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New kid on the block? a conceptual systematic review of digital agency

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Abstract

The digitalisation of education has been emphasised over the last two decades, affecting and developing both the theories and practices of teaching and learning. Considering these developments, the need for addressing teachers' and students' digital competence has gained ground. In the last few years, the concept of digital agency has been noted in empirical and theoretical research – broadly focusing on the integration of information and communication technologies (ICT) in education. Nonetheless, how digital agency is understood and how it relates to the more established concept of digital competence remains unclear. To address this gap, we conducted a conceptual systematic review and examined the current state of the knowledge on digital agency. Specifically, we review the conceptualisations of digital agency, its underlying theoretical frameworks, and how it relates to digital competence and similar concepts. Database searches resulted in 32 publications, with the majority published in education and design journals and stemming from Scandinavian countries. Our findings show that out of 32 studies, only one aimed at defining digital agency explicitly. Nevertheless, for the last three years, digital agency has been more frequently used in the body of literature, emphasising the design and transformation of teaching and learning with technology towards a 'new normal' considering the post-pandemic era and lessons learned. Reviewing the extant body of knowledge on digital agency, we review the strengths and weaknesses of the concept and compare it to the more established notion of digital competence. Finally, we discuss implications for policy, research, and practice in education.

Keywords Digital agency · Digital competence · Digitalisation · Education · Conceptual systematic review

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1 Introduction

Over the last two decades, the concept of *digital competence* has been used in education and integrated into the compulsory curricula in many countries (Erstad & Voogt, 2018). Across curricula and frameworks, several components define its basic aspects, such as to 'access, manage, integrate and evaluate information, develop new understandings, create, and communicate with others' (Erstad et al., 2021, p. 78). Over time, the understandings and the content of digital competence have, however, been modified and revised to meet technological and societal developments (Siddiq et al., 2016). For example, when discussing the digital competence of teachers, student teachers, and teacher educators, the term professional digital competence (PDC) is often used to refer to how teachers' use digital technologies for teaching and learning and facilitate the development of their students' digital competence (Røkenes et al., 2022; Røkenes & Krumsvik, 2016).

Recently, another seemingly related concept, *digital agency*, has been used in theoretical and empirical studies focusing on technology in education and particularly the design of teaching and learning (Aagaard & Lund, 2019; Brevik et al., 2019). While digital agency has rarely been defined explicitly, several studies have used it interchangeably with other concepts, such as transformative agency or teacher agency. However, the concept of *agency* has a long standing in education and refers to 'the capacity of human beings to shape circumstances in which they live' (Emirbayer & Mische, 1998, p. 965).

During the COVID-19 pandemic and the respective lockdowns of educational institutions, the need for 'digital competence' to adequately teach and learn in different contexts (e.g., online, blended, hybrid, asynchronous, synchronous) became apparent (Brehm et al., 2021). The pandemic revealed huge variations in how prepared teachers considered themselves to be for online teaching and underscored the necessity for developing students' and educators' digital competence (Howard et al., 2020; Scherer et al., 2021). Moreover, as part of the post-COVID-19 discussions, several scholars have questioned the lessons learned from the pandemic (Cukurova et al., 2023) and what will be 'the new normal' state of education in the future. An example of such a discourse is the special issue this paper is a part of which focuses on the critical and emergent issues regarding *Digital competence and 21st century skills in education* (Siddiq et al., 2023).

In this paper, we aim at identifying the understanding and use of digital agency, comparing it with digital competence. Moreover, we discuss the potential of and the needs for digital agency as a theoretical lens in policy, research, and practice to conceptualise teaching with technology in the post-pandemic era. We discuss the need for novel theoretical perspectives on teachers' and students' use of technology as part of a 'new normal' considering the post-pandemic period and lessons learned to better prepare for teaching and learning in the digital era and cope with unforeseen situations. To contribute with such knowledge, we conducted a conceptual systematic review, a method that can potentially result in a theoretical contribution which emphasises refining, re-conceptualizing, and providing insights into the strengths and weaknesses of a phenomenon (Hulland, 2020). In other words, we aim at collating and distinguishing digital agency from other related concepts that might be misla-

belled or confused with digital agency. This includes showcasing conceptual similarities and differences to revise and reconfigure existing conceptual understandings and circumvent possible 'jangle fallacies' (i.e., situations in which different labels are used for similar constructs). By highlighting gaps, inconsistencies, connections, and insights across existing studies, we attempt to present a new understanding of digital agency and interrelated concepts by creating 'common ground on which to build a new and enhanced conceptualization' (Jaakkola, 2020, p. 21). In sum, we aim at contributing to existing theory by unpacking the understanding of digital agency, how it relates to the concept of digital competence, and how it can contribute to theory, practice, and research in the future.

2 Theoretical background

2.1 Agency

Researchers within the field of educational research oftentimes use the concept of agency as an analytical category, frequently building on the seminal work by Emirbayer and Mische (1998). The authors reconceptualised agency as 'a temporally embedded process of social engagement, informed by the past (in its habitual aspect), but also oriented towards the future (as a capacity to imagine alternative possibilities) and towards the present (as a capacity to contextualize past habits and future projects within the contingencies of the moment)' (Emirbayer & Mische, 1998, p. 963). In other words, they considered agency as 'the capacity of human beings to shape circumstances in which they live' (p. 965). Emirbayer and Mische relied on Dewey's work and saw agency as having a temporal dimension which is projective (future oriented) but also towards the present and the past. In a special issue on agency, Mäkitalo (2016) further outlined the transformative dimension of agency introduced by Emirbayer and Mische as 'the capacity of humans to distance themselves from their immediate surroundings and it implies recognition of the possibility to intervene in, and transform the meaning of, situated activities' (p. 64). Further, several scholars have reviewed or operationalised different conceptualisations of agency in various contexts, including, for example, student agency (Stenalt & Lassesen, 2022; Vaughn, 2020), teacher agency (Cong-Lem, 2021; Priestley et al., 2015), relational agency (Edwards, 2017), professional agency (Eteläpelto et al., 2013), and transformative agency (Lund & Vestøl, 2020; Aagaard & Lund, 2019). Our review focuses on the theoretical concept of digital agency, which has, to the best of our knowledge, yet to be examined in a full systematic literature review.

