Philosophical underpinnings of digital citizenship through a postdigital lens: Implications for teacher educators' professional digital competence

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Abstract
Embedded in society, digital infrastructure has changed citizens' lives. Young people therefore need to develop digital competence and digital citizenship, and schools have an important role in this regard. To prepare new schoolteachers for this role, teacher educators (TEDs) need professional digital competence (PDC) that includes knowledge, competences, and a conceptual understanding to teach teaching for digital citizenship. In light of the limited body of research on theorizing digital citizenship in relation to TEDs' PDC, this paper critically analyzes three conceptualizations of digital citizenship. Being potentially normative and part of the latest phase of development in the field, these conceptualizations could shape TEDs' PDC and practice. In a qualitative content analysis of the selected conceptualizations, this paper uses a postdigital lens to bring into focus and critically analyze aspects of philosophical underpinnings related to socio-technical relations. The results show that conceptualizations of digital citizenship convey different understandings of human–technology relations and the knowledge and competences necessary to exercise digital citizenship. These differences have far-reaching implications for TEDs' PDC in ways that could impact students' opportunities to develop digital competence and digital citizenship. Therefore, TEDs' PDC needs to include a critical understanding of digital citizenship, and the post-pandemic juncture of "new normal" provides opportunities to rethink and reframe PDC. To this end, a postdigital lens can shift the focus to how PDC is contingent on the shifting entanglements in which pedagogical activities are situated and orchestrated, and how these relate to broader issues of injustice in society.

Keywords Digital citizenship · Postdigital · Professional digital competence · Socio-technical relations · Teacher education

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1 Introduction

Embedded in society and everyday activities, digital infrastructure has changed citizens' interactions with their social, political, economic, and cultural environments, and consequently digital citizenship has become an increasingly important dimension of citizenship (Hintz et al., 2019). Emerging technologies, for example, the Internet of Things, datafication, and artificial intelligence, together with phenomena such as fake news and disinformation, have placed new demands on citizens' development of digital competence and digital citizenship to engage critically with digital technologies (Vuorikari et al., 2022). COVID-19 conspiracy theories and citizens' actions on and beyond social media (Dow et al., 2021) have showed how digital citizenship is not limited to a distinctly digital sphere, such as "the online". Rather, citizens exercise digital citizenship within broader socio-technical arrangements by acting through digital technologies (Isin & Ruppert, 2020), which requires digital competence (Pangrazio & Sefton-Green, 2021).

What digital competence citizens need to exercise digital citizenship, including the role of education in this regard, has increasingly drawn attention in research and policy. In particular, the period from 2015 onward marks a phase of growth and critical formation for educational research on digital citizenship (Richardson et al., 2021), which is still ongoing. This has been paralleled by government initiatives, which have gradually foregrounded digital competence and digital citizenship in national curricula (Erstad & Voogt, 2018). Moreover, various stakeholders in education have engaged in work on digital citizenship, such as the Organisation for Economic Co-operation and Development (OECD), the European Commission, and the Council of Europe (e.g., Burns & Gottschalk, 2019; European Commission, 2021; Richardson & Milodivov, 2022). The growing attention to digital citizenship in research and policy reflects the importance ascribed to education and, specifically, the role of schoolteachers to help young people develop digital competence and digital citizenship (cf. Cervera & Caena, 2022; Redecker, 2017).

To prepare new schoolteachers for this role, teacher educators (TEDs) need professional digital competence (PDC), which is relevant knowledge, skills, and an understanding of digital technologies that are specific to the teaching profession (Lund et al., 2014; Tømte et al., 2013). As TEDs' PDC needs to be responsive to societal change and contribute to preparing young people for a future that is yet to be, PDC is a concept in flux (Skantz-Åberg et al., 2022; cf. Almås et al., 2021). From this perspective, the increasing importance of young people's digital competence and digital citizenship places demands on TEDs to have a dynamic PDC to teach teaching for digital citizenship, which includes relevant knowledge, skills, and conceptual understandings. Through such PDC, TEDs can support student teachers so that they, as future schoolteachers, can help young people engage critically with digital technologies as citizens (Cervera & Caena, 2022; cf. Uertz et al., 2018).

1.1 Professional digital competence to teach teaching for digital citizenship in a state of "new normal"

Echoing the evolving character of PDC described above, previous studies highlight the importance of supporting TEDs' PDC, for example, through continuous professional development (Amhag et al., 2019; Instefjord & Munthe, 2017; Lindfors et al., 2021). This support may be even more important when considering how paths toward becoming a TED can be vastly different with inconsistencies in TEDs' education and opportunities for professional development specific to the TED role (Cochran-Smith et al., 2020; European Commission, 2022). Studies in teacher education (TE) and school contexts also indicate that professional development in PDC need to target TEDs' conceptual understanding of digital citizenship, which is central in ensuring that future schoolteachers are prepared to teach for digital citizenship (Vajen et al., 2023; Örtegren, 2022). Moreover, a critical conceptual understanding is important because digital citizenship is a contested concept (Hintz et al., 2019); conceptualizations can have different foci, content, and underpinnings, which can be problematic, for example, if they are conducive to passive-conformist attitudes in students (Heath, 2018; Mattson, 2016).

To support critical discussions on TEDs' PDC to teach teaching for digital citizenship in ways that meaningfully reflect the role of socio-technical relations in contexts of pervasive digital infrastructure, this paper uses a postdigital lens. Viewed through this lens, boundaries have become blurred between the online–offline, digital–analog, humans–non-humans, and digital networks. Rejecting such binaries, a postdigital lens highlights how humans, digital technologies, and social practices are entangled in political, economic, and social contexts (Jandrić et al., 2018; Knox, 2019).

Consequently, a postdigital lens offers other ways to understand TEDs' PDC and the space within which they act. It moves the focus from centering on individual TEDs' PDC to the context of teaching, and how PDC is contingent on the shifting entanglements in which pedagogical activities are situated and orchestrated. These entanglements extend beyond immediate classroom contexts and pedagogy to include, for example, the broader mesh of relations between human and non-human entities, social practices, teaching goals, university policy, and global issues (Fawns, 2022; Lamb et al., 2022; Markauskaite et al., 2023).

In the wake of the COVID-19 pandemic, research has explored teaching in a state of "new normal", for example, online teaching readiness (e.g., Scherer et al., 2021), which has provided insights in the context of pandemic-spurred permeation of digital technologies in higher education. Through a postdigital lens, another way to understand TEDs' PDC and the space within which they act is to go beyond the "great online transition" to consider "what underpins contextualised teaching in which the use of digital technologies is an *inseparable part of a broader future-oriented goal and mission*" (Markauskaite et al., 2023, p. 182, added emphasis). Such goals and missions could be, for example, the democratic role of schools and how TEDs prepare student teachers for this role. From this perspective, the "new normal" encourages us to reframe TEDs' PDC holistically toward an ecological view, where PDC to teach teaching for digital citizenship is contingent on entanglements that transcend immediate classroom contexts and link to democracy. As Jandrić (2021a)

highlights, this includes considering how such entanglements broadly relate to social change, emancipation, and social justice. In other words, an ecological view of TEDs' PDC entails a recognition how technology and pedagogy are entangled within pedagogical activities (Fawns, 2022), and how these activities are broadly situated within socio-technical relations and power structures that shape epistemologies and society (Jandrić & Ford, 2022).

Against this backdrop, and in light of the limited body of research on theorizing digital citizenship in relation to TEDs' PDC, the aim of this paper is to critically analyze the philosophical underpinnings of three conceptualizations of digital citizenship and discuss implications for TEDs' PDC to teach teaching for digital citizenship. In a qualitative content analysis, the use of a postdigital lens brings into focus aspects of philosophical underpinnings specifically related to socio-technical relations. The conceptualizations included in this study appear in publications by Ribble (2015), Choi (2016), and Frau-Meigs et al. (2017), which are potentially normative and part of the most recent phase of critical development in the field. As such, these conceptualizations could shape TEDs' PDC and practice when teaching to teach for digital citizenship. To address the aim of this paper, the following research questions are answered:

– What philosophical underpinnings do the conceptualizations of digital citizenship have related to socio-technical relations between humans and digital technologies?
– In light of these underpinnings, what are the implications for teacher educators' professional digital competence to teach teaching for digital citizenship?

