Norwegian Professional Digital Competence and Danish Technology Comprehension in Teacher Education – Two Peas in a Pod?

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Abstract

Norwegian and Danish policy and development regarding digital competence and digital technology have historically had a similar focus on the implementation of digital competence in the educational sector and specifically in teacher education (TE) . Both countries have managed to give schools extensive access to technology and internet and put it high on the political agenda . In recent years, Norway and Denmark have introduced new concepts that differ but share the objective of preparing students for an ever-changing future. In Norway, the concept of *teachers' professional digital competence* has been introduced in teacher education while in Denmark, the concept of *technology comprehension* has been introduced both in teacher education and in schools*.* The question remains how these two concepts compare when broken down and how the findings compare to other international and European frameworks and research. The study shows that these Scandinavian perspectives have a strong element of digital *Bildung*, suggesting an orientation towards ontological ambitions related to digital technology. This Scandinavian take on digital competence could be relevant for researchers and policymakers outside Scandinavia.

Background

Norway and Denmark are two Scandinavian countries with very similar educational systems as well as similarities in teacher education (TE)[1] (Elstad, 2020). Both systems are rooted in socio-democratic values (Erstad et al., 2021) with shared pedagogical values, often referred to as the Nordic model (Olofsson et al., 2021). Norway and Denmark have been, and still are, at the forefront of using and implementing digital technology in schools and boast widespread access to digital technologies (Erstad et al., 2021) and similar national digitalization strategies (Olofsson et al., 2021; Tømte et al., 2019). These strategies have focused on access to technology in schools and policy implementation of digital competence, digital skills,

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[1] In this context, TE is teacher education for primary and lower secondary schools.

and related concepts (Olofsson et al., 2021) with a somewhat stronger top-down political steering in Denmark (Tømte et al., 2019). Godhe (2019) found a stronger emphasis on societal issues and a critical and ethical approach in relation to digital competence[2] in the Scandinavian countries, including Norway and Denmark, compared to other countries. This can be related to a long and shared tradition of viewing education as a crucial part of the formation of civic society and democracy, particularly framed in the concept of Bildung [dannelse] (Ottesen et al., 2013).

Over the years, both Norway and Denmark have increased the frequency with which they launch new policies and strategies (Elstad, 2020; Lisborg et al., 2021) and perspectives have changed from understanding digital competence as mostly technological skills to applying more complex concepts including more dimensions, such as competence, Bildung, teacher identity, and a perspective on technology in a digitalized society (Olofsson et al., 2021). Also, Norway and Denmark are the only two Scandinavian countries that have national guidelines for digital competence in TE; "obligations" for TE in Sweden and Finland in this area are "less explicit" (Olofsson et al., 2021).

The aim of this chapter is to shed light on how the national guiding documents for TE in Norway and Denmark differ in their conceptualization of digital competence. In doing do, it provides insight into ways to further develop policy, practice, and research that is internationally relevant to the field of digital competences.

Introducing Danish and Norwegian TE

Teacher education in Norway and Denmark is rather similar in terms of structure and content; however, it is relevant to note that Denmark has a Bachelor of Education (B.Ed.) (240 ECTS) for teaching in primary and lower secondary schools at levels 1–6 or 4–10 while Norway switched to a five-year integrated master's program (300 ECTS) for teaching at either levels 1-7 or 5-10 in 2017 (Elstad, 2020). The difference in program length is not believed to affect this study, which looks at the conceptualization of digital competence and not the content of the educational programs.

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[2] I use the term digital competence to refer to both the Norwegian PDC and the Danish TC.