2.2 Digital agency

In their theoretical paper titled *Digital agency: Empowering equity in and through education*, Passey et al. (2018) presented one of the first conceptualisations in the research literature of the term digital agency. The authors proposed the following definition: 'Digital Agency (DA) – consisting of digital competence, digital confidence and digital accountability – is the individual's ability to control and adapt to a

digital world' (Passey et al., 2018, p. 426). The authors argued for the need for digital agency among all individuals to guarantee the power of freethinking as the world is progressively filled with increasingly pervasive technologies, where 'technologies are developed and managed by specific individuals, companies or corporations and then "given to" and used by other individuals' (Passey et al., 2018, p. 426). Against this backdrop, they raised the question of 'whether technology controls us (technological determinism) or whether we as individuals shape new technologies as we use and interact with them (social shaping of technology)' (Passey et al., 2018, p. 426). This definition emphasises change and transformation and is framed in a way of 'empowering people to deal with new technologies so that they feel they have roles in how they adopt, adapt to and use them wisely and responsibly' (Passey et al., 2018, p. 427). The authors unpacked several terms, including digital competence, digital confidence, and digital accountability when conceptualizing digital agency. In doing so, the authors underscored the need to move beyond foundational skills (literacy, numeracy, knowledge, and critical thinking), referring to other aspects such as a need for English language proficiency on the internet; ensuring digital equity by enabling producer and consumer activities; building digital confidence by closing the digital divide in inequality of access and engagement; and promoting digital wellbeing, knowledge, and responsibility. Passey et al. (2018) developed a model of digital agency, as shown in Fig. 1, which presents digital agency as encompassing digital accountability, digital confidence, and digital competence. Moreover, in their article, they provided a detailed discussion and another figure addressing the challenges related to digital agency.

While digital agency may not have been fully conceptualised in the literature, there are certain features that apply, in particular to digitalisation *in* and *of* learning and teaching. One such feature is the increasingly agentic dimensions found in

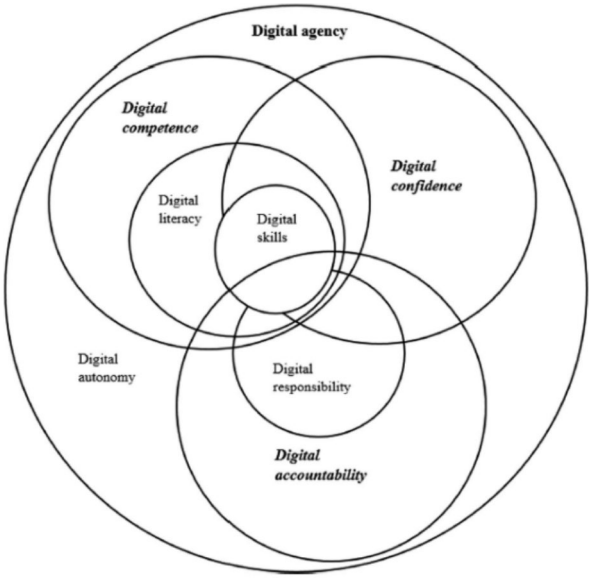

Fig. 1 Proposed relationships of terms related to digital agency (Passey et al., 2018, p. 427)

Proposed relationships of terms related to digital agency

the algorithms and sheer computational force found in digital resources (Lund & Aagaard, 2020; Ågerfalk, 2020). From being introduced as tools that can provide infrastructure and routinised operations (spreadsheets, word processors, databases) that can potentially make learning and teaching more effective, digital resources progressively became integrated as partners in problem solving, hypothesizing, and creative activities. Although agency still resided with the actors, the relationship between actors and digital artefacts increasingly materialised as distributed agency (Shaffer & Clinton, 2006). With gradually more sophisticated artificial intelligence, powerful algorithms, and neural networks, digital resources can greatly influence or even override human decisions (diagnoses in medicine, self-driving cars avoiding crashes, decisions on fiscal policies, learning analytics for adaptive and personalised learning; Ågerfalk, 2020). For education, we can identify fundamental changes in epistemologies and epistemic practices; how we come to knowledge and by what resources (e.g., ChatGTP) are constantly evolving (Facer, 2011; Lund & Aagaard, 2020). Thus, the question of agency is pressing when learning, teaching, and living in digitalised environments becomes more than an issue of competence. In contemporary society, it is not enough to be able to handle and master progressively more sophisticated and generative technologies (Karanasios et al., 2021). Increasingly, such actions require an agency that is not merely dependent on skills or intelligence but also human consciousness and capacity for reflection (Tegmark, 2017).

In addition to the epistemological dimensions, there is a massive corporate push to introduce and sell digital applications to the educational sector – from applications for the individual to platforms and infrastructure for meso- and macro levels (Teräs et al., 2020). This particular issue is beyond the scope of the current paper but adds to the necessity of examining human agency and not merely the adoption of and adaption to digitalised environments. It follows that both learners' and teachers' roles and identities change with increased agency.

In the current review, we use the trends identified above as a backdrop when examining how digital agency is articulated and conceptualised in the studies included in this conceptual systematic review.

2.3 Digital competence and related concepts

There are numerous concepts describing how people acquire, use, adapt to, and learn with technology. Digital competence, computer and information literacy, digital skills, information, and communication technology (ICT) literacy, technological fluency, and new media literacy are examples of such concepts (Spante et al., 2018), which are frequently used in educational research and policy to describe what is needed of citizens to 'benefit from digital tools and media' (Ala-Mutka, 2011, p. 5). Acknowledging the different concepts and their theoretical backgrounds and underpinnings, scholars have agreed that they are oftentimes interchangeably used, converge to a large degree, and include many of the same aspects and/or domains, such as using digital resources in a critical way for leisure, work, communication, and learning (Erstad et al., 2021; Calvani et al., 2012; Siddiq et al., 2016; Lund et al., 2019; Voogt & Roblin, 2012). Hence, in this paper, we refer to the concept of digital competence as synonymous with digital literacy, ICT literacy, and digital skills.