The following sections focus first on the concepts of digital citizenship and PDC in TE, and what a postdigital lens on digital citizenship entails in this paper. The methods section presents how the three conceptualizations of digital citizenship were selected, and how they were analyzed using a postdigital lens focusing specifically on aspects of philosophical underpinnings related to socio-technical relations. The results section presents the analysis which, at this post-pandemic juncture of "new normal", provides the basis for a discussion on implications for TEDs' PDC to teach teaching for digital citizenship in ever-evolving socio-technical environments.

2 Background and conceptual framework

2.1 Conceptualizations of digital citizenship in the context of teacher education

For a long time in the social sciences, Marshall's (1950) conceptualization of citizenship was influential, which focused on the relation between citizens and nation-states in terms of civil rights, political rights, and social rights. At the end of the 20th century, however, scholars started drawing attention to broader dimensions of citizenship beyond rights and the nation-state (Banks, 2008).

Digital citizenship draws attention to questions concerning citizenship in relation to digital technologies. In various configurations, conceptualizations of digital

citizenship generally include the use of technologies, knowledge, skills, attitudes, and behaviors (cf. Heath, 2018; Richardson et al., 2021). Early conceptualizations tended to focus on responsible use of technology (e.g., Ribble et al., 2004) and participation (e.g., Mossberger et al., 2007). Later conceptualizations have often had a broader conceptual scope highlighting, for example, the relationship between the "online" and the "offline" (e.g., Choi, 2016; Couldry et al., 2014), and the increasingly significant role of datafication, algorithms, and artificial intelligence (e.g., Hintz et al., 2019; Vuorikari et al., 2022).

In educational research, attempts to map categories of theoretical approaches to digital citizenship (e.g., Choi & Cristol, 2021; Heath, 2018) have observed a tendency to focus on early conceptualizations, for example, responsible use of technology and participation. However, these are only some aspects of digital citizenship, and there is a need for educational research to cover a larger conceptual scope, including critical approaches to digital citizenship (Heath, 2018). This is echoed by recent calls for rethinking the type of knowledge and competences that citizens need in 21st-century contexts of increasing permeation of digital technologies, for instance, in relation to datafication (Hintz et al., 2019) and artificial intelligence (Markauskaite et al., 2022).

Furthermore, educational research on digital citizenship has largely been empirical, focusing on K-12 schools with limited attention to TE contexts (Örtegren, 2022) and often without providing a clear definition of digital citizenship (Jæger, 2021; Richardson, et al., 2021). The limited attention to digital citizenship in TE, together with the broader tendency in educational research not to engage with definitions of digital citizenship, indicates a need for more efforts to theorize digital citizenship in TE, where theory–practice gaps are important to bridge (Darling-Hammond, 2017). For example, calls have been made for more research on digital citizenship frameworks that specifically addresses theory–practice gaps in education (Richardson et al., 2021). Inadequately theorized conceptualizations of digital citizenship can lead to, for instance, limited conceptual understandings (Davis, 2020; Vajen et al., 2023; Örtegren, 2022), overlaps with other theoretical concepts (Frau-Meigs et al., 2017), and problematic underpinnings (Heath, 2018; Mattson, 2016).

Despite calls for educational research on theorizing digital citizenship, few studies have critically examined the theoretical underpinnings of the conceptualizations themselves. Two examples, which closely relate to the approach in the present paper, focus on ideological underpinnings. Mattson's (2016) critical discourse analysis identified, for example, perspectives of adult control, student passivity, for-profit data control, and a duality between students' development of citizenship online and offline. Similarly, Noula's (2019) critical discourse analysis identified issues related to depoliticized citizenship education and fostering passive-conformist attitudes in students. While these studies contribute to the literature, they discuss implications for TE contexts to a limited degree. There are examples, however, of empirical studies that include reflections on how the concept of digital citizenship is (or could be) understood in TE, but this has not been their primary aim (e.g., Vajen et al., 2023).

Therefore, there is a need for more TE research on digital citizenship with a broad conceptual scope (cf. Heath, 2018) that critically focuses on theorizing digital citizenship in contexts of increasingly pervasive digital infrastructure (cf. Hintz

et al., 2019; Markauskaite et al., 2022). By focusing on how conceptualizations of digital citizenship are theorized, research could contribute to discussions on the links between theory and practice when it comes to teaching to teach for digital citizenship in TE (cf. Richardson et al., 2021). To this end, this paper draws inspiration from Mattson (2016) and Noula (2019) by critically analyzing underpinnings of conceptualizations of digital citizenship. Specifically, this paper focuses on aspects of philosophical underpinnings related to socio-technical relations, namely, human–technology relations and what knowledge and competences citizens need to exercise digital citizenship.

2.2 Conceptualizing teacher educators' professional digital competence

To conceptualize the knowledge and competences that TEDs need to teach teaching for digital citizenship, the present paper uses the concept of professional digital competence (PDC). PDC refers to knowledge, skills, and an understanding of digital technologies that are specific to the teaching profession. PDC was first developed in the context of Norwegian TE in 2013 (Lund et al., 2014; Tømte et al., 2013), and it has since undergone conceptual changes or been the topic of such discussions (e.g., Almås et al., 2021; Brevik et al., 2019; Skantz-Åberg et al., 2022).

More specifically, this paper follows Gudmundsdottir and Hatlevik's conceptualization of PDC. They have previously used this conceptualization to study conceptual aspects of digital citizenship, namely, responsible use of digital technologies (Gudmundsdottir & Hatlevik, 2020). Gudmundsdottir and Hatlevik describe four dimensions of PDC, each of which relates to digital technologies in different ways. *Generic digital competence* refers to generic knowledge, skills, and attitudes that TEDs need to have. *Subject-specific digital competence* concerns knowledge and skills related to subject didactics. *Profession-oriented digital competence* involves a broad range of aspects relevant to teaching, for example, classroom management. *Transformative agency* refers to the ability to turn unforeseen situations into opportunities for meaningful teaching and learning (Gudmundsdottir & Hatlevik, 2018, 2020; cf. Brevik et al., 2019).

In this paper, PDC is understood as a concept in flux because of its responsiveness to societal change (Almås et al., 2021; Skantz-Åberg et al., 2022) and the changing demands at schools with increasing permeation of digital technologies (Pettersson, 2018). This in-flux character gives PDC a certain degree of plasticity and temporality (Olofsson et al., 2021), where the state of "new normal" following the COVID-19 pandemic is a recent example of changing demands on PDC (cf. Scherer et al., 2021). Moreover, all four dimensions of PDC are understood as necessary for TEDs to teach teaching for digital citizenship in a society permeated with digital technologies. For example, focusing on the role of algorithms in society, TEDs need generic digital competence (e.g., knowledge about the role of algorithms in society) and subject-specific digital competence (e.g., didactic skills to teach such content so that student teachers, in their future careers, can teach for digital citizenship). TEDs also need profession-oriented digital competence (e.g., knowledge of how they can further their own professional development in this regard). Lastly,

TEDs need transformative agency (e.g., the ability to turn an unforeseen classroom situation into an opportunity to deepen students' understanding of the role of algorithms in society).

2.3　Digital citizenship through a postdigital lens

As pervasive digital infrastructure has changed how citizens think and interact (Hintz et al., 2019), "[w]e are increasingly no longer in a world where digital technology and media is separate, virtual, 'other' to a 'natural' human and social life" (Jandrić et al., 2018, p. 893). For example, citizens' lives are increasingly becoming data points possible to collect, analyze, and act on through opaque digital infrastructures, which has implications for society and social life (Hintz et al., 2019; Zuboff, 2019). Citizens are not merely passive objects acted on, however. Within socio-technical arrangements, citizens act as subjects through digital technologies, and when doing so, citizens bring these very arrangements into being and shape socio-technical relations within them (Isin & Ruppert, 2020).

For instance, when employers use algorithmic management, such as in scheduling or task assignment for gig workers, or when workers resist such management, they contribute to bringing certain socio-technical arrangements into being which shape employer-labor relations. These arrangements are also entangled with broader structures in society which, in the case of gig workers, include social class, corporate practices, and legislation, to mention some examples (Rogers, 2023).