Methodology

In the analysis, an abductive approach was applied to making sense of the data by exploring and developing different categories in the search for patterns to give new meaning to the data (Thompson, 2022). First, I developed initial categories inspired by Technology Pedagogy Content Knowledge model (T-PACK) (Mishra & Koehler, 2006), which stems from educational sciences, and DigCompEdu (Redecker, 2017), which represents a policy effort. In the process, I redefined them, added new categories from the data, and iterated different codes in several rounds of coding. I initially identified codes such as pedagogy, technology as tool, teacher professional identity, assessment, empowering learners, and learner competences. However, through the iterative process of coding the data and trying out other codes inspired by existing research, it became apparent that there were elements in the documents that were not captured by these codes. Through further iterations, the following final categories were generated and used to code the data: assessment, creative use, empowerment, societal perspectives, digital Bildung, pedagogy vs. technology as a tool, technology as a subject, professional identity, and teacher and student roles. These categories are used to structure the presentation of the findings.

Documents included in the study

The Norwegian and Danish documents shown in table 1 represent the main data in this study. Their background and content are explained in the following.

Data included in the study	
Norway	Kelentrić, M., Helland, K. & Arstorp, A-T., (2017). *Professional Digital Competence Framework for Teachers in Norway,* Centre for ICT in Education.[3]
Denmark	Rehder, M. et al., (2019). *Teknologiforståelse og digital dannelse – undervisningsvejledning til et nyt modul på læreruddannelsen* [Technology comprehension and digital Bildung—a teaching guide to a new module in teacher education], University College Copenhagen.

Table 1 shows the data included in the study.

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[3] In the interest of full disclosure, I must acknowledge that I was one of the authors of the Norwegian PDC framework. However, this is not likely to have had any impact on the analysis other than potentially adding insight.

Framework for professional digital competence in Norwegian TE

Background

The 2006 Knowledge Promotion reform in Norway included digital skills as one of five equally important basic skills: oral skills, reading skills, writing skills, numeric skills, and digital skills (Norwegian Ministry of Education and Research, 2006; Tømte et al., 2019). This reform was followed by the digitalization strategy for higher education 2017–2021 (Danish Ministry of Children and Education, 2018) and a national framework for teachers' professional digital competence (PDC) (Kelentrić et al., 2017). *Digital skills* relate to students in primary and secondary schools whereas *professional digital competence* refers to the competence of teachers (Olofsson et al., 2021).

The framework

To date, the only national document explicating what PDC is in TE is the Norwegian framework for PDC (Kelentrić et al., 2017). It was written as a guiding document to address a need for defining and conceptualizing teachers' digital competence specifically for TE. The framework has since gained the status of policy document as the ministry has based several initiatives on its implementation. It was developed by the Centre for ICT in Education, a national center under the direction of the Norwegian Ministry of Education, and was subject to input from Norwegian TE in the process. At the center of the framework structure is the teacher, which puts more focus on teachers' competences than on the technology itself (Kelentrić et al., 2017) as suggested by previous research (Johannesen et al., 2014). The 11-page framework contains an introduction, a description of seven content areas (each containing an introduction and about eight learning outcomes). The content areas are *Subjects and skills, School in society, Ethics, Pedagogy and subject didactics, Leadership of learning processes, Interaction and communication,* and *Change and development.*

Technology comprehension in Danish TE

Background

Following the launch of the Partnership for 21st Century Learning in 2002 (Bertelsen, 2016; P21 Partnership for 21st Century Learning, n.d.), there was a shift in Denmark towards viewing students as active learners, critical thinkers, and producers (Selander, 2008). In 2019, *technology comprehension* (TC) was launched as a pilot subject in schools and TE (Danish Ministry of Children and Education, 2018). TC is oriented towards competences needed for the future such as agency [handleevne] and understanding/comprehension of technology [forståelse] but also empowerment [myndiggørelse] and Bildung [dannelse] (Rehder et al., 2019). These perspectives are connected to the history of educational

design in Denmark, which includes *didactical designs for learning* and now *design comprehension* [designforståelse] incorporated in TC (Smith et al., 2015). At the present time, the test period for TC in schools has ended, and it is still undecided what role technology comprehension will play.