In 2006, the European Commission identified digital competence as one of the critical skills needed for the future and developed the *Digital Competence Framework for Citizens* (DigComp) (Ferrari, 2013). This framework defined digital competence as 'the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society' (Vuorikari et al., 2022, p. 1). The DigComp framework structures digital competence by specifying five levels with increasing conceptual resolution. First, it outlines five competence areas: (1) information and data literacy, (2) communication and collaboration, (3) digital content creation, (4) safety, and (5) problem solving. Second, within each of the five competence areas, three to six competences are described (for an overview, see Table 1). The third level in DigComp formulates a discrete number of proficiency levels for each competence, while the fourth level outlines examples of knowledge, skills, and attitudes applicable to each competence. The last and fifth level provides examples of cases on the applicability of the competences to different contexts.

The framework emphasizes that the first three competence areas contain competences that can be traced back to specific activities and uses (Vuorikari et al., 2022, p. 7). Moreover, areas 4 and 5 (safety and problem solving) are highlighted as 'transversal' given that they apply to any type of activity carried out through digital means. Also, the framework accentuates that 'elements of Problem solving, in particular, are present in all competences, but a specific area was defined to highlight the importance of this aspect for the appropriation of technology and digital practices' (p. 7). Hence, the competence area of problem solving along with digital content creation (in par-

Table 1 DigComp: A framework for developing and understanding digital competence in Europe

Competence areas (Level 1)	Competences (Level 2)
1. Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
2. Communication and collaboration	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3. Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licences 3.4 Programming
4. Safety	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being
5. Problem solving	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technology 5.4 Identifying digital competence gaps

ticular, competences 3.1 developing digital content and 3.2 integrating and re-elaborating digital content) accentuates the need for agency. The students are expected to not only be able to use technology but also review, revise, and transform the use of technology to reach certain goals.

2.4 PDC

Accompanying the focus on students' digital competence and the inclusion of digital competence in the compulsory K–12 curricula in many Western countries (Arstorp, 2021; Siddiq, 2018; Starkey, 2020), the emphasis on teachers' and educators' PDC has gained increased attention (Instefjord & Munthe, 2017; Lund et al., 2014; Skantz-Åberg et al., 2022; Røkenes and Krumsvik, 2014, 2016). In an educational context, PDC 'explicitly focuses on the requirements of using digital technology in the teaching profession' (Røkenes et al., 2022, p. 47) in addition to the aspects/dimensions/competence areas within the digital competence frameworks. According to Krumsvik (2011), PDC can be understood as the 'teacher/teacher educator's proficiency in using ICT in a professional context with good pedagogic-didactic judgment and his or her awareness of its implications for learning strategies and the digital Bildung of pupils and students' (Krumsvik, 2011, pp. 44–45). This understanding is echoed by Lund et al. (2014), who argued that 'we need to move away from understanding digital competence as a set of generic skills suitable for all situations, both personal and professional, and toward an understanding of PDC that includes both generic and specific teaching-profession skills' (Lund et al., 2014, p. 283).

Several models, tools, and frameworks have been developed to outline and describe teachers' pedagogical and professional use of digital technology for teaching and learning (i.e., teachers' PDC), including the Technological, Pedagogical, and Content Knowledge (TPACK) framework (Koehler & Mishra, 2009), DigCompEdu (Redecker & Punie, 2017), the PDC Framework for Teachers (Kelentrić et al., 2017), the Teacher Digital Competency (TDC) framework (Falloon, 2020), and the Pedagogical, Ethical, Attitudinal, and Technological (PEAT) model (McDonagh et al., 2021). Including, describing, and discussing in full all possible frameworks that can be related to teachers' PDC is beyond the scope of this paper. Instead, three of the frameworks will be elaborated on here (TPACK, DigCompEdu, and the PDC Framework for Teachers) and discussed in terms of how they promote aspects concerning digital agency.

A highly cited model in educational technology research, the TPACK framework builds on Shulman's (1986) seminal work on pedagogical content knowledge (PCK) and describes 'how teachers' understanding of educational technologies and PCK interact with one another to produce effective teaching with technology' (Mishra & Koehler, 2006; Koehler & Mishra, 2009, p. 62). The framework presents teachers' knowledge as consisting of three main components: content, pedagogy, and technology (Mishra & Koehler, 2006). The authors underscore 'the interactions between and among these bodies of knowledge, represented as PCK, TCK (technological content knowledge), TPK (technological pedagogical knowledge), and TPACK' (Koehler & Mishra, 2009, p. 62). TPACK thus emerges as a form of knowledge that goes beyond

the core components of the model and is the foundation for effective teaching with technology.

Another widely used framework is DigCompEdu, which was developed as a response to 'the growing awareness among many European Member States that educators need a set of digital competencies specific to their profession in order to be able to seize the potential of digital technologies for enhancing and innovating education' (Redecker & Punie, 2017, p. 8). The framework consists of three overarching levels of digital competence (educators' professional competences, educators' pedagogic competences, and learners' competences) and is divided into six areas with underlying competencies: (1) professional engagement, (2) digital resources, (3) teaching and learning, (4) assessment, (5) empowering learners, and (6) facilitating learners' digital competence. The framework is designed as a 'progression model to help educators assess and develop their digital competence' (Redecker & Punie, 2017, p. 9) and bears many similarities to the DigComp framework (Table 1).

Focusing on PDC in the Norwegian educational context, the PDC Framework for Teachers gives suggestions of what should be demanded of a digitally competent and confident teacher (Kelentrić et al., 2017). The framework aims at supporting professional development and actual practice in the teaching profession and is divided into seven main areas, including subject and basic skills, school in society, ethics, pedagogy and subject didactics, leadership of learning processes, interaction and communication, and change and development.

Of relevance for educational research is the entanglement of and relations between digital competence and digital agency. Thus, the myriad of terms, concepts, and frameworks invites a systematic examination of how digital agency appears in the scholarly literature and how it is conceptualised and operationalised. Note that the focus in this conceptual systematic review is on the concept of digital agency, while digital competence provides the theoretical lens and framework which digital agency relates too as shown in this section.