Therefore, to meaningfully discuss TEDs' PDC in relation to conceptualizations of digital citizenship, specifically philosophical underpinnings related to socio-technical relations, this paper uses a postdigital lens. A *post*digital lens is not to be understood as a state of "after-the-digital" (Taffel, 2016) but a critical approach to technology and society (Jandrić et al., 2018) where post signals that "we have something to talk about" (Sinclair & Hayes, 2019, p. 129). In contrast to human-centered, instrumentalist understandings of technology, such as teachers using technology to "enhance" learning (Bayne, 2015), a postdigital lens entails "a messier view of socio-technical relations" (Fawns et al., 2023, p. 11): digital technologies are embedded in political, economic, and social contexts, and they are thus entangled with social practices. Using a postdigital lens therefore has major implications for the understanding of socio-technical relations (Knox, 2019), TEDs' PDC (Markauskaite et al., 2023), and teaching to teach for digital citizenship (Örtegren, 2022).

Furthermore, a postdigital lens entails a recognition of how technology is always political through its entwinement with the human condition. This lens can be used to critique, for example, the technological determinism that currently dominates politics and educational policy (Jandrić & Knox, 2022) where interests beyond TE and schools are represented, such as businesses, think-thanks, government agencies, and foundations (Player-Koro et al., 2018). In contrast to narratives of digital transformation and increased efficiency, a postdigital lens offers ways to highlight alternative understandings of technology (Cramer, 2015; Knox, 2019) and develop other narratives (Jandrić & Knox, 2022). This includes ways of understanding and narratives around digital citizenship in education and in relation to TEDs' PDC.

Developing such alternatives can also draw on critical pedagogy to which postdigital theory traces some of its roots. In doing so, a postdigital lens could draw attention to how socio-technical relations are connected to social issues, emancipation, and social justice (Jandrić, 2021a, 2021b).

3 Method

3.1 Selection

This paper sought to critically analyze key conceptualizations of digital citizenship, and based on this analysis, discuss implications for TEDs' PDC to teach teaching for digital citizenship. For a balanced trade-off between thick, analytical descriptions and opportunities for comparisons, the study design included three conceptualizations of digital citizenship. To identify these conceptualizations, a review of the literature was conducted. In digital citizenship research, there have been discussions on the advantages and disadvantages of following restrictive or broad approaches to selection criteria (e.g., Jørring et al., 2018; Richardson et al., 2021). For example, a restrictive approach can promote systematicity by focusing on citations or sub-fields only. In contrast, a broad approach can consider a range of characteristics, such as citations, citation patterns (e.g., by whom, through which publication outlets, and across time), the contexts in which the conceptualizations were developed and promoted (e.g., by key stakeholders in education) or other factors that contribute to making the conceptualizations relevant to study.

Using a purposive sampling approach (Cohen et al., 2018), this study sought to analyze conceptualizations of digital citizenship that are potentially normative in the field within a specific time period, a status which may be derived not only from citations but also from other factors. Therefore, in reviewing the literature, a broad approach was used to selection criteria. First, the publications in which the selected conceptualizations appear needed to have a certain status that makes them potentially normative in the field of digital citizenship in education and TE by, for example, being seminal publications, frequently cited, or promoted by key stakeholders in education. Second, only publications between 2015-2022 were included. This period marks the most recent phase of critical formation for the field of digital citizenship in education (cf. Richardson et al., 2021), which is still ongoing.

Guided by these selection criteria, the review of the literature included books, peer-reviewed articles, and reports retrieved by searching the databases Education Resources Information Center (ERIC), Google Scholar, and Web of Science. ERIC and Web of Science were used because of their large repositories relevant to educational research and possibilities to analyze citation patterns whereas Google Scholar was mainly used to contrast citations. Database searches were limited to publications in English. The final selection of publications included Ribble (2015), Choi (2016), and Frau-Meigs et al. (2017). These publications are introduced below together with the selection rationale.

While selection criteria can guide the review of the literature, the process of delimitation can still be a challenge, particularly when assessing the degree to

which a publication can be considered potentially normative in a field. It is not a straightforward task. However, this study did not seek to identify and analyze the most influential or potentially most normative conceptualizations of digital citizenship in education. Rather, the study sought to explore the process of critically unpacking digital citizenship conceptualizations central to the field, focusing on socio-technical relations and discuss implications for TEDs' PDC. In this regard, a broad approach enabled the selection to include publications that are potentially normative for different reasons and developed by different authors. This breadth enabled the analysis of possible differences and similarities in how conceptualizations convey understandings of socio-technical relations, and the knowledge and competences that citizens need to exercise digital citizenship accordingly.

3.1.1 Ribble (2015)

Ribble published one of the first articles on digital citizenship in education (Ribble et al., 2004), and his subsequent book *Digital Citizenship in Schools*, in its various iterations, has become one of the most frequently used conceptualizations in educational research (Heath, 2018). For instance, a systematic literature review focusing on 2004-2019 found that 33% of the 78 articles used Ribble's conceptualization, 13% used ISTE Standards which are closely related to Ribble's work, while close to 47% did not use any specific conceptualization (Richardson et al., 2021). This gives Ribble's conceptualization a status as potentially normative in the field. Included in this study was therefore the latest edition of the book *Digital Citizenship in Schools*, which was published in 2015 and builds on the 2007 and 2011 editions.

As to the contents, this edition spans 173 pages (excluding references and appendices) and is intended for TEDs. In seven chapters based on an evaluation of "hundreds of articles, books, blogs, websites, and news broadcasts" (2015, p. 23), Ribble presents a background to the field, the conceptualization of nine specific elements of digital citizenship and, among others, recommendations for implementation.

3.1.2 Choi (2016)

Choi has published on digital citizenship in education since 2015, and particularly a 2016 journal article has drawn attention in which Choi presents a conceptualization of digital citizenship. For instance, searches on Web of Science and Google Scholar reveal that in the period 2015-2022, Choi's conceptualization was among the most frequently cited conceptualizations of digital citizenship in education. Moreover, literature reviews have used Choi's article as a point of departure (e.g., Jørring et al., 2018; Richardson et al., 2021), and until 2021, this article was the only publication that had examined how digital citizenship had been conceptualized in the literature (Richardson et al., 2021). Related publications by Choi have also become frequently cited exploring, for example, teachers' levels of digital citizenship, and have appeared in academic journals central to the field. At the time of preparing the study reported on in the present paper, the 2016 article was Choi's most cited effort

to conceptualize digital citizenship. Therefore, all characteristics considered, Choi's conceptualization has a status as potentially normative in the field, and the 2016 article was included in this study.

As to the contents, Choi's article spans 26 pages (excluding references and appendices). In the article, Choi describes the development of digital citizenship and a concept analysis of how digital citizenship has been conceptualized in education, political science, and communication and journalism studies from 2003 to 2014. This concept analysis includes articles, white papers, book chapters, blog posts, and websites, and Choi (2016) claims that the results of the analysis are relevant to TE and particularly social studies.

3.1.3 Frau-Meigs et al. (2017)

To understand the rationale for selecting Frau-Meigs et al.'s conceptualization requires more contextual information. Their conceptualization was part of a digital citizenship education project, which was commissioned by the Council of Europe (CoE) Steering Committee for Educational Policy and Practice. This committee supports the 46 CoE member states by, for instance, supervising programs in education and engaging in policy development (Council of Europe, n.d.). Frau-Meigs et al.'s work provided direction for other publications in said CoE project, for instance, the 2019 and 2022 iterations of the *Digital Citizenship Handbook*, which provides practical support to teach for digital citizenship in classroom settings (Richardson & Milodivov, 2022). In other words, Frau-Meigs et al.'s publication has been, and still is, a part of the work of the CoE to impact digital citizenship education in and beyond a geographical region roughly corresponding to the European Union (EU).

While the CoE is a separate body from the EU, the former has functioned as an "antechamber" for aspiring EU candidate countries, and over time collaborations have expanded to include many areas (Cornu, 2013). For example, the CoE and the EU collaborated on digital citizenship education in 2018-2019 (European Commission, 2019), that is, in close conjunction with Frau-Meigs et al.'s publication. For the period 2023-2024, similar CoE-EU collaborations have been established in the areas of democracy, digital literacy, and civic education following the Russo-Ukrainian war and challenges to democracy, such as disinformation campaigns (Council of the European Union, 2023).

