging to find opportunities for the students to explore tools within the *specific subjects* that each preservice teacher chooses as primary subjects. Nevertheless, since the use of digital tools has become an essential part of the repertoire for teachers, it is valuable to understand the challenges and opportunities that preservice teachers face when they explore the use of digital tools in schools. In this case study, we examine how a group of Norwegian preservice teachers presented their experiences with digital tools after having had the opportunity to test different tools during their teaching practice. The digital competence was framed as part of social studies in their teacher education, but the students applied digital tools in a variety of subjects during their second-year teaching practice.

2. Generic and subject-specific digital teacher competence

In the context of teacher education, some argue that it is necessary to distinguish between *generic* digital teacher competence on the one hand and *subject-related* digital teacher competence on the other. As Lund et al. (2014) put it:

> (…) teacher education (…) needs to *focus on the aspects of digital technologies that are generic to the teaching profession* (…): how they are linked to fundamental assumptions about learning and teaching, how they have epistemological consequences, and how they might disrupt existing practices. Of equal importance, though, is that teacher education also must be *sensitive to the more specific disciplinary procedures and features characterising each school subject*. When these two dimensions are combined and used to design and enact learning activities, we arrive at a truly integrated approach to professional digital competence, where the scientific disciplines, the professional disciplines (pedagogy and subject didactics), and practices add up to a coherent whole. (Lund et al., 2014, p. 293, emphases in original)

This means that, in principle, the digital competence requirements of future teachers are quite extensive. Not only are they required to learn to use different digital tools, but they are also required to develop an understanding of which digital tools to use in different school subjects. As Lund et al. (2014) emphasise, if we want the digital competence of future teachers to add up to a coherent whole, digital competence must be approached both from the perspective of generic and subject-specific digital teacher competence. The question, then, is what the specific challenges and opportunities are from the perspective of digital didactics in the different subjects in teacher education.

As noted in Section 3 below, the preservice teachers in this study received digital training within the teacher education subject of social studies. Social studies as a subject in Norwegian schools and Norwegian teacher education has developed significantly over time, but currently, the curriculum is characterised by an amalgamation of three perspectives: Geography, history and social sciences (Norwegian Directorate for Education and Training, 2019). Within the social sciences strand of social studies, the main emphasis is on subjects such as political science, sociology and social anthropology, including topics related to democratic citizenship, migration and diversity in societies. In

addition, the curriculum contains topics within subjects that are adjacent to the social sciences, such as law (especially human rights), personal finance and psychology. The multifaceted disciplinary composition of social studies entails that it is notoriously challenging for teacher educators to perform high-quality professional and disciplinary assessments of students' work. This also applies to the use of digital tools during teacher education. In addition, from the students' perspective, the broad scope of the subject of social studies means that it can be difficult for the preservice teacher to grasp what it means that digital competence is specific to the subject area of social studies. When the subject matter ranges from natural geography to early history and further to general social science topics such as democracy and social identity, it can be challenging for students to detect the digital teacher competence specific to social studies.

3. A mandatory digital preservice teacher assignment

The student presentations examined in this article were held in April 2021 by two different classes of second-year preservice teachers at a Norwegian university. Due to the covid19 pandemic, their experiences were presented in Zoom and not in physical auditoriums. The presentations were mandatory within the teacher education subject of social studies. A couple of weeks before the mandatory student presentations, the students had had a lecture on the use of digital tools in social studies. Also, before the presentations, the students had had the opportunity to test their digital teaching arrangements in a practical classroom setting during their three-week teaching practice. Thus, in summary, the students' schedule in acquiring digital teacher competence was as follows:

a) Various forms of digital software were presented to students in a lecture by a teacher educator in social studies.
b) The digital tools were applied by groups comprising 1-4 students during their three weeks of teaching practice.
c) The groups from the teaching practice presented their experiences to peers and a social studies teacher educator in Zoom.

Regarding a, it should be noted that although students were presented with a wide range of digital tools in the university lecture (cf a in the list above), particular emphasis was given to Kahoot and Mentimeter. The reasoning behind this particular emphasis was primarily pragmatic. Kahoot (Kohnke & Moorhouse, 2021) is a digital tool developed in Norway, and thus, Norwegian teachers are familiar with it. Correspondingly, Mentimeter (Little, 2016; Mayhew, 2019; Skoyles & Bloxsidge, 2017) was developed in Sweden, a neighbouring country of Norway, and is also a well-known digital tool in Norwegian universities and colleges. In the case of the student groups examined in this article, they had access to Mentimeter via a general license held by their university.