2.5 The present study

The current study presents a conceptual systematic review of digital agency. Digital agency is currently emerging in the literature to seemingly describe the 'new normal' in teaching and learning as one aspect of the critical and upcoming issues in an increasingly digitalised society and the post-pandemic era. This study does not aim to present a comprehensive, exhaustive, or definitive review. However, it intends to capture a process of conceptual development in research and practice – how the change in relationships between actors and digital artefacts and resources makes researchers and practitioners look for ways to theorise this relationship. Also, while much of the research referred to coincides with COVID-19 and efforts to digitalise education in online settings, the role of the pandemic is not explicitly referred to in the studies reviewed. Consequently, this study does not examine any potential correspondence or causality while acknowledging that there may be a connection (see the overview below). The research questions (RQs) and the results of the review must be understood against this backdrop.

The present study addresses the following RQs:

RQ1 What are the characteristics of studies on the concept of digital agency in education?

RQ2 How is the concept of digital agency conceptualised, and how does it align with digital competence and related concepts?

RQ3 How is the concept of digital agency operationalised, and what types of RQs or aims are typically addressed in studies focusing on this concept?

3 Method

We performed a conceptual systematic review to address our RQs. A conceptual review 'aims to reconcile and then extend past research in a particular domain in a meaningful, conceptual way' (Hulland, 2020, p. 28). This type of review can be used to 'present theoretical syntheses (e.g., theoretical reviews, integrative frameworks), develop completely new ideas (e.g., novel theories, propositional inventories, analytical models of unexplored phenomena), or direct attention to substantive domains that have not yet received adequate attention' (Yadav, 2010, p. 5).

Our conceptual review followed the key criteria for systematic reviews (Gough et al., 2017), using criteria for inclusion and exclusion to increase transparency and reduce bias and the risk of cherry-picking evidence to fit an agenda. Moreover, we followed the five steps for best practice when conducting conceptual reviews as suggested by Hulland (2020). These include: (1) establishing the scope of the domain under review, (2) integrating and synthesizing extant knowledge within the domain, (3) resolving inconsistencies, (4) highlighting gaps in the existing literature, and (5) setting an agenda for future research. Accordingly, in the initiation of this project, a search protocol was developed describing the aim, RQs, inclusion and exclusion criteria, the search strategy, and an overview of which databases to search within. In the following sections, we describe the application of these steps.

3.1 Literature search

We developed a search protocol including two primary search terms – digital agency and education. Synonyms and alternative terms and expressions widely used in the literature for each search word were identified and resulted in the following search:

- *Digital agency*: 'digital agenc*', OR 'ICT agenc*', OR 'technolog* agenc*', OR 'agent*'.

- AND*Education*: education*, OR school*, OR primary, OR 'teaching and learning', OR secondary, OR college*, OR higher*, OR universit*, OR teach*, OR pupil*, OR student*, OR learn*.

We combined these search terms using the Boolean expression AND between the key words and OR between the synonymous or related words in three databases: Scopus, ERIC, and ProQuest. We also screened the first 200 search hits in Google Scholar using the abovementioned keywords as well as searched for relevant publications on ResearchGate for possible grey literature and studies potentially not captured by the database searches.

The search process was conducted between February and May 2022. The initial search yielded 528 publications, and 19 duplicates were removed, leaving 509 cases for title and abstract screening. Figure 2 provides an overview of the search process through the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement flow diagram (Page et al., 2021).

3.2 Eligibility criteria and screening

Eligibility criteria were pre-defined as part of creating the protocol for this systematic review and applied to the primary screening of the abstracts and titles. Studies were included if they met the following criteria:

1. Published between 1 and 2000 and 1 June 2022;
2. Published in English, German, or a Scandinavian language (Danish, Norwegian, or Swedish);
3. Published as a conference proceeding, report, book, thesis, or paper in a refereed journal;
4. Contained references to digital agency (or one of the synonymous concepts as described above); and.

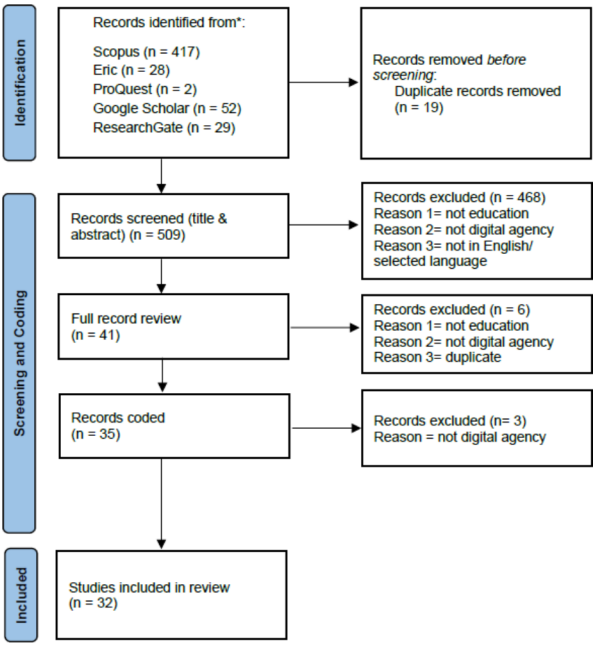

Fig. 2 Flow chart (PRISMA) describing the selection process. 'Not education' = studies excluded because they were not in the field of education; 'Not digital agency' = studies excluded because they did not explicitly refer to the concept of digital agency or similar concepts

5. Conducted in an educational context.

We allowed for the inclusion of studies in one of the five languages as described above because these are the languages the authors are fluent in and could be included without any additional translation.

Studies were excluded if they focused on agency in general or other types of agency, such as teachers' or students' agency; ICT use or technology integration in general; or solely digital competence, digital literacy, or similar concepts.