Considering these contextual factors, Frau-Meigs et al.'s conceptualization was included in the study primarily because of two reasons. First, this conceptualization is frequently cited, although not to the same degree as the other two included publications, and it could thus impact educational research on digital citizenship. More importantly, given its role in the work of the CoE, this conceptualization could potentially influence education on digital citizenship in many nation-states by, for example, shaping discourse, policy, and practice. Together, these factors give Frau-Meigs et al.'s conceptualization a status as potentially normative in the field, and thus their 2017 publication was included in this study.

In passing, given the bidirectional influence between the CoE and the EU (Cornu, 2013) and their collaborations on digital citizenship education, it would be

reasonable to assume that Frau-Meigs et al.'s conceptualization is positioned in ways that could influence developments in education also in and through the EU. While this potential influence may add to the relevance of studying Frau-Meigs et al.'s conceptualization, such a project deserves a study of its own and would need to include other data sources, for instance, EU-related conceptualizations such as *The Digital Competence Framework for Citizens (DigComp)* (Vuorikari et al., 2022) and interviews with key informants.

As to the contents, Frau-Meigs et al.'s (2017) conceptualization is based on a literature review of peer-reviewed academic literature and relevant programs and policies from 2000 to 2017, which also includes publications by civil society organizations. Spanning 53 pages (excluding references and appendices) and divided into six sections, Frau-Meigs et al. focus on core concepts, national policy and industry, sense-making practices, trends, challenges, and recommendations for education although with few explicit references to TE.

3.2 Analysis

Through a postdigital lens on the conceptualizations included in this study, the analysis focused on philosophical underpinnings related to socio-technical relations regarding (a) human–technology relations, and (b) the knowledge and competences that citizens need to exercise digital citizenship. Thus, after selecting conceptualizations, the next step was to define what aspects were to be brought into focus in the analysis. To do this, the postdigital lens incorporated the concept of agential cuts through which six aspects, firmly grounded in postdigital literature, were selected and defined. These aspects then functioned as analytical categories in a qualitative content analysis as described in the subsections below.

3.2.1 Making research inquires bounded while appreciating complexity: Agential cuts

The use of a postdigital lens in this paper builds on the notion that digital technologies and social practices are entangled, and that depending on how such entanglements are understood, this may have implications for what knowledge and competences citizens need to exercise digital citizenship and, accordingly, what PDC TEDs need to teach teaching for digital citizenship. This notion of socio-technical relations also shifts the view of PDC from centering on TEDs' individual PDC to a more ecological view, where PDC is contingent on shifting entanglements between humans and non-human entities in pedagogical activities (Markauskaite et al., 2023; cf. Fawns, 2022).

In this context, entanglements can be a helpful concept to think about ecologies, but there are methodological points that researchers need to consider. For instance, this concept can be useful in that within entanglements, elements are viewed not as simply interconnected but mutually constitutive (Murris & Fullagar, 2021), and thus the concept can consider complexity in which digital technologies are embedded. However, being able to consider complexity also means that making research

inquiries bounded is potentially a challenge. For example, entanglements "do not exist as physical entities (or objects) but as conceptions of invisible relations" (Fawns et al., 2023, p. 9), which means that relations in entanglements are not "there" but created by researchers. Hence, research inquires need to be bounded, and they need to be bounded in ways that facilitate dialogue and mutual understanding with other researchers (Fawns et al., 2023).

One way to do this in postdigital educational research is to incorporate concepts and insights from sociomaterialism (e.g., Fawns, 2022; Lamb et al., 2022), such as Barad's (2007) concept of agential cuts. "Cuts" refer to temporary separations of entanglements. As such, cuts become entities with determinate boundaries within the indeterminate phenomenon of interest. Consequently, agential cuts include certain aspects of entanglements while recognizing that these aspects are entangled with the aspects that were excluded. As Fawns et al. highlight, cuts are necessary choices by researchers to make research inquiries bounded; cuts reflect what aspects the research focuses on and, at the same time, they "acknowledge the violence that this does to our understanding of objects in the world" (2023, p. 7).

Therefore, to consider the complexity in which digital technologies are embedded while also making the research inquiry bounded, the postdigital lens in this paper incorporated the concept of agential cuts. Cutting was a process of necessary boundary-making within the larger, shifting entanglements that comprise the environment of and teaching for digital citizenship, in other words, the entanglements on which TEDs' PDC is contingent. Focusing on the conceptualizations of digital citizenship included in this study, specific aspects of philosophical underpinnings were selected and "cut out". By being cuts, these aspects temporally became entities with determinate boundaries and thus possible to analyze and discuss in the paper, all the while recognizing that these aspects were part of an indeterminate whole and entangled with aspects that could have been part of the analysis but were excluded.

3.2.2 Selecting aspects for analysis

The aspects related to socio-technical relations to be selected and "cut out" for analysis concerned (a) human–technology relations, and (b) what knowledge and competences citizens need to exercise digital citizenship. As these aspects were to structure the qualitative content analysis, their number had to be feasible; too few or too many aspects could impact the precision of coding and analysis (Kuckartz, 2014). Ultimately, six aspects were selected and "cut out" for analysis. Grounded in postdigital literature, the first two aspects concern human–technology relations with a tilt toward the latter, while the other four aspects concern citizens' knowledge and competences to exercise digital citizenship:

– Society
– Technology
– Ideal citizen
– Context
– Critical approach
– Social justice

Society refers to the society for which digital citizenship is described as relevant in the selected publications. Of interest is the broad narrative around the state of digital technologies in society, for example, descriptions of "a digital age" or societal phases (cf. Cramer, 2015; Jandrić et al., 2018). In contrast, *technology* provides higher analytical resolution. This aspect draws attention to descriptions of technological development (e.g., sequential, technology-determinist, and non-determinist), such as technology being the driver of social change or neutral "tools" (cf. Fawns, 2022; Jandrić & Knox, 2022; Knox, 2019). This includes possibilities for different understandings of technology and technological development to coexist (cf. Cramer, 2015; Knox, 2019).

Moreover, *technology* draws attention to descriptions of the potential messiness of socio-technical relations (cf. Fawns et al., 2023). Examples include the boundaries between (and the postdigital rejection of) online–offline, old–new media, digital–analog, and biology–digital (Jandrić et al., 2018) and where the digital takes place (e.g., in a distinctly digital sphere, the material world or both; Sinclair & Hayes, 2019). This includes descriptions of human and non-human agency, and notions of shared agency (Jandrić, 2021b; Jandrić & Ford, 2022).

Through the remaining four aspects, it becomes more apparent that postdigital theory is "[d]eeply imbued in the tradition of critical pedagogy" (Jandrić, 2021b, p. 29; cf. Jandrić et al., 2018). *Ideal citizen* focuses on descriptions of knowledge, competences, and ways in which digital citizenship is exercised, for example, descriptions of ideal citizens to become (cf. Jandrić, 2021b). Given the view of digital technologies as embedded in almost all contexts of social life (Jandrić et al., 2018; Knox, 2019), *context* refers to the contexts described as relevant to digital citizenship formation. For example, this could be formal spaces of learning or contexts outside of school. The final two aspects are related but with an important difference. *Critical approach* refers to descriptions of critical ambitions, for example, to highlight power asymmetries in relation to digital technologies, such as in data surveillance and algorithmic processes, and how these shape citizens' lives (Jandrić & Ford, 2022). *Social justice* moves from highlighting to challenging such power asymmetries through citizens' development of relevant knowledge and competences, and thus this aspect is ultimately connected to emancipation and social justice (Jandrić, 2021a, 2021b).

3.2.3 Qualitative content analysis

These six aspects, brought into focus through a postdigital lens and defined above, were used as analytical categories in a qualitative content analysis of the conceptualizations of digital citizenship included in the study. Qualitative content analysis can be performed on documents, such as the publications included in this study, but there are different techniques. Broadly, the analysis involves coding text based on categories, where the focus is on selected aspects of relevance to the research question. The meaning of the coded data can then be reduced

or expanded to a higher and more abstract level (Cohen et al., 2018; Drisko & Maschi, 2015).

This qualitative content analysis followed what Kuckartz (2014) describes as a thematic qualitative content analysis. This type of analysis consists of seven phases with the possibility to shorten some if the specific aspects of interest are already defined (i.e., the categories to be used for coding). As this was the case in the present study, the analysis was shortened to five phases, skipping initial sample coding, category creation and refinement.