The lecture given to students on digital tools (cf a in the list above) and the student presentations (cf c in the list above) were arranged within the teacher education subject of social studies. That is also why social studies is listed as a column for each student class in tables 1 and 2 below; since the students had received a lecture on various digital tools

from the perspective of social studies (cf a in the list above), it was relevant to observe, during the student presentations, whether or not each of the groups had applied their teaching arrangements in the school subject of social studies during their three weeks of teaching practice.

4. The student presentations

The first class comprised primary school preservice teachers in their second year. These students were enrolled on an integrated five-year teacher education programme where they specialise in teaching pupils in grades 1-7 (age range approximately 6-13). Student groups of various sizes, identical to those that had had their three-week teaching practice together, held Zoom presentations about the experiences of using digital tools during teaching practice. Below is an overview of the groups, listing the number of students in each group. The sex of the students is defined according to the common sex identification of the forenames of the students. As shown in the table, all groups except one applied their teaching arrangements within the school subject of social studies. The 'grade' column indicates the grade of the pupils in the class where the preservice teachers applied their digital arrangements. For one of the groups (group 4), information about the grade of their practice pupils was missed during the data gathering.

Table 1: Student class 1 (primary school preservice teachers – 27 women, 6 men)

Group	Students	Social studies	Grade	Software
1	Four women	Yes	6	PowerPoint, Google Classroom
2	Three women, one man	Yes	4	Video, PowerPoint
3	Three women, one man	Yes	3	Video, internet
4	Three women	No	N/A	Web page quiz, videos
5	Three women	Yes	3	Google Classroom, Kahoot
6	One woman, two men	No	5	Web pages, Kahoot
7	Three women, one man	Yes	2	Web pages, Mentimeter
8	Three women	Yes	7	Mentimeter
9	One woman, one man	Yes	6	Mentimeter, web pages, Kahoot
10	Three women	Yes	5	Mentimeter, Web pages

The second class comprised lower secondary school preservice teachers in their second year. In the same way as the primary school preservice teachers, the lower secondary school preservice teachers were enrolled on an integrated five-year teacher education programme. Their programme specialty was teaching pupils in grades 5-10 (age range approximately 11-16). The presentations were made by groups identical to the groups that had had their three-week teaching practice together. Below is an overview of the groups, listing the number of students in each group. The sex of the students is listed according to the common sex identification of the forenames of the students. As shown in the table, all groups except four groups applied their digital teaching arrangements within the subject of social studies. The 'grade' column indicates the grade of the pupils in the class where the preservice teachers applied their digital arrangements. For one of

the groups (group 3), information about the grade of their practice pupils was missed during the data gathering.

Table 2: Student class 2 (lower secondary school preservice teachers – 20 women, 11 men)

Group	Students	Social studies	Grade	Software
1	Two women, two men	Yes	9	Mentimeter, Kahoot, Web pages
2	Two women	Yes	5	Video, Kahoot
3	One woman, one man	No	N/A	Web pages
4	One woman	Yes	8	PowerPoint, Mentimeter, Padlet
5	Three women, one man	No	9	Web pages
6	Three men	No	8	Podcast production
7	One woman, one man	Yes	7	Mentimeter
8	Three women	Yes	9	Padlet
9	Two women	Yes	7	Mentimeter
10	Two men	Yes	10	Mentimeter, Kahoot, web pages
11	Two women	No	9	Video, Google Slides, Google Classroom
12	One woman	Yes	6	Kahoot, video
13	One woman	Yes	6	Mentimeter, Padlet, web pages
14	One woman, one man	Yes	7	Geoguessr, Socrative

5. Dimensions of digital competence

Within the university of these two classes of teacher students, the notion of digital teacher competence had not been thoroughly conceptualised prior to the teaching practice and the examined student presentations. As we can conclude from the variety of the digital tools used by the students (cf tables 1 and 2 above), there was a substantial degree of confusion among the students relating to the delimitations of the notion of 'digital teacher competence'. Although all the students in question passed the mandatory presentation of their experiences using digital tools in schools, it became apparent during the presentations that the students had acquired quite different *forms* of digital competence. The presentations showed that digital teacher competence in Norwegian teacher education is not an easily identifiable category but rather a conglomeration of competencies. Thus, providing preservice teachers with digital teacher competence is a conceptually complex task. However, the student presentations examined in this article allowed us to identify a set of digital competence dimensions. These dimensions are depicted in Figure 1 and are detailed further below.