The teaching guide

There is one document addressing TC in TE, which is analyzed in this study (Rehder et al., 2019). This document is a teaching guide [undervisningsvejledning] on TC. It was commissioned by the Danish Ministry of Education and Research and developed by key people from the field of Danish TE, giving it a mixed status of teaching guide and policy document. The document is intended as a guiding document for teaching TC in TE and thus contains practical examples (including of formal elements, learning outcomes, teaching methods, suggested activities, and literature). But apart from this, it divides the concept of TC into four areas: "empowerment and Bildung in a digitalized society, technology comprehension", "computational thinking; and digital design" (Lisborg et al., 2021, p. 56), and complex problem-solving (Rehder et al., 2019). Each of these areas is broken down into learning objectives, as in the Norwegian framework. I have excluded the practical examples, suggested activities, and literature from the data, totaling 79 excluded pages. The resulting abbreviated version of the document (11 pages) left me with a conceptualization of TC, including learning outcomes. In content, this makes the remaining text rather similar and comparable to the Norwegian document.

In the following, these two documents are analyzed and compared. Subsequently, they are contrasted with perspectives from outside Scandinavia in the discussion section.

Findings

The presentation of the study's findings is organized thematically (with themes closely linked to coding categories). Figure 1 displays the share (percentage) of each category out of the total number of excerpts from each document.
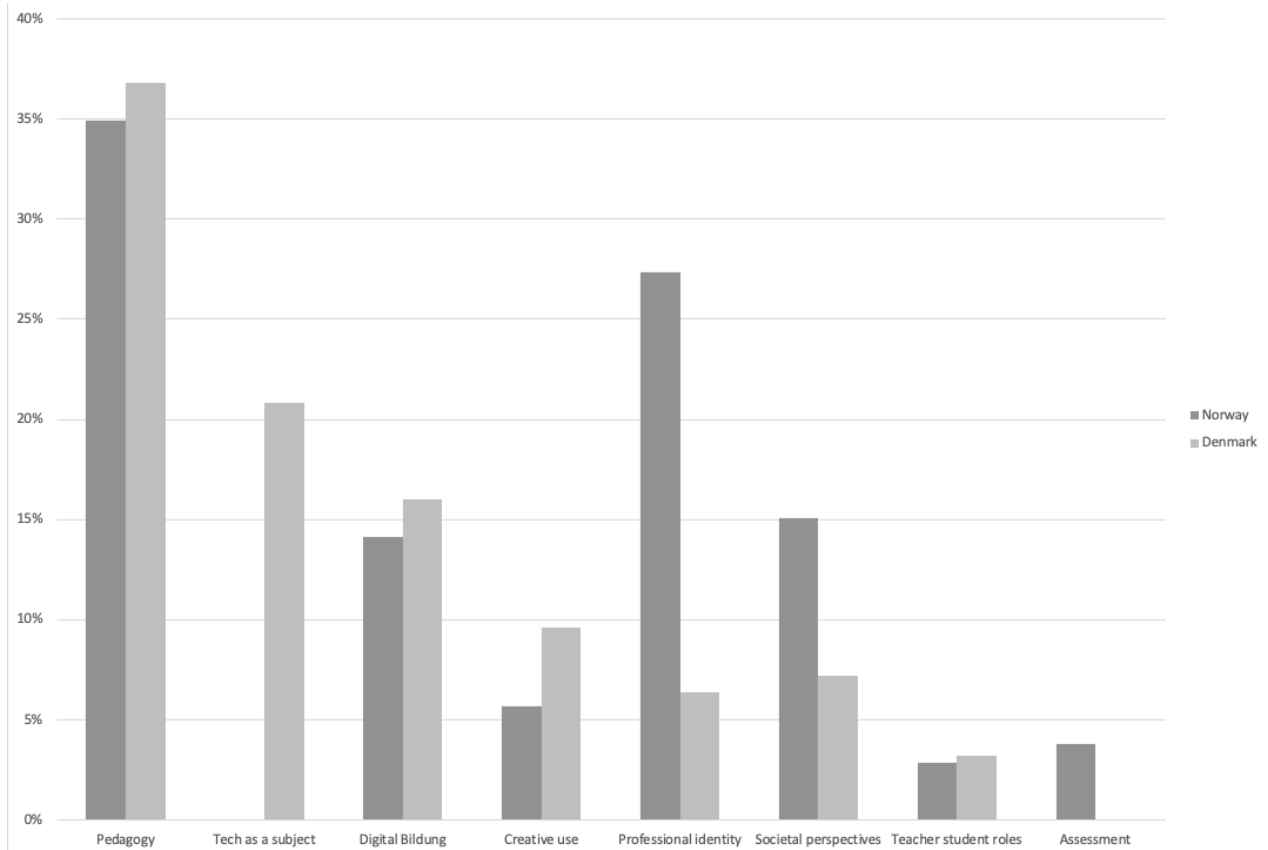