The first phase was familiarization with the data, which included identifying the core definitions of digital citizenship used in the publications. The publications were read several times, and content was highlighted if it was identified as potentially relevant to the six aspects with comments added in the margin. Such content could be words, phrases, larger parts of text, contextual or latent meaning of potential relevance (Kuckartz, 2014; cf. Cohen et al., 2018). While qualitative content analysis often is descriptive, coding in this analysis was a critical interrogation of the texts (cf. Drisko & Maschi, 2015) partly because of the critical approach underpinning the postdigital lens, and partly because contextual and latent meaning was considered in the analysis.

Following Kuckartz (2014), four iterative and non-linear phases followed. The first three phases comprised (a) reading and deductive coding based on the six aspects above, where irrelevant text remained uncoded, (b) condensing coded text into analytical summaries for each aspect in relation to the first research question, and (c) creating case summaries for each analyzed conceptualization. Table 1 shows an example of this process. The final phase (d) focused on all three conceptualizations, where the write-up combined and contrasted the results.

In these phases, the use of a profile matrix (Kuckartz, 2014) had a central role in developing the analysis and the write-up of the results. As Drisko and Maschi (2015) highlight, matrices can facilitate analysis, comparisons, and write-up of the results while providing insights into the coding process. Based on Kuckartz (2014), the profile matrix (Table 2) listed the six defined aspects distributed vertically in the left-hand column, and the authors of the publications in the top row. By adding coded text to different cells, the profile matrix facilitated the analysis in several ways. For example, it helped structure the interpretation of the data (phase a) and condense coded text into analytical summaries (phase b). The profile matrix also facilitated the creation of summaries vertically (i.e., case summaries of each conceptualization, phase c) and horizontally (i.e., cross-case comparisons, phase d).

Thus, as signaled by referring to phases rather than steps (Kuckartz, 2014), the analysis was an iterative and non-linear process of shifting focus between the publications, the profile matrix, and writing the summaries. This analysis then provided the basis for a discussion on implications for TEDs' PDC to teach teaching for digital citizenship, which is highlighted in the lower section of the profile matrix.

Table 1 Example of developing a profile matrix and case summary based on aspects analyzed in Ribble (2015)

	Text coded for aspect	Analytical summary	Case summary
Core definition	"[T]he norms of appropriate, responsible behavior with regard to technology use" (p. 15)	-	
Society	"Over the years, users of technology have come together to interact with one another, creating, in effect, a digital society" (p. 1)	Digital	
Technology	"This digital society has forged new opportunities for education, employment, and social interaction" (p. 1)	Techno-optimistic	
Ideal citizen	"Everyone needs to learn both the good and the bad of technology" (p. 2)	Yes	→ Write-up of case summary based on analytical summaries
Context	"Without such [digital citizenship] education, our students will find it much more difficult to become productive digital citizens" (p. 169)	Formal primarily (i.e., education)	
Critical approach	"[T]hey [digital citizens] must agree to live according to the parameters that are mutually agreed upon by members" (p. 46)	No	
Social justice	"Educators need to evaluate the use of computers, tablets, and other devices within their schools. Do all students have adequate access to technology throughout the day?" (pp. 24-25)	Limited to access (hard-/software)	

Table 2 Final profile matrix, including core definitions, the six aspects brought into focus through a postdigital lens, and how these can inform TEDs' PDC

	Ribble (2015)	Choi (2016)	Frau-Meigs et al. (2017)
Core definition	"[T]he norms of appropriate, responsible behavior with regard to technology use" (p. 15)	"[A]bilities, thinking, and action regarding Internet use, which allows people to understand, navigate, engage in, and transform self, community, society, and the world" (p. 584)	"[A]bility to engage competently and positively with digital technologies … participating actively and responsibly … in communities … at all levels … double process of lifelong learning … seamlessly defending human rights and dignity" (pp. 11-12)
Society	Digital	Digitalized, networked	Coexistence of the digital and the real world
Technology	Linear development; techno-optimistic Technological determinism Boundaries mainly distinct Human agency Unclear role of non-human entities	Emergent Multifaceted understanding of digital technologies Tendency toward blurred boundaries Human agency Unclear role of non-human entities	Entangled Multifaceted understanding of digital technologies Blurred boundaries Co-constitutive agency Implicit consideration of non-human entities
Ideal citizen	Yes; not "full-fledged" by default	To some degree	Many ways to be a digital citizen
Context	Formal primarily (i.e., education)	Formal, informal	Formal, informal, non-formal
Critical approach	No	Yes	Yes
Social justice	Limited to access (hard-/software)	Yes	Yes
	→	→	→
		TEDs' PDC to teach teaching for digital citizenship	
	Generic digital competence · Subject-specific digital competence · Profession-oriented digital competence · Transformative agency		

4 Results

In chronological order, this section focuses on how digital citizenship is conceptualized in the publications by Ribble (2015), Choi (2016), and Frau-Meigs et al. (2017). For each conceptualization, there is a brief introduction which includes the identified core definition of digital citizenship. The analysis then focuses on aspects of their philosophical underpinnings related to socio-technical relations, which are (a) human–technology relations, and (b) what knowledge and competences citizens need to exercise digital citizenship. The analysis of human–technology relations is based on the first two aspects brought into focus through a postdigital lens, which are *society* and *technology*. These aspects have therefore been grouped together. The analysis of knowledge and competences is based on the other four aspects, which have also been grouped together, namely, *ideal citizen*, *context*, *critical approach*, and *social justice*.

By focusing on these six aspects, the analysis provides the basis for a discussion on possible implications for TEDs' PDC to teach teaching for digital citizenship. Quotes below highlight the use of words and phrases in the publications that support the analysis, but contextual and latent meaning is also considered (e.g., that which is not stated).

4.1 Digital citizenship as conceptualized in Ribble (2015)

Ribble's conceptualization of digital citizenship aims to provide both "starting points" and a "teaching solution" (pp. 82, 1). The focus is on responsible technology use, which is conceptualized as nine interconnected elements:

– Digital access
– Digital commerce
– Digital communication
– Digital literacy
– Digital etiquette
– Digital law
– Digital rights and responsibilities
– Digital health and wellness
– Digital security

These elements are connected to the core definition of digital citizenship, which is "[t]he norms of appropriate, responsible behavior with regard to technology use" (p. 15).

4.1.1 Society and technology

Ribble's conceptualization of digital citizenship focuses on technology use in a "digital society" which is the product of interaction between "users of technology" (p. 1). This digital society has given rise to "opportunities" and "advantages" in social,

work-related, and educational contexts (p. 1). Technology is broadly described in positive terms, for example, highlighting "the positive aspects of technology" (p. 7), which are contrasted by some statements that point to aspects of use rather than the technology itself: "technologies are inherently neither good nor bad–it's only use that makes them so" (p. 33).

As to technology use, Ribble highlights the importance of keeping ideas from the past, such as "good life skills ... tested over time" (p. 13), and using the "best tools of today" to "enhance" learning and prepare for future technology use (pp. 1-2). Ribble links this importance to job prospects, among others, because sufficient development of digital citizenship can lead to a "better chance of finding meaningful employment" (p. 169). Because of the opportunities made possible through technological change, citizens need to "come to reasonable conclusions" when using technology to achieve the "goal of digital citizenship" (p. 171). In other words, citizens' actions are foregrounded in response to technological development, for example, how they protect their data. Ribble draws little attention to how non-human entities shape people and their world, for example, through data networks and artificial intelligence.

Actions through technology use are sometimes situated in a distinctly digital sphere (e.g., online) while other times the boundaries between the digital and citizens' physical, place-based lives become more blurred. For example, Ribble discusses "the appropriate thing to do when online", and how digital citizenship will continue to be a meaningful concept until there is no difference in how people treat each other "both on and offline" (p. 13). At the same time, the "'digital'" and the "'real'" world "have intersected" (p. 12): "digital technology has become ingrained in our society, to the point where it is often difficult to separate the technology from the users" (p. 20), which is why "the digital world" has impacted citizenship in the "'real'" world (p. 19).

Thus, Ribble's conceptualization broadly links technology to new advantages with a focus on citizens' actions in response to technological change. While largely human-centered, the descriptions of human–technology relations vary to some degree, particularly between online–offline and digital–real, which impact the knowledge and competences necessary to exercise digital citizenship.