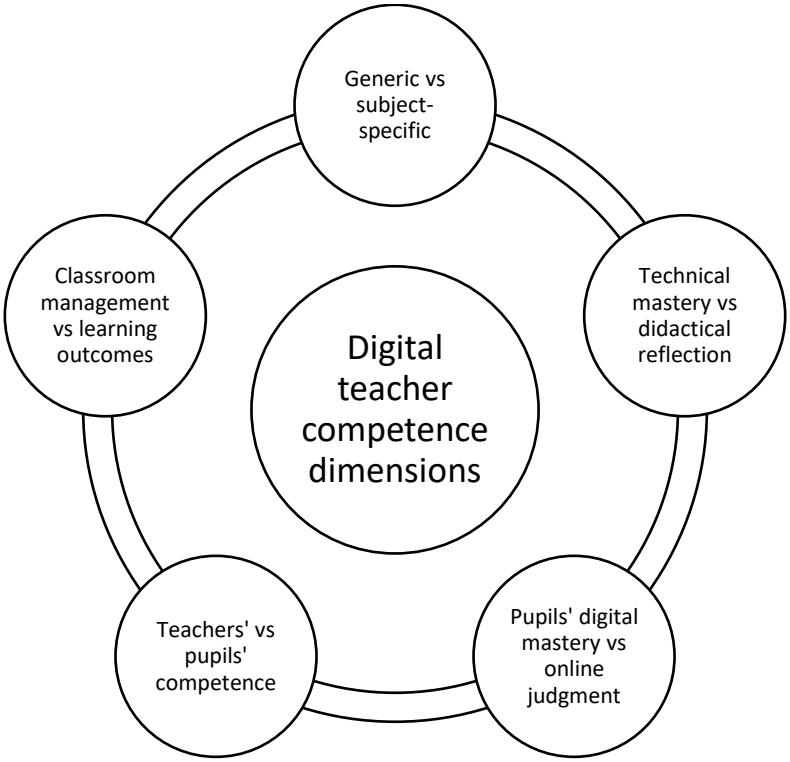

Figure 1: Digital teacher competence dimensions

a. Generic versus subject-specific digital teacher competence

As we saw in the introduction, an ambitious approach to digital teacher competence is to view it as both a generic and a subject-specific form of competence. From this ambitious perspective, the teacher can only be regarded as digitally competent if he or she can make an informed judgment of which digital tools to use in which subjects.

We can conclude from the student presentations examined in the present article that virtually none of the student groups were able to provide reflections on the subject-specific use of digital tools. The students experienced digital competence primarily as a *generic* competence that they might want to use in their future work as teachers within a *range* of subjects. There are probably different reasons for this. First, the students are faced with so many other tasks and assignments during their studies that they are lucky if they can learn a few digital tools satisfactorily. Moreover, during the teaching practice, where they have the opportunity of testing their digital teaching arrangements, they are forced to make various pragmatic choices. For example, although a preservice teacher's primary subject at university might be social studies, her teaching the school subject of social studies during teaching practice might not fit into the schedule of her practice school. Furthermore, the practice school might not have access to the technical tools necessary for her to find out what works and what does not work within the specific subject of social studies. Ideally, preservice teachers should develop a technical repertoire sufficient to make their own reflections relating to subject-specific uses of digital tools. But presumably, at least in the Norwegian case, that reflective level will not be attainable for preservice teachers unless teacher education programmes start including discussions

about the relationship between generic and subject-specific digital teacher competence in the curriculums of preservice teachers.

b. Digital tools for classroom management versus learning

While digital tools can be used to enhance the pupils' learning, the student presentations in our study reminded us that digital tools can also be used as a more practical tool for classroom management. For example, a digital quiz competition's instrumental and quantitative nature might serve as a motivation factor for some pupils. If a pupil knows that the lesson will be finalised by a Kahoot (quiz), this can increase motivation. One of the student groups in this study noticed this motivation mechanism in their class. Group 5 in student class 1 concluded that the most successful lesson that they had in a class in the 5th grade (age 10-11) with 18 pupils was a lesson where they early on had informed the pupils that a Kahoot (quiz) would be arranged towards the end:

> In the third lesson, we allowed the pupils a lot of freedom to explore [on a defined resource web page for schools], but in this lesson, we also informed the pupils from the start that there would be a Kahoot quiz towards the end of the class. [We told them about this] to encourage them to work independently. And that worked very well; this was probably the best lesson in terms of learning. ("Martin", primary school preservice teacher, group 6)

Without stating so explicitly, this group also seems to have experienced that the noise level in the class declined from the second to the third lesson. The only difference between the teaching strategies in these two lessons was that in the third lesson, the pupils had been informed that there would be a Kahoot (quiz) towards the end of the lesson. By using this digital tool as a motivational factor, the group had seemingly been able to reduce the noise level in the class and enhance the overall learning outcomes of the pupils. Thus, the digital tool was not only valuable as a learning instrument but also increased the level of learning indirectly by improving the classroom environment.