3.3 Data extraction, coding, and analysis

The initial screening of titles and abstracts (N = 509) was conducted by the first and the second authors. Studies that did not fit the inclusion criteria were removed, resulting in 41 studies. Full texts were divided among all the authors and screened and coded following a coding scheme which was developed to extract the most relevant information for answering the RQs posed. Another six studies were excluded (Fig. 2) because they either were not in the educational context, not addressing digital agency, or duplicates. Thus, 35 included papers were coded for background information (e.g., author, year of publication, journal, type of publication), the context of the study (e.g., educational level, focusing on students and/or educators), and other relevant data (e.g., research aims and questions, methods used, population, theoretical lens or framework applied).

During this process, yet another three papers were identified as not addressing digital agency as a concept but rather digitalisation or technology and agency more generally. A total of 32 papers were included in the final review (Fig. 2), composing the data in the study. These were analysed, summarised, and synthesised.

To approach our second RQ (the conceptualisation of digital agency and how it aligns with digital competence and related concepts), we first coded the extent (frequency) and depth of coverage of the concept. For identifying the extent to which and depth that the concept of digital agency (and synonymous terms) was used in the studies, we coded (1) the frequencies of the concept mentioned and (2) the extent to which it was covered in the study using four categories on an ordinal scale: 1 = no information, 2 = passing reference, 3 = brief discussion, and 4 = applied/detailed discussion. This coding process aimed at identifying and presenting values based on the information reported in the paper. The first two categories (no information and passing reference) were used for studies which only mentioned the concept and/or provided a shallow reference without further explaining, defining, or describing the key concept. The third category, brief discussion, was used when a definition or description of the concept was provided. Finally, the fourth category (applied/detailed discussion) was used for papers which in addition showed how the concept was applied and/or included a detailed discussion.

To address our third RQ (operationalisation of the concept of digital agency and RQs/aims addressed), we identified the verbs that were used in the aims and/or RQs in connection with digital agency, competence, skills, and transformation. This preliminary step amounts to using verbs as a heuristic – a mental shortcut (Bellur &

Sundar, 2014) to probe what kind of research-oriented actions were indicated in the studies included in the review.

Each study was coded by two researchers independently, and the coding converged to a large extent. In cases of disagreement, both researchers together with the rest of the team went through the coding together and discussed until agreement was reached.

We conducted a thematic analysis across the papers to identify and collate overarching themes and underlying theoretical/conceptual nuances. Braun and Clarke's (2006) six-step process to thematic analysis was used across the papers, including data familiarisation, generating codes, searching for themes, reviewing themes, defining themes, and producing reports.

4 Results

4.1 RQ1. What are the characteristics of studies on the concept of digital agency in education?

4.1.1 Country and year of publication

Our sample consisted of a diverse set of studies, as reflected in the overview in Table 2. The studies were set in a range of international locations with evidence of more empirical work in the Scandinavian context (especially Norway, N = 15), followed by the US and Australia. Notably, only one study was conducted outside Western societies, in India.

Our overview of the year the studies were published (Table 2) shows that most of the studies (N = 22) were published between 2020 and May 2022 (i.e., the latter is when the database searches were finalised). Eight studies were published between 2017 and 2019, and only one was *published* in 2016 and one in 2009. The publication years clearly showcase that the concept of digital agency has found its way into the literature in recent years. Notably, many of the studies are conducted around the time of the COVID-19 pandemic, which to a great degree demanded a transition to online and/or blended learning (Scherer et al., 2021).

4.1.2 Educational level and study design

As shown in Table 2, most studies were conducted in higher-education settings (N = 19), in particular teacher education. Only five focused on primary and secondary school contexts and one on early childhood education. Furthermore, two studies had a mixed method design (including both empirical and theoretical research designs). The number of empirical studies (N = 20) preceded the mere theoretical studies (including conceptual or literature reviews, curriculum, or other document analysis) (N = 10). This might suggest the nascent nature of the still-developing field of the digitalisation of education and a critical need for updated theoretical lenses for studying these phenomena.

Table 2 An overview of the studies included in the conceptual systematic review

Author	Year	Country/ region[a]	Design[b]	Educational level[c]	Concept used[d]	No. times[e]	Depth of use[f]
Brox	2017	Norway	Emp	HE	Techn. agency	2	3
Engeness et al.	2020	Norway	Emp	HE	Transf Dig. agency	18	4
Engeness & Nohr	2020	Norway	Emp	HE	Transf Dig. agency	15	4
Ganduri et al.	2021		Theo	HE	Digital agency	21	4
Goriss-Hunter et al.	2021	Australia	Emp	Secondary	Digital agency	31	4
Knussen & Agnew	2022	Australia	Emp	HE	Digital agency	33	4
Passey et al.	2018		Theo	NR	Digital agency	>20	4
Schrum	2022	US	Emp	HE	Digital agency	7	4
Sherman	2016	US	Emp	HE	Techn. agency	>30	4
Stenalt	2021		Theo	NR	Digital (student) agency	7	3
Sultan	2020	Sweden	Emp	Primary	Techn. agency	1	1
Turja	2009		Theo	Early childhood	Techn. agency	2	1
Aagaard & Lund	2019	Norway	Mix		Digital agency	4	2
Lund & Aagaard	2020	Norway	Mix	HE	Transf Dig. agency	4	4
Brevik et al.	2019	Norway	Emp	HE	Transf Dig. agency	5	4
Albion & Tondeur	2018		Theo		Digital agency	1	2
Blankenship	2020	US	Emp	HE	Digital agency	2	2
Blankenship	2019a	US	Emp	HE	Digital agency	2	2
Blankenship	2019b	US	Emp	HE	Digital agency	3	2
Dabbagh & Castaneda	2020		Theo	NR	Digital agency	2	2
Aagard et al.	2022	Norway	Emp	HE	Transf Dig. agency	1	2
Nagel	2021	Norway	Theo	HE	Transf Dig. agency	7	3
Brynildsen et al.	2022	Norway	Emp	1–12	Transf Dig. agency	7	3
Almås et al.	2021	Norway	Emp	HE	Transf Dig. agency	2	3
Bader et al.	2021	Norway	Emp	HE	Transf Dig. agency	4	3
Singh & Engeness	2021	Norway	Emp	HE	Digital agency	1	2
Marin et al.	2020		Theo	HE	Transf Dig. agency	1	2
Tveiterås & Madsen	2022	Norway	Theo	HE	Transf Dig. agency	8	3
Stigberg et al.	2022	Norway	Emp	HE	Transf Dig. agency	1	2
Arnesen et al.	2017	Norway	Emp	Secondary	Digital agency	27	2