4.1.2 Implications for citizens' knowledge and competences

The philosophical underpinnings of Ribble's conceptualization related to society and technology implicate certain knowledge and competences as important for citizens to develop. Knowledge is "the central issue of technology use in a digital society" (p. 17). While a "vast array of technology issues" is covered by digital citizenship (p. 3), Ribble's focus is on responsible use of technology. Without knowledge relevant to responsible technology use, young people can exploit digital technologies for negative purposes. Specifically, advantages afforded by technology entail responsibilities for citizens. Such responsibilities include a need to understand "the good and the bad of technology" and to become citizens "of character and integrity" (p. 2). As such, they can contribute as "members of a digital society" and "help others learn how to use technology appropriately" (pp. 7, 15).

Being "closely tied to digital character education" (p. 13), formal education is "to take the lead" by providing consistency in relation to young people's development of digital citizenship through "modeling and direction" (pp. 169, 2). Thus, education has an important role in promoting young people's development of knowledge and competences related to responsible technology use, but also to foster certain attitudes. Among such attitudes is seeking feedback on technology use from others and engage in self-correction through "personal adjustments" (p. 39). Moreover, both "[s]tudents and school staff need to become more positive about the use of technology in schools" (p. 18). The focus is largely on formal education, where the work with developing young people's digital citizenship also includes, for instance, parents and carers.

The implications for citizens' knowledge and competences, then, are that people need to develop into "full-fledged" citizens (p. 17) with certain knowledge, competences, and attitudes which are linked to responsible use of technology. The focus on responsible technology use is combined with skills proven important over time. Becoming such digital citizens is possible "only by learning the principles of digital citizenship" (p. 17), where Ribble's nine starting points provide "the foundation on which the digital society is based" (p. 16).

4.1.3 Summarizing the analysis of Ribble (2015)

In Ribble's conceptualization of digital citizenship, the aspects of philosophical underpinnings related to socio-technical relations discursively convey an understanding of a digital society where the boundaries between citizens, the digital, and the physical are mainly distinct but occasionally become more blurred. Technology is generally described with a focus on new opportunities where citizens, in response, need to use technology responsibly. Human agency is foregrounded through a focus on citizens' use of technology to shape the world, and there are few contrasting descriptions of, for example, how technology can shape citizens and their world through non-human entities.

4.2 Digital citizenship as conceptualized in Choi (2016)

Choi aims to provide a "a cohesive, well-defined concept of digital citizenship" (p. 566), which comprises four categories:

– Ethics
– Media and information literacy
– Participation/engagement
– Critical resistance

These categories are linked to the core definition of digital citizenship, which is "abilities, thinking, and action regarding Internet use, which allows people to understand, navigate, engage in, and transform self, community, society, and the world" (p. 584).

4.2.1 Society and technology

Choi discusses digital citizenship in a "digitalized and networked" society in the "Internet age", where "Internet users" engage in "Internetworking activities" (pp. 565-566, 573). In this society, citizens' everyday lives have changed with "emerging digital media and web-based networking elements" (p. 566). Choi foregrounds the impact of the internet on social life, particularly the online aspect through descriptions such as "communicate with others online" or "online civic activities" (pp. 577, 585). Although referring to an internet age, Choi describes digital citizenship as "not limited to use of the Internet" (p. 585) or "solely to online behavior" (p. 587). Rather, digital citizenship "is where we think, feel, behave, and experience on a daily basis in connection with mixed offline and online participation" (p. 585). Digital citizenship is therefore "an extension" of previous "traditional and/or critical approaches to citizenship" (p. 587).

While digital technologies necessitate an extension of the approach to citizenship, few descriptions suggest that this is because emerging technologies have inherent qualities, for example, possibilities to enhance learning or political participation. Instead, digital citizenship is an important concept because internetworking activities are "closely related to place-based communities" (p. 585). In other words, the relationship between citizens' online and "offline (place-based) civic lives" is one of interrelatedness which sometimes is "non-linear" (p. 587). This relationship suggests a tension between the online–offline with "sometimes transparent boundaries between (cyber) space and place" that citizens can "traverse" (p. 587). For instance, citizens' activities on social media platforms may appear to be situated online, but these activities can be mutually dependent on actions and behaviors in citizens' place-based lives.

In Choi's conceptualization, technology therefore contributes to shaping human interaction by blurring offline–online boundaries. The focus is on humans who use technology to engage in activities made possible by technology. In this context, human agency is foregrounded with few descriptions of the role of non-human entities aside from constituting a means of communication, which impacts the knowledge and competences necessary to exercise digital citizenship.

4.2.2 Implications for citizens' knowledge and competences

The philosophical underpinnings of Choi's conceptualization related to society and technology implicate that citizens need to develop certain knowledge and competences "in the maelstrom" of the internet age (p. 587). Digital technologies enable citizens to develop new perspectives on the "self, community, society, and the world" (p. 584), in other words, their social world. What becomes important, then, is citizens' responsible use of the internet together with media and information literacy. Citizens need to have "Internet access, technological skills, and psychological capabilities" combined with knowledge of "social and political issues" (pp. 584-585). The focus on sociopolitical issues reflects the importance of being able to participate "in existing social structures" and "critique ... the existing power structure" (pp. 584,

581). Such critique can stem from political engagement directly, for example, political activism, and indirectly, such as reposting a meme as part of citizens' everyday activities.

Choi also describes how the knowledge and competences that citizens need overlap with earlier approaches to citizenship. These overlaps concern "social responsibility, being well-informed on issues, and active and engaged" as a citizen (p. 586), which are reflected by the focus on responsibility, literacy to "use ... the Internet, including searching for new information", and "developing and sustaining the diverse online communities to which people belong" (pp. 586-587).

Therefore, in Choi's conceptualization, citizens need certain knowledge, competences, and attitudes. Citizens need competences to use and understand the internet, including how engaging in internetworking activities relate to their place-based lives, but also attitudes to identify and challenge injustice.

4.2.3 Summarizing the analysis of Choi (2016)

In Choi's conceptualization of digital citizenship, the aspects of philosophical underpinnings related to socio-technical relations discursively convey an understanding of society where digital technologies are embedded to some degree. The boundaries between, for example, online–offline and digital–physical are sometimes distinct and other times blurred with the balance slightly tipping toward the latter. In this context, human agency is at the center not just in relation to digital technologies and citizenship, but also in overlaps with other conceptualizations of citizenship, which suggests that the role of digital technologies for citizenship can be understood in different ways. As citizens use technology to engage in internetworking activities, they need knowledge and competences to become responsible, knowledgeable, and skillful internet users, which also includes developing certain attitudes, for example, to social justice.

4.3 Digital citizenship as conceptualized in Frau-Meigs et al. (2017)

Based on a literature review examining definitions of digital citizenship, Frau-Meigs et al. conceptualize digital citizenship by highlighting four points. These points form a core definition, and to appreciate the content of these points, they are reproduced in full below:

– the ability to engage competently and positively with digital technologies (creating, working, sharing, socialising, investigating, playing, communicating and learning);
– participating actively and responsibly (values, skills, attitudes, knowledge and critical understanding) in communities (local, national, global) at all levels (political, economic, social, cultural and intercultural);
– being involved in a double process of lifelong learning (in formal, informal and non-formal settings); and
– seamlessly defending human rights and dignity (pp. 11-12)

4.3.1 Society and technology

Frau-Meigs et al. conceptualize digital citizenship for a "digital era" (p. 13; also "digital age", p. 13). Because of the changing role of digital technologies in society, "citizens are faced with a whole new series of challenges and opportunities" (p. 11). For example, digital technologies have "engendered" a "diversity of modes of participation" (p. 51), and some of these modes are linked to "facilitating individual participation and social change" (p. 10). In other words, "future forms of social and political participation will be profoundly changed, if not already" (p. 47). Such descriptions link both to the present and the future, but the focus is primarily on the former with examples such as post-truth politics, fake news, and radicalization on social media.

This profound change in social and political participation reflects how, "in a digital age, citizenship straddles both offline and online worlds" and must therefore be viewed as "an integrated whole" (pp. 13, 10). These worlds are not just interrelated but in a state of mutual influence:

> [C]itizens live in a space in which the digital world and the real world coexist: virtual environments are not only created by technologies, but also by the relationship exchanges which take place within them, and in fact shape them in a cycle of mutual influence (p. 41).