Figure 1 shows the share [percentage] of the different categories for each of the two countries.

Societal perspectives

Societal perspectives were applied in the coding when aspects of society and its development were related to digital technology. Different facets were identified and are presented here to show the breadth of the representations of the category.

Norway:

(1) **Dynamic PDC –** The technological development makes PDC "dynamic and complex" (p. 3), which will "become increasingly apparent at every level of the education system (…) creating new

challenges for teachers' working methods in pedagogical, didactic and administrative contexts"
(p. 1).

(2) **Global society** – Students are to become "active participants and contributors in a global, digital
and democratic society" (p. 5).

(3) **Labor market** – With students' digital Bildung, the teacher "ensures that they can participate in
tomorrow's labour market*"* (p. 5).

Denmark:

(1) **The big why** – A societal, discursive contextualization for TC, referred to as asking "the big why
[for using technology in schools]" (p. 6).

(2) **Citizenship in a global world** – Societal changes impact digital agency and empowerment
[myndiggørelse] and digital Bildung, requiring a critical approach "in a continually changing world"
(p. 30).

(3) **New pedagogy** – The digitalization of society has established "a need for different pedagogical
and didactical approaches" (p. 30).

These examples show how both countries consider it important to address societal and technological
changes and changes in the labor market because of the presumed impact of these factors on practices in
TE and schools. Both documents contain elements of how these changes impact teachers' work and their
pedagogy, but they differ in terms of how they envisage the concept of PDC: dynamic and changing
(Norway) or in terms of the "big why" question (Denmark). Both countries emphasize the importance of
addressing how students participate in a changing, global, and democratic world, and this resonates with
the Scandinavian Bildung tradition. Godhe also found this in Swedish, Finnish, Danish and Norwegian
policy: "...the terms [including digital competence] used in connection to students' digital literacy or
competence, are in the Nordic curricula conceptualized in a broad sense where societal issues and a
critical approach are emphasized... influenced by the notion of Bildung" (Godhe, 2019, p. 33).

Digital Bildung

Bildung [dannelse] has a strong and long tradition in the Scandinavian context. Gran (2018) describes
digital Bildung as an overriding cultural competence focused on students' identity and their ability to
reflect and to understand themselves and others in a digital context with an element of citizenship.

Norway:

(1) **Rules and regulations** – Teacher competence and knowledge on "legislation and ethical concerns" in connection with students being able to "exercise good judgement in a digital environment" (p. 6).

(2) **Digital identity** – Guiding students "in the development of their digital identity, and [creating] (…) responsible interaction in a digital environment" (p. 6) and engaging professionally and responsibly in digital interactions with colleagues and parents.

(3) **Critical and reflexive approach** – "The role of teaching includes fostering pupils who are capable of identifying credible information, quoting sources, protecting their intellectual property (…) and developing a reflective relationship in relation to their own and others' actions, cultural differences, values and rights" (p. 1).

Denmark:

In Denmark, digital Bildung is a substantial element of the subject, and included in the title *Technology comprehension and digital Bildung*, but it is nevertheless not explicitly conceptualized in the document. In 14 of 20 excerpts, it is mentioned as an add-on to other elements: "This is done by focusing on students developing technology comprehension and digital Bildung" (p. 30). However, it is possible to identify some patterns of what digital Bildung is:

(1) **Subject area** – Digital Bildung as a "subject area in primary education" (p. 7) and in TE.