c. Digital teacher competence as technical repertoire versus reflective competence

In a practical setting, teachers must decide which strategies they should use to reach specific goals, for example, to obtain a productive class environment or to facilitate a high amount of learning. Thus, a pertinent question in the digital training of teacher students is whether teacher educators should request the students to use *the digital tool that works* for each student in terms of classroom management or learning outcome, i.e., to focus on *reflective competence*, or whether the teacher educators should encourage the students to *experiment with specific digital tools* regardless of the pupils' possible learning outcomes, i.e. to purposefully increase the students' *technical repertoire*. There is a trade-off between these two in that time allotted to familiarising oneself with a technical tool cannot also be used to reflect on the learning outcomes. The essential question is how much time preservice teachers should spend acquiring technical knowledge about specific digital tools before considering this tool a part of their active digital teaching repertoire. After all, it is only after the teacher has acquired a significant mastery of a digital teaching tool that the teacher can also critically scrutinise the learning that this tool is likely to provide.

One student's experience with Mentimeter can serve as an illustration of this trade-off between technical mastery and didactical reflection:

> Mentimeter worked very well in the sense that I received a lot of responses. Those pupils who were not usually active in class also participated. I knew this because Mentimeter gave me an overview of the number of responses. The anonymity of the responses worked well, but also, in a way, it did not work so well. It worked well in the sense that the pupils dared to answer. Many in that class did not usually dare to raise their hands in the fear that they would say something wrong, or (…) well; they had a bit of that attitude to it. But now it was anonymous, so the pupils did not think about this issue, and then they could just write whatever they thought was the correct answer. Also, I received information about what the pupils had learnt, in the sense that Mentimeter was used to summarise the presentation and the video clips that the pupils had seen earlier. This means that I got information on which knowledge the pupils had acquired from what they had seen and heard in the presentations. But on the other hand, the anonymity was a problem because I received many comments that were just jokes on the different slides. And when [Mentimeter] was in slide show mode, I could not find out how I could delete comments in clouds or the comment slides. So, well, I don't know whether this was because I had not spent enough time finding out these things or (…) because it was the first time I used it. But in any case, I did not find out, when I was in front of the pupils, how I was supposed to delete [those comments] while it was in slide show mode. I don't know if that is possible or not. ("Heidi", lower secondary school preservice teacher, group 4)

As shown in this quote, "Heidi" would have needed more practical experience with the specific digital tool in question before she could assess how productive the tool might be in enhancing learning in particular subjects or topics. This is a dilemma in teacher education where time is limited: Should the focus in digital competence be on technical mastery of selected learning software, or should it be on how to use this software in the practical teaching situation? How much software experience is enough to make informed didactical decisions in general or within specific subjects such as social studies?

In a time-limited education, this will inevitably be a question of balance. On the one hand, students will have to acquire a specific repertoire in digital competence. Still, on the other hand, they will have to use some of their time as students to reflect on which digital tools are productive in which classroom situations and in which subjects. Also, it is a balance that teacher educators are forced to reflect upon: They will have to balance the requirements of *technical mastery* within a core of selected digital tools with the needs of *didactical reflections* related to using those digital tools.

d. Digital teacher competence versus digital pupil competence

Another dimension that teacher educators should be aware of is the relationship between the *teachers'* digital competence on the one hand and *pupils'* digital competence on the other. During the student presentations within the present study, it became clear that many of the students did not only think of digital teacher competence as *their own* competence but also their competence in teaching pupils about the *pupils'* use of digital tools. Most notably, this was the case with competencies related to presentation skills and making podcasts or films. As one student explained:

> We had a pupil assignment about current [political and military] conflicts. We were in a school where it had already been decided what we were supposed to teach, so we tried to adapt so that our own [digital] assignment could fit into this [the teaching plan at their school]. We were in a class in the 10th grade, and they had learnt about topical conflicts and used teaching arrangements from the United Nations [web pages]. And now they were going to have an assignment (…) they were going to investigate a conflict of their own choice after 1990. And the learning objective we worked with (…) was to discuss the causes and effects of critical international conflicts during the 1990s and the 2000s. We started the first lesson with Mentimeter, where the pupils wrote down the conflicts they knew about so that we got these on the board. Then we presented the assignment to the pupils in a PowerPoint presentation. And then, the pupils started their work in groups of two or three pupils. This lasted for three weeks, and after two weeks, they were to submit a podcast or a movie with a length of 5 minutes. In addition, they were required to submit two Kahoot questions [relating to their own podcast or movie] that we would use during the third week. We were going to have a competition between the groups, where they would all have seen each others' podcasts or movies. ("Gustav", lower secondary school preservice teacher, group 10)

What this example shows is that digital teacher competence was in part interpreted by these students as how to make pupils more digitally proficient. A substantial portion of the learning experience of the pupils was related to their technical production of a podcast or a movie.