Such philosophical underpinnings reflect blurred boundaries between digital–real as they "coexist" in citizens' lives "in a cycle of mutual influence" (p. 41). In this context, there are few descriptions that suggest this cycle of influence is the result of, for example, inherent qualities of technology. While technologies shape the socio-technical arrangements within which citizens engage in relationship exchanges, these exchanges also shape socio-technical arrangements, which includes bringing arrangements into existence. Thus, digital technologies are intertwined with the social in "a complex entanglement of physical reality, technologies, digital media and social networks" (p. 11). For digital citizenship, this entanglement means an "interpenetration of 'real' and 'virtual' spaces of citizenship" (p. 45).

Consequently, Frau-Meigs et al.'s descriptions do not position technology as distinctly external to humans by, for example, highlighting citizens' use of technology. One possible exception is a remark that strategies for digital citizenship education needs to consider the "*harnessing* [of] the diversity of modes brought about by digital technologies" (p. 10, added emphasis), but only one such remark appears in the publication.

Overall, the primary focus is not on technology-using citizens, but on entanglements between humans and technology, where agency is one of mutual influence. While non-human entities are not discussed explicitly, it is possible to consider these as part of the entanglements, for example, artificial intelligence, which places demands on the knowledge and competences that citizens need.

4.3.2 Implications for citizens' knowledge and competences

The philosophical underpinnings of Frau-Meigs et al.'s conceptualization related to society and technology implicate certain knowledge and competences as important for citizens to exercise digital citizenship. Given the descriptions of socio-technical relations above with challenges and opportunities linked to digital technologies, citizens need preparation to "live, act and make choices" and be "able to participate in a democratic culture" (pp. 11, 45). Such preparation requires digital citizenship education that goes beyond technical skills, focusing on "transversal characteristics that incorporate ... values, skills, attitudes, knowledge and [a] critical understanding" (p. 51).

These transversal characteristics reflect a strive for balance between "'hard [technical] skills'" and "'soft skills'" (p. 39). For instance, Frau-Meigs et al. mention global citizenship education and "[p]articipation as a global citizen through the use of digital technologies" (p. 14). They also highlight the relationship between digital citizenship and competences described in other frameworks, for example, the Council of Europe's (2016) competences for democratic culture, which echoes the transversal mix of skills.

Education is described as important to ensure that young people develop knowledge and competences relevant to digital citizenship. In this context, Frau-Meigs et al. note that there are overlaps in the literature on digital citizenship education and media and information literacy. Digital citizenship education should therefore be plugged "into existing literacies [e.g., media and information literacy] rather than ... a special form of education" (p. 52). Moreover, relevant teacher training is important particularly "to ensure access, equity and social justice for all" (p. 38).

While formal contexts such as education are important for citizens' development of digital citizenship, particularly for young people of school age, "formal, non-formal and informal settings" are all relevant to digital citizenship formation (p. 46). Thus, a variety of educational contexts are important for citizens to develop digital citizenship to live, act, and participate in society. Together, these contexts contribute to citizens' development of relevant knowledge, hard and soft skills, and attitudes which include, for instance, engaging in lifelong learning and defending human rights.

4.3.3 Summarizing the analysis of Frau-Meigs et al. (2017)

In Frau-Meigs et al.'s conceptualization of digital citizenship, the aspects of philosophical underpinnings related to socio-technical relations discursively convey an understanding of digital technologies in society as entangled: a mesh of blurred boundaries between the physical, the digital, and the social, which impacts digital citizenship. As technology and the social are intertwined in mutual influence, agency becomes co-constitutive. This co-constitution indicates a multifaceted understanding of digital technologies which rejects, for example, attempts to describe technological

and social change in deterministic ways. Therefore, to exercise digital citizenship, it is important for citizens to develop transversal sets of relevant knowledge and competences that include technical skills, values, skills, and attitudes.

5 Discussion

To navigate the changing environments of digital citizenship toward a future yet to be, schoolteachers have a key role in helping young people develop digital competence and digital citizenship. To prepare new schoolteachers for this role, TEDs need PDC that includes relevant knowledge, competences, and a conceptual understanding to teach teaching for digital citizenship. However, there is a limited body of research on theorizing digital citizenship in relation to TEDs' PDC, particularly such that considers the role of socio-technical arrangements for digital citizenship in contexts of pervasive digital infrastructure. Also, while educational research has mapped approaches to the concept of digital citizenship (e.g., Choi, 2016; Heath, 2018; Richardson et al., 2021), few studies have critically analyzed the theories underpinning different conceptualizations (e.g., Mattson, 2016; Noula, 2019).

This post-pandemic juncture of "new normal" provides opportunities for critical discussions on how digital citizenship is theorized in relation to TEDs' PDC. To contribute to such discussions, this paper used a postdigital lens on digital citizenship to bring into focus and critically analyze aspects of philosophical underpinnings related to socio-technical relations, and based on this critical analysis, discuss potential implications for TEDs' PDC to teach teaching for digital citizenship.

The discussion is divided into three parts. First, it focuses on how conceptualizations of digital citizenship do more than highlight knowledge and competences important for citizens to develop. The second and the third part focus on potential implications for TEDs' PDC.

5.1 Conceptualizations of digital citizenship – more than knowledge and competences

In the analysis of aspects related to socio-technical relations, the focus was on human–technology relations, and the knowledge and competences that citizens need to exercise digital citizenship. Perhaps unsurprisingly, the analyzed publications by Ribble (2015), Choi (2016), and Frau-Meigs et al. (2017) define the concept of digital citizenship differently with diverse foci and emphases, which sometimes overlap. However, the results also showed that these conceptualizations do more than highlight what is important for citizens to exercise digital citizenship. Their philosophical underpinnings related to socio-technical relations discursively convey different understandings of, for example, technological development, human–technology relations, and contexts of importance for developing and exercising digital citizenship. These understandings impact what knowledge and competences citizens need to exercise digital citizenship.

For example, Ribble's conceptualization echoes the technological determinism currently prevalent in education and politics (cf. Jandrić & Knox, 2022) with a strong focus on human agency. This is a stark contrast to Frau-Meigs et al.'s more multifaceted understanding of socio-technical relations, which highlights entanglements of humans, the digital, and the physical, and it includes notions of co-constitutive agency. In this regard, the philosophical underpinnings of Frau-Meigs et al.'s conceptualization even reflect a postdigital lens (cf. Jandrić et al., 2018).

Another example concerns Ribble's and Choi's conceptualizations, where the results show a tendency to foreground human agency through their focus on technology-using citizens. However, like Frau-Meigs et al. above, Choi's conceptualization reflects a more multifaceted understanding of socio-technical relations despite the focus on technology users, and thus it sits somewhere between Ribble's and Frau-Meigs et al.'s conceptualizations. For example, whereas citizens in Ribble's conceptualization must respond to an inevitable drive of digital change, often in relation to employability, the philosophical underpinnings of Choi's conceptualization suggest a more dialectic view of socio-technical relations. This dialectic view opens for the possibility of citizens as co-drivers of social and technological change, which becomes complete in Frau-Meigs et al.'s "cycle of mutual influence" (2017, p. 41).

While people in TE and schools may have ideas about socio-technical relations already before engaging with the concept of digital citizenship, these conceptualizations, once deployed, convey understandings of socio-technical relations that shape notions of digital technologies and digital citizenship in specific ways, including how to teach for digital citizenship. In other words, notions of socio-technical relations are inseparable from teaching for digital citizenship, and these conceptualizations can shape such notions.

This is one of several reasons highlighted by this paper why critically engaging with conceptualizations of digital citizenship in TE and schools is important: if the ambition is to meaningfully consider the role of socio-technical arrangements for digital citizenship and the digital competence that citizens need to exercise digital citizenship (cf. Isin & Ruppert, 2020; Pangrazio & Sefton-Green, 2021), then the understandings of socio-technical relations need to be on par. To this end, which this paper has shown, a postdigital lens can be used to critically tease out and challenge underlying understandings of socio-technical relations, for example, determinist and human-centered narratives (cf. Fawns et al., 2023; Jandrić & Knox, 2022) in favor of messier and – in relation to teaching for digital citizenship – more meaningful views of socio-technical relations.