Table 2 (continued)

Author	Year	Country/ region[a]	Design[b]	Educational level[c]	Concept used[d]	No. times[e]	Depth of use[f]
Anand & Lall	2021	India	Emp	1–12	Digital agency	18	3
Hunter & Costello	2021		Theo	all	Digital agency	16	4

a Country/region. Reporting of specific countries or a region in which the study was conducted or to which the analysis and findings primarily applied. The field is left blank if not specified or not relevant (e.g., theoretical study). b Educational level. Early childhood education; primary and/or secondary (grades 1–12); higher education; training/adult; multiple

c Overall design of study. Emp=Empirical studies; Theo=Theoretical studies including conceptual or literature reviews or curriculum or other document analysis; and Mix=mixed methods studies, including both empirical and theoretical design

d Concept used. Digital agency; technological agency; transformative digital agency; other

e No. times the concept is mentioned excluding instances in keywords and reference lists

f Depth of use of the concept. 1=no information; 2=passing reference; 3=brief discussion; 4=applied/ detailed discussion

4.1.3 Publication types and channels

Table 3 gives an overview of the publication channels (i.e., journals, books, conference proceedings) and types (i.e., article, book, report, thesis) used in the studies included. As shown in the table, most studies on digital agency are published in educational technology journals and books. Also, most studies are published as journal articles (N=23), followed by five book chapters, one book, two conference proceedings, and one unpublished PhD thesis. None of the studies included in this review were a report or policy document.

4.1.4 Summary of results on RQ1

In sum, our pool of studies were mostly conducted in Western contexts and in higher education and published as journal articles. Furthermore, the number of empirical studies was larger than theoretical studies. Apparently, the empirical work in this field seems to be driving the field, in particular during the last three years, while the theoretical aspects lag.

4.2 RQ2. How is the concept of digital agency conceptualised, and how does it align with digital competence and related concepts?

4.2.1 Concepts and depth of use

As shown in Table 2, three main concepts are used in the literature to connote digital agency. Fifteen studies used the concept of digital agency, and surprisingly a quite large number used the concept transformative digital agency (N=12), followed by technological agency (N=4) and digital student agency (N=1). The latter study (Stenalt, 2021) also used digital agency, provided a definition of it, and discussed that such framing of digital agency 'pays little attention to agency in education and how the digital affects humans' (p. 53) to continue using digital student agency.

Table 3 Overview of publication channels and publication types

Publication channels	N
Journal	
Nordic Journal of Digital Literacy	3
Nordic Journal of Comparative and International Education	3
Technology, Knowledge and Learning	2
Cultural-Historical Psychology	2
Policy Futures in Education	1
Irish Educational Studies	1
Arts and Humanities in Higher Education	1
Frontline Learning Research	1
Design and Technology Education	1
International Journal of Technology and Design Education	1
Teaching and Teacher Education	1
Educational Technology Research and Development	1
Italian Journal of Educational Technology	1
Interaction Design and Architecture(s) Journal – IxD&A	1
Digital Culture & Education	1
NORRAG – Network for International Policies and Cooperation in Education and Training	1
Journal of Educational Informatics	1
Publication types	
Articles	23
Book chapters	5
Books	1
Conference proceedings	2
Unpublished thesis	1

For identifying the extent to which and depth that the concept of digital agency (note that this includes transformative digital agency and technological agency) was used in the studies, we coded (1) the frequencies with which the concepts were mentioned and (2) the extent to which it was covered in the study using four categories.

As shown in Tables 2 and 12 out of the 32 studies were classified as having a significant focus on digital agency (coded as 4 = applied/detailed discussion), whereas in eight studies, evidence of digital agency was brief (coded as 3 = brief discussion), typically, for example, only mentioned without defining and/or applying the notion of digital agency in the study. In 12 cases, the link with digital agency was quite weak, for instance, typically mentioning the concept of digital agency without exploring or defining it (coded as 1 = no information) or mentioned the concept as a passing reference, such as in the introduction or the discussion (coded as 2 = passing reference). These findings were also mirrored by the frequencies with which the concept was mentioned in the papers, revealing similar patterns (see Table 2).

4.2.2 Conceptualisations of digital agency

As shown above, three main concepts (i.e., technological agency, digital agency, and transformative digital agency) were used in the literature – interchangeably or in similar ways. This requires further investigations of the concepts to identify their definitions and origins and the extent to which and how they converge. Therefore, we will first briefly present the conceptualisation of each, including reflections on how it resonates with digital agency before we provide a summary and our synthesis of their convergence.

4.2.3 Technological agency

Four studies used the concept of technological agency. In three studies (Brox, 2017; Sultan et al., 2020; Turja et al., 2009), this concept is mentioned one to two times (see Table 2) and quite briefly covered. Therefore, an in-depth conceptualisation is lacking.

In Brox (2017), technological agency is understood as the agency of the technology as opposed to human agency. This was evident from the following two passages in the paper: 'The article discusses how and why teacher education should encourage a deeper understanding of technology, in which both human and technological agency are explored and problematized' (p. 129); and 'It has left teacher education with little room to raise important discussions about technology and about the ways technologies and forms of technological agency might work upon the conduct of human actors. For instance, how and where should it be addressed that technologies (both digital and non-digital) possess their own material properties that shape and alter "content" and that predispose what can be done with and against them?' (p. 131).

In Sultan et al. (2020) and Turja et al. (2009), the concept of technological agency has not been clarified, explained, or defined. However, it was used in relation to the digitalisation of primary and early childhood education, digital competence, and acting agentic. Notice that this is our interpretation based on the few mentions and the context of the studies.