(2) **Learning activities** – How different modes of participating in learning activities [deltagelsesformer] "can actively contribute to developing student Bildung, citizenship and empowerment [myndiggørelse]" (p. 9) and prepare "students to be critical-analytical" (p. 7) towards technology.

(3) **Critical consumer** – the "student has knowledge of data harvesting, data analysis (…) [and] ethical choices regarding data and tech giants use of data and privacy" (p. 10).

Both countries agree on the importance of critical reflexivity being part of digital Bildung in school. Norway explores this further by emphasizing the importance of good judgement and ethics (knowing rules and regulations) but also of developing awareness one's digital identity. Denmark also stresses how the right pedagogical approach, namely inviting students to participate actively in learning activities, is important for developing digital Bildung. These findings are supported by those of Godhe (2019) which characterize Nordic curricula as emphasizing societal issues and a critical and ethical approach. Altogether, the Norwegian examples reflect more overarching pedagogical issues, whereas the Danish document reflects more didactical and practice-oriented issues.

Preprint version of chapter: Arstorp, A-T. (in print). Norwegian Professional Digital Competence and Danish Technology Comprehension in Teacher Education – Two Peas in a Pod? I: Willersmark, S., Anders D. Olofsson & Lindberg, O. *Digitalization and Digital Competence in Educational Work: A Nordic Perspective from Policy to Practice*. Routledge

Professional identity

Professional identity is related to the nexus of technology, teachers' professionalism, professional identity, and professional development.

Norway:

> Professional development "of digital competence is a lifelong, dynamic, situational and flexible process" as the teacher "can independently develop their own professional digital competence further, and contribute to the development of pupils, schools, colleagues and teaching professions, in line with digital changes in society" (p. 10).

Denmark:

> Professional identity is limited to mentioning how teacher students gain "a fundamental knowledge of technology comprehension as a teacher professional content area [fagfelt]" (p. 5), without further elaboration.

The Norwegian document in particular puts emphasis on the teaching profession and teacher identity, including continued professional development and the obligation to contribute to the development of colleagues and the school. This can be explained by the fact that (1) the role of teacher is at the core of the framework (Kelentrić et al., 2017), and (2) professional development is institutionalized in Norway through the Competence for Quality for teachers (Ministry of Education and Research, 2015). The Danish document does not mention these elements, which can be explained by the fact that Denmark has focused more on conceptualizing digital competence and not yet to the same extent on the professional development of TC for teachers.

Remaining categories

The remaining categories are presented briefly with quotes in table 2 and commented below.

Category	Norway	Denmark
Pedagogy	"The teacher understands how the integration of digital resources into learning processes can help	The teacher develops students' technology comprehension and Bildung through their ability to "assess and apply explorative, creative

	to achieve competence aims in a subject and to address the five basic skills" (p. 4).	and critical-reflexive approaches to teaching and learning" (p. 8).
Creativity	Using technology to "create frames for developing the pupils' creativity, innovation, problem-solving skills algorithmic thinking, and entrepreneurship that they need in a globalized society, and a constantly changing labour market" (p. 5).	Knowing "design methods, such as field studies, ideation, prototyping, testing and reflection including theory on wicked problems" (p. 8) and being able to scaffold and guide design processes (p. 8).
Teacher and student roles	Teachers need to be able to "adapt their teaching role to different activities, and switch between the role of tutor, guide, participant and intermediary in a digital environment" (p. 8).	See example above on teacher scaffolding and supervising of the design processes.
Assessment	The teacher "can foster a desire to learn by clarifying learning objectives and using diverse forms of feedback and assessment for learning in a digital environment" (p. 7).	[NO CONTENT]
Technology as subject	[NO CONTENT]	Technology is the object of investigation, e.g., "behind every technology is a person who has chosen the data being processes by the computer. Working critically with this content area will contribute to the students' digital empowerment" (p. 57).