5.2 Implications for TEDs' PDC – TE policy a way forward?

The results also show that depending on which conceptualization informs TEDs' PDC, TEDs' teaching to teach for digital citizenship may become underpinned by philosophies that shape their practice accordingly (Table 2 in this paper; cf. Almås et al., 2021). These underpinnings could in turn impact future schoolteachers'

understanding of digital citizenship, including their understanding of socio-technical relations, which ultimately could shape students' opportunities to develop digital competence and digital citizenship. These results stress the significance of a PDC that includes a critical conceptual understanding of digital citizenship, which is important also in light of other studies that have indicated a need to deepen TEDs' and schoolteachers conceptual understanding of digital citizenship (Vajen et al., 2023; Örtegren, 2022).

For example, by drawing on Ribble's conceptualization in TE, young people in schools may ultimately develop digital competence and digital citizenship that include an understanding of digital technologies in society that is characterized by a strong focus on humans using technology *for* them. Consequently, young people may become ill-prepared to understand the opaque workings of pervasive digital infrastructure, such as datafication, algorithms, and artificial intelligence, and what technologies can do *with* or *against* them (cf. Hintz et al., 2019; Markauskaite et al., 2022; Vuorikari et al., 2022).

To combat such ill-preparedness, engaging with a postdigital lens can support TEDs' and in turn student teachers' development of PDC to include a critical conceptual understanding of digital citizenship. Such PDC could help to meaningfully consider digital citizenship in relation to its shifting environments, for example, the role of datafication and artificial intelligence (cf. Hintz et al., 2019). In other words, engaging with a postdigital lens in TE could help prepare future schoolteachers so that they can offer rich opportunities for students to develop digital competence and digital citizenship to engage critically with digital technologies (cf. Cervera & Caena, 2022; Vuorikari et al., 2022).

As the philosophical underpinnings of digital citizenship may not always be conducive to a deep conceptual understanding, this could indicate a need for TE policy to provide guidance that supports TEDs' PDC to teach teaching for digital citizenship. Such guidance could support TEDs who might be ill-prepared to teach teaching for digital citizenship given the inconsistencies in the paths toward becoming a TED and their opportunities for professional development (Cochran-Smith et al., 2020; European Commission, 2022). However, any policy initiative to this end would likely benefit from critical discussions on what conceptualization(s) of digital citizenship could meaningfully inform TEDs' PDC and thus their practice. Such discussions would be valuable given the narrow conceptual focus in educational research (cf. Heath, 2018; Richardson et al., 2021) and practice in TE and schools (Davis, 2020; Vajen et al., 2023; Örtegren, 2022).

Discussions on potential policy initiatives concerning digital citizenship in TE are also linked to fundamental questions, such as what the purpose of education is or should be. Such initiatives need to be preceded by careful considerations of what discourses and imaginaries they link to (cf. Jandrić & Knox, 2022; Rahm, 2021). Otherwise, there is a risk that TE is reduced to a means of reacting to perceived challenges related to digital citizenship, instead of stimulating "critical traditions of thought which in direct and indirect ways contribute to the resources which enable us to conceptualize the notion of citizenship and bring about its flourishing in any given society" (Annette & McLaughlin, 2005, p. 61).

5.3　Implications for dimensions of TEDs' PDC in in-flux environments

In parallel with increased TE policy support, this paper highlights a need for TEDs' knowledge, competences, and conceptual understanding of digital citizenship to span across all four PDC dimensions to teach teaching for digital citizenship. For example, TEDs' generic digital competence is important for basic skills and a conceptual understanding of digital citizenship while TEDs' subject-specific digital competence informs their didactic design when teaching to teach for digital citizenship. To further their knowledge in this field, TEDs also need relevant profession-oriented digital competence while transformative agency supports their ability to act purposefully in unforeseen situations in contexts of teaching and learning. As shown by this paper, when it comes to digital citizenship, what these dimensions of PDC ultimately include can be influenced by underlying notions of socio-technical relations. This influence is not necessarily unhelpful; it can help draw TEDs' attention to digital citizenship in meaningful ways. However, such influence on PDC may become problematic, for example, if conceptualizations promote notions of digital citizenship that poorly align with the role of schools to foster democratic citizens (cf. Heath, 2018; Mattson, 2016), or if they inadequately reflect the societal and temporal context (cf. Skantz-Åberg et al., 2022).

In this dynamic context, transformative agency could be a particularly important dimension of TEDs' PDC as "the environment for digital citizenship is in flux and is shaped by a complex interplay of forces, interests and public discourses" (Hintz et al., 2019, p. 82; cf. Isin & Ruppert, 2020). In teaching to teach for digital citizenship, TEDs constantly face new or unexpected situations, which they can turn into meaningful opportunities for teaching and learning through transformative agency.

However, if TEDs' PDC is to be responsive to such changing environments for digital citizenship (Skantz-Åberg et al., 2022), what may be even more important is that PDC has an in-flux character (Almås et al., 2021) with a certain degree of plasticity and temporality (Olofsson et al., 2021). For TEDs' PDC to evolve continuously, this may place demands on TE institutions to provide TEDs with relevant opportunities for continuous PDC development (Amhag et al., 2019; Instefjord & Munthe, 2017; Lindfors et al., 2021). Given TEDs' key role in preparing new schoolteachers for the fostering of democratic citizens (Raiker & Rautiainen, 2020), TEDs' professional development cannot be left to chance (cf. Cochran-Smith et al., 2020; European Commission, 2022). Again, this echoes the potential role of TE policy to provide further guidance.

Moreover, while the examples above frame TEDs' PDC primarily as something they have and can develop, a postdigital lens can offer other ways to understand PDC. It can shift the focus to the context of teaching, and how PDC is contingent on the shifting entanglements in which pedagogical activities are situated. Viewed through this lens, PDC includes considering how entanglements of, for example, humans, technology, social practices, democracy, and social justice are co-constitutive elements in the orchestration of teaching to teach for digital citizenship in ways that transcend immediate classroom contexts (cf. Fawns, 2022; Jandrić & Ford,

2022; Lamb et al., 2022; Markauskaite et al., 2023), which reframes TEDs' PDC holistically toward an ecological view.

Lastly, the results presented in this paper serve as a reminder that technology is inherently political (Jandrić & Knox, 2022) and entangled in sociocultural dimensions. Through political approaches, digital citizenship in education has often been linked to imaginaries of autonomous actors performing their citizenship and seeking self-development (Rahm, 2021). However, not recognizing the political nature of technology and its entanglement with sociocultural dimensions risks putting the responsibility on the citizen for self-improvement via educational institutions when, in fact, questions relating to digital citizenship must be connected to broader issues of injustice in society, such as digital infrastructure, datafication, and governance (Hintz et al., 2019; cf. Jandrić, 2021a; Jandrić & Ford, 2022). This highlights a need for TEDs to have robust PDC through which they can use their unique position to support student teachers to engage critically with digital technologies (cf. Krutka et al., 2022), which includes developing an understanding of the political nature of technology and its social implications in education and society.

6 Conclusions

In conclusion, this paper contributes to the literature on theorizing digital citizenship in relation to TEDs' PDC by using a postdigital lens to show how conceptualizations do more than highlight what is important for citizens to exercise digital citizenship. There is a risk that such conceptualizations – which could inform TEDs' PDC and practice – inadequately consider the role of socio-technical arrangements and pervasive digital infrastructure for digital citizenship. Therefore, the paper stresses the importance that TEDs' PDC includes relevant knowledge, competences, and a critical conceptual understanding of digital citizenship. Moreover, TEDs' PDC needs to have a certain degree of plasticity and temporality to support PDC responsiveness to the dynamic environments of digital citizenship.

As this paper is theoretical in nature, future research could explore examples of good practice when it comes to teaching to teach for digital citizenship. For example, in dialogue with the results presented here, practice-oriented research could contribute to a more informed understanding of TEDs' PDC, which could impact, for instance, the design of professional development programs for TEDs. Another important focus would be stakeholder activity in education, for example, focusing on education initiatives and policy development that may impact the way digital citizenship is conceptualized and taught in TE contexts.

Data availability Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Declarations

Competing Interests The author has no competing interests to declare that are relevant to the content of this article.

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