Sherman (2016), in his unpublished PhD dissertation, provided an elaborate exploration of technological agency and used it together with ideologies of technology as conceptual lenses to study three instructors' relationship to technology by 'reinterpretation of technological artifacts through the discovery of new affordances' (p. 3). Sherman explained technological agency as 'a person's perceived ability to interpret or reinterpret a technology, and to act with that technology based on that interpretation' (p. 39) and continued addressing the intentions of the designer of the technology, the properties of a particular artefact, and the individual's interpretation of it. Technological agency 'is not posited as a capacity, much less an essential and unchangeable property of a person. Rather, like ecological models of agency, technological agency manifests in context, and so can differ from context to context, technology to technology' (p. 39). Thus, Sherman's explanation of technological agency resonates with Passey et al.'s (2018) definition of digital agency. However, at the end of this passage, he states that 'This conception of agency emphasizes that it is not something to be granted or a skill to be trained, but rather something to be

encouraged through the establishment and maintenance of favorable conditions' (p. 39). This last part diverges from other studies focusing on digital agency, in which at its core is the training of or at least experience with technology in situ, emerging from the need to change a path or practice. Seemingly, Sherman emphasises the external factors, while the literature on agency weights the need for change/solving a problem or a dilemma; in other words, a connection and/or relation between the external and internal factors were emphasised (Emirbayer & Mische, 1986; Mishra & Koehler;, 2009; Aagaard and Lund, 2019; Brevik et al., 2019).

4.2.4 Digital agency

Most studies (N = 16) included in this review used the concept of digital agency. A first look into the studies showed that eight studies had only a brief mention of digital agency (see Table 2) and did not apply digital agency as the core term. There are several reasons for this. For instance, three studies mentioned the concept of digital agency when discussing the results of the study (e.g., Arnesen et al., 2017; Dabbagh & Castaneda, 2020; Schrum, 2022), while another two used it in the title (Blankenship, 2019a; Aagaard and Lund, 2019) but not in the body of the text. However, these studies aligned with the other studies in the pool in that they addressed the needs for transformative agency, digitalisation, and (professional) digital competence. Aagaard and Lund's book (2019) addressed the issues related to digitalisation and epistemological changes brought by this, further discussing transformative agency along with other perspectives (e.g., affordances, double stimulation) to overcome such challenges.

Eight studies provided a brief discussion of digital agency (Anand & Lall, 2021; Stenalt, 2021; Ganduri et al., 2021; Goriss-Hunter et al., 2021; Knussen & Agnew, 2022; Passey et al., 2018; Schrum, 2022; Hunter & Costello, 2021). Passey et al. (2018) elaborated on the concept of digital agency and provided the most cited definition of digital agency along with elaborate theoretical views on its importance and relations to other key co-existing concepts. Eleven of the 16 studies defined digital agency referring to Passey et al. (2018, p. 426, see previous section on digital agency).

We note that Hunter and Costello's (2021) study is a commentary on the Passey et al. (2018) article supporting the notion of digital agency.

4.2.5 Studies expanding the digital agency definition of Passey et al. (2018)

Three studies (Stenalt, 2021; Goriss-Hunter et al., 2021; Knussen & Agnew, 2022) discussed and expanded the definition of digital agency. Acknowledging the definition of Passey et al. (2018), they stated a need for a new or revised definition. For instance, Stenalt (2021) argued that 'studies that focus on digital agency (Passey et al., 2018; Shonfeld et al., 2017) emphasize agency as a requirement for and through education. More specifically, digital agency refers to having the necessary digital competencies, digital confidence, and digital accountability to control and adapt to the digital world as an individual. However, this framing of digital agency pays little attention to agency in education and how the digital affects humans' (p. 53). Building

on media research and student agency research, the article proposes a framework for digital student agency that distinguishes five critical domains of student agency in digital contexts: 1) agentic possibility, 2) digital self-representation, 3) data uses, 4) digital sociality, and 5) digital temporality.

Goriss-Hunter et al. (2021) argued that digital agency is a subset of student agency and provide an expansion of Passey et al.'s (2018) use of the term, suggesting another definition of digital agency 'as the level of autonomy that a student experiences when digital technology is used in the classroom or the learning activities that are employed to scaffold the development of skills and knowledge relevant to the capable use of ICTs and other digital technologies' (p. 786). Moreover, a rudimentary model of digital agency was developed based on the findings in their study. This model is non-linear and non-hierarchical, 'in which the degree of DA [digital agency] relates to the level of students' autonomy regarding their technological learning in the classroom' (p. 791). Here, it should be noted that the studies of Stenalt (2021) and Goriss-Hunter et al. (2021) both focused on students.

Knussen and Agnew (2022) investigated early career teachers' digital agency (applying Passey et al.'s, 2018 definition). Based on their findings and literature review, they proposed a new model (see Fig. 3) for digital agency for early career teachers. This model reflects internal and external factors, and beliefs and attitudes influencing each other, providing an innovative interplay of digital agency. This model appears slightly more sophisticated compared to the model introduced by Passey et al. (2018; see Fig. 1) given the inclusion of the external and internal factors along with the context of teaching and learning and the agents' beliefs and attitudes.

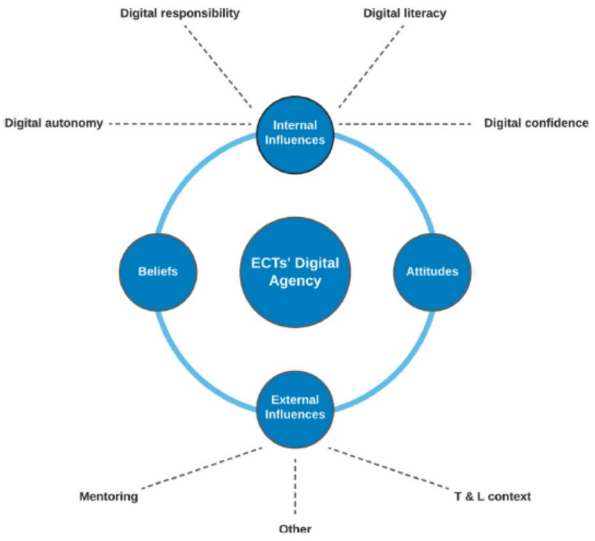

Fig. 3 Proposed representation of early career teachers' digital agency (Knussen & Agnew, 2022, p. 207)

1. Proposed representation of ECT digital agency (model by authors).

4.2.6 Transformative digital agency

From our pool of 32 studies, 12 used the concept of transformative digital agency. These were studies mostly published between 2019 ($n=1$) and later.