Table 2 showing examples from the remaining categories in both countries.

Table 2 exemplifies the similarities and differences that are also visible in figure 1. The category with the highest frequency for both countries is *pedagogy,* and their approach is in many ways similar. Creativity appears more frequently in the Danish document than the Norwegian one, which can be explained by it having a more explicit position on TC. Teacher and student roles are described similarly, as shown above. Assessment appears only in the Norwegian document, which can be explained by the existence of an

explicit Norwegian policy on "assessment for learning" [vurdering for læring] as an element throughout the educational system (Brevik & Blikstad-Balas, 2014), which is not found in Denmark.

Discussion and conclusion

In title of the chapter, I raise the question whether or not these two Scandinavian perspectives are two peas in a pod. As the following discussion and conclusion will show, there are both similarities and differences between them. The Norwegian document gives a clearer idea of the professional dimension of the teacher than the Danish one. This is primarily visible in the concept of teachers' *professional digital competence* (PDC). This accentuates a clearer attention to the professional development of teachers' digital competence in Norway, which is supported by quite extensive funding of teachers' in-service training to raise competence (Norwegian Ministry of Education and Research, 2015), including specifically developing PDC in TE (Norwegian Ministry of Education and Research, 2017). Denmark has devoted more attention to perspectives on technology itself, as evidenced by the name of the subject: *technology comprehension,* which refers to *understanding* technology and the changes it leads to*.* TC was tested as a subject in schools in 2018–2020 and subsequently incorporated as a module in Danish TE in 2022 (Andersen, 2021). The understanding of technology represented in TC is in itself quite different from the Norwegian PDC which supports the argument of two somewhat different approaches between the countries. The fact that the Danish document (while also having similarities to the Norwegian document) is a *teaching guide* also suggests a national effort more focused on how to teach the subject and less on what constitutes digital competence for individual teachers or on professional development. By comparison, the Norwegian approach emphasizes what makes a digitally competent teacher and how to develop students' digital skills, but without operationalizing how PDC can be implemented and taught in TE. This constitutes a major difference between the documents, possibly related to their different objectives as a teaching guide and a framework, respectively.

The category *Technology as subject* relates to technology itself being the object of study and was only found in the Danish document. This exemplifies the same difference between the documents as the one mentioned above. Norway has chosen to make digital skills a basic skill, hence making digital technology part of all subjects and potentially risking not addressing it at all. In 2019, Denmark chose to make TC a subject in schools and TE and was the first country in the world to do so (Danish Ministry of Children and Education, 2019). In addition, the subject of TC has a strong emphasis on design, creation, innovation, and problem-solving, while the Norwegian national core curriculum includes "the joy of creating, engagement and the urge to explore" as a core value in all subjects (Norwegian Directorate for Education and Training,

n.d.). Nonetheless, this leaves Norway with a somewhat unarticulated and unrealized potential to develop new pedagogical approaches to technology based on design, creation, innovation, and entrepreneurship, among other things.

Both documents refer to a globally changing world and how it impacts us in a variety of ways. They both include elements related to digital citizenship and the importance of having digital agency and being able to act in a global, online, and changing world. This is very visible in the Danish document's use of empowerment [myndiggørelse] as a central concept of TC. The Norwegian document has similar elements related to empowering students ("active participants and contributors in a global, digital and democratic society," p. 5). Also, the Danish document mentions "asking the big why" as a way of contextualizing TC and thereby explaining its importance, including why empowerment is important. Empowerment is an interesting concept related to being able to reflect upon one's participation in digital arenas and having an awareness of its consequences on one's wellbeing. A clearer articulation of the concept of empowerment is found in Mäkinen (2006), who describes it as an "increased control over life and coping skills" and claims that technology offers us the possibility to develop "new abilities and ways to participate and express themselves in a networked society (…) [which] can be called digital empowerment" (p. 381).