Another group (group 1 from the primary school teacher students) explained that they asked their pupils to work in pairs, and each team of pupils was asked to make a PowerPoint presentation of a European country. The student group explained that one of the main objectives was that the pupils should develop their ability to think critically about the sources where they found information about the respective European countries. This is also an example of an interpretation of digital competence where it is the *pupils* who are required to develop different kinds of digital competence. In this case, digital pupil competence was defined by the ability to make digital presentations as well as the ability to think critically about digital sources of information.

e. The pupils' technical digital competence versus the pupils' online judgment

In the current learning objectives in Norwegian primary and lower secondary education, life mastery has become an important topic, which also applies to the current social studies curriculum. Moreover, in the case of life mastery, the digital aspect is quite important. As stated in the current social studies curriculum, pupils must "*demonstrate good judgment when choosing digital information, using digital resources and communicating online*" (Norwegian Directorate for Education and Training, 2019, p. 6). It is a general goal of the curriculum in social studies that pupils should know what it means to engage in safe online communication. This online judgment among the pupils is a type of competence that differs from the pupils' *instrumental* form of digital competence, for example, instrumental competence in producing pupil podcasts or PowerPoint presentations.

As a case in point, one of the student groups informed that they had had a particular focus on digital judgment among their pupils. One of the reasons they decided to focus on this was that there was not so much they could do in terms of practical digital

teaching in their practice because of the lack of satisfactory equipment. They explained together:

> There was very little we could do. They [the school] had four or five computers that the pupils could share in the classroom, but the computers were very slow, and thus, we could not use them in our practice. What we had was a smartboard that we used in our teaching, and we used this for PowerPoint and for showing videos. ("Marit", primary school preservice teacher, group 1)

> (…) We thought that since we did not have much access to digital tools, we could focus our teaching on digital judgment. We asked them which digital social habits the pupils had at home and how they behaved on the internet at home and privately. (…) And we showed them some movies that we found on the web pages of Save the Children Norway. These videos were a kind of dialogue starters. One of the videos was on how people sometimes present themselves as someone else online. The video discussed what the children should do in this case, who they could contact and who they should talk to if they experienced something uncomfortable. We showed them different movies and asked the pupils about their opinions and attitudes. ("Solveig", primary school preservice teacher, group 1)

> (…) In the next lesson, we had a PowerPoint presentation where we talked more about digital judgment. I started with a video, then I had the PowerPoint presentation, and then we asked the pupils which rules they should apply online. I wrote down their suggestions in the PowerPoint presentation, and then we compared them with the recommendations of Save the Children Norway for online behaviour. ("Jonas", primary school preservice teacher, group 1)

This group's decision to focus on online behaviour and digital judgment was, by and large, a result of the lack of computers in their practice school. However, it was beyond doubt that the students in the group viewed supervision in digital judgment as a natural part of their digital teacher competence. Not only did they use digital tools such as videos and PowerPoint presentations, but they also encouraged the pupils to take part in active discussions about online safety. Thus, while the pupils' digital competence can be related to the instrumental uses of digital tools, as we saw in Section d above, the pupils' digital competence can also be interpreted as how competent the pupils are in managing their online safety. This digital competence dimension applies to pupils and not teachers, and thus, strictly speaking, it does not fit into a model of digital *teacher* competence. Nevertheless, cognisance of this dimension might be helpful for preservice teachers and teacher educators alike.

6. Conclusion

Digital teacher competence has a range of dimensions that teacher educators should consider when designing courses for future teachers. This article has pinpointed five such dimensions that teacher programme planners and teacher educators should be aware of: Generic versus subject-specific digital teacher competence; digital tools for classroom management versus learning; technical mastery versus reflective digital competence; the

digital competence of teachers versus the digital competence of pupils; and pupils' instrumental digital competence versus pupils' online judgment.

Teacher educators are forced to prioritise between these different dimensions and the different forms of digital competence they represent. Having a proper conceptualisation of digital teacher competence, then, is a prerequisite for educating teachers that are digitally competent in social studies and beyond. Accordingly, one important aim of future research will be to hone the concepts of digital teacher competence further.

Conflict of Interest Statement

The author declares no conflicts of interest.

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