Digital citizenship and empowerment also appear, namely when the documents emphasize the importance of students becoming critical consumers and being able to participate actively in democratic and cultural online processes and reflect upon how this influences their wellbeing (Kelentrić et al., 2017). Such aspects suggest digital Bildung as a basic premise for schooling and for preparing students not only for further studies but also for life. And it extends beyond this when the documents address applying a critical and analytical perspective to communication technologies as well as creating and participating online with an awareness of the consequences that technology and its byproducts, like big data, can have for society and life in general. In the Danish document, empowerment is also about understanding the intentionality of technology to be able to think critically and make informed decisions (Rehder et al., 2019). This perspective is also found in the recent Norwegian curricular reform where "life skills" is a component of all subjects in primary and lower secondary schools (Norwegian Directorate for Education and Training, n.d.).

As mentioned previously, both documents are based on the premise, that it is important to address the societal, technological, and labor market changes impacting practices in TE and schools. This is addressed in a number of ways as preparing students for participating in a changing, global, and democratic world,

which can be seen as reflections of the traditional Bildung ideal. Aagaard (2021) refers to Bildung as an ideal "with the holistic question of what it means to become an educated person" (p. 43). However, the Bildung perspectives in the documents seem to go beyond this traditional ideal and to mirror the ontological turn within education. Representing a turn away from "the linear transmission of knowledge and the measurement of learning, the ontological turn shifts the focus back to a notion of education centred [sic] on being and becoming" (Taylor, 2016, p. 421). The implication of this ontological turn is a move away from a learning tradition that emphasizes epistemological aspects, such as how and what to teach. Moreover, the ontological turn suggests a move towards a posthumanist perspective that sees Bildung and technology as

> a lifelong task of realizing one's responsibility within an ecology of world relations, it occurs outside as well as inside formal education, in virtual as well as "real" places. Furthermore, a posthuman Bildung interrogates what "citizenship" as a political project might mean, it (…) complicates all such projects by positing that all our educative encounters are material, coemergent and experimental becomings which cannot be planned or known in advance (Taylor, 2016, p. 432)

In such a posthumanist Bildung perspective, digital technology is no longer a tool to be mastered but more of an extension of us, requiring our critical awareness. Aagaard clarifies: "According to this posthumanist approach, ICTs are not external influences from which we must break free, but mediating artefacts that shape our lives for better or worse" (Aagaard, 2021, p. 50). This resonates with the elements presented from the Scandinavian documents such as critical reflexivity, digital judgement, digital ethics, and digital identity awareness. Here technology is viewed as something that shapes our lives and requires critical reflexivity (among other competences) as opposed to something to be controlled and mastered. Applying this posthumanist ontology to the conceptualization of PDC in TE emphasizes how technology changes our world, as well as us and elements of our being. I would argue that there are many signs of this move towards a posthuman understanding of Bildung in both the Norwegian concept of PDC and the Danish concept of technology comprehension as they are presented in these two documents. And I would also argue that in many ways, the Norwegian and Danish concepts are two peas in a pod. This does also suggest, that particularly the Bildung aspects of the two Scandinavian concepts could be relevant for TE and policy makers outside of Scandinavia.

Limitations

Despite the limited sample size of the current study, the data have significant value as they are the only available documents on digital competence in TE in Norway and Denmark. As such, they can be considered authoritative, justifying the sample size. The study's objective was to compare and contrast the ways in which digital competence is conceptualized in these documents and thereby identify general elements of interest. Nonetheless, to acquire a more exhaustive understanding of digital competence in TE, it is imperative to conduct more extensive reviews of the field and frameworks.

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Figure 1 ALT text

The figure shows the frequency of the nine coding categories in columns. For each category there is a column for Norway and one for Denmark. The columns are similar for Pedagogy, Digital Bildung, Empowerment, Teacher-Student Roles and Tech as tool. And not similar for Tech as Subject, Professional Identity and Societal Perspectives.