Three papers provided a passing reference to transformative digital agency (Aagaard et al., 2022; Marin et al., 2020; Stigberg et al., 2022), whereas nine studies provided a brief or more elaborate discussion of the concept. Except for one study, the rest were conducted in Norway and mostly in teacher education or the school context. The studies provided similar definitions of the concept, emphasizing the agents' (students, teachers, or student teachers) capacity of 'breaking away from the given frame of action and taking the initiative to transform it' (Lund & Aagaard, 2020). Additionally, most of them referred to Brevik et al.'s (2019) definition: 'Transformative digital agency captures (student) teachers' competence in taking initiatives and transforming their practices by selecting and using relevant digital tools. It arises as a necessity when (student) teachers are placed in demanding situations involving challenges or a conflict of motives, thus creating a wish or need to break out of the current situation' (2019, p. 4). Brevik et al. (2019) built on the notion of transformative agency (Haapasaari et al., 2016), arguing for the need for making 'the connections between transformative agency and the integration of digital resources' (p. 3). Furthermore, they included digital agency as the fourth pillar in the TPACK model (Mishra & Koehler, 2006).

4.2.7 Summary and brief synthesis across the concepts

To summarise our findings regarding the conceptualisation(s) of digital agency and alike across the studies included in this systematic review, we identified that technological agency (N=4) is poorly defined in three out of the four studies. Further, even though technological agency shares some aspects with digital agency (e.g. focus on affordances of technology, interpretation of the user, and the need for agency in context), it diverges to a large degree in terms of the idea that it is something that cannot be trained or connects internal/personal and external factors (for more details see the section on technological agency).

Moreover, we identified two key studies which provided definitions of digital agency. One of the most cited studies in our corpus was the theoretical positioning paper by Passey et al. (2018), where the authors presented a conceptual clarification of digital agency. Several papers referred to and used the definition of digital agency as presented by Passey et al. (2018). Another highly cited study in our review was the article by Brevik et al. (2019), in which the authors presented the notion of transformative digital agency, which is another concept that is used similarly to digital agency in many papers in the review.

Based on our brief analysis of the conceptualisations of digital agency and transformative digital agency, along with the narratives presented in the studies, we have identified some common elements in the two. First, the two concepts are understood and framed in similar ways. Both accentuate:

1. The need for adapting and evolving competences and practices due to the changing/developing nature of technology;
2. That the concept is related to other key concepts in the field, in particular (professional) digital competence; and.
3. That the concept is involved in a complex, holistic, mutually dependent, and interconnected relation with other key concepts.

Second, while the reasoning for the concept of digital agency and transformative digital agency was similar, the concepts were presented at different levels. In Passey et al. (2018), digital agency was the overarching concept encompassing the other key concepts, while Brevik et al. (2019) positioned transformative digital agency as an aspect of PDC. This is a notable difference between the two publications.

4.2.8 Other key concepts used

In almost all studies (N = 30), (professional) digital competence or similar concepts (digital skills, digital literacy, technological literacy/skills, technological expertise, digital fluency, design-based pedagogy in technology rich environments, TPACK, digitalisation, ICT use) were used. Also, many studies (N > 18) addressed additional types of agency (e.g. transformative agency, networked agency, professional agency, human agency, student agency, teacher agency, agency in learning to learn, etc.). Most studies were related to digitalisation and teaching and/or learning with technology. Hence, the contextual framing of the studies converged to a large extent.

Alignment with digital competence and related concepts.

As shown above, the two main concepts addressing digital agency have some common features, in particular the reasoning for the importance of the concepts and their relations to other key concepts. Yet, they differ in terms of how comprehensive they are and at what level the concept is intended.

Hence, the alignment of the two with digital competence and concepts alike differs. Clearly, Passey et al.'s (2018) framework envisions digital agency as an overarching concept, meaning that to be digitally agentic, one needs to be proficient in digital competence, digital accountability, and digital confidence. Thus, the framework reminds of the 21st -century skills frameworks, basically an umbrella term that tends to include many of the other key competences one needs to navigate the future (e.g. Griffin et al., 2012; Voogt and Roblin, 2012). This view probably challenges the alignment of the concept of digital competence.

The conceptualisation of transformative digital agency invites an expansion of the concept of (professional) digital competence, that is, adding digital agency as a competence area or aspect of digital competence. Given the competence areas and competences as described in the DIGCOMP-framework (see the theoretical background section and Table 2), traces to agency and agentic behaviour can be assumed. However, a specific area focusing on digital agency seems absent.

Please note that it is out of scope of this systematic review to draw any further conclusions. The aim of this review is to provide an overview of the current state of knowledge regarding digital agency, and thus we clearly see two lines of building and theorizing digital agency in research.

4.2.9 Summary of results on RQ2

We have identified three key concepts used in the literature: digital agency, transformative digital agency, and technological agency. The three concepts converged to a large degree in terms of their presentation, argumentation, and reasoning. While technological agency was used only in four studies, and also the eldest studies, digital agency and transformative digital agency were more frequently used in recent studies. The two latter concepts presented similar narratives addressing the need for adapting and evolving competences due to the changing/developing nature of technology, include other key concepts (such as PDC, transformative agency, digitalisation), and acknowledge that these concepts are complex and interconnected. Moreover, a brief analysis of digital agency and transformative digital agency conceptualisations showed that the concepts are placed at different levels in alignment with digital competence.

4.3 RQ3. How is the concept of digital agency operationalised, and what types of RQs or aims are typically addressed in studies focusing on this concept?

Concepts such as digital agency do not reside in context-free research zones but are subject to negotiations and interpretations as concepts are put to work to examine phenomena beyond their surface appearances. Concepts carry explanatory power and constitute frameworks that capture the more essential features of a phenomenon and how it plays out under certain conditions: 'Concepts are not just thought-forms, but social forms of social life' (Blunden, 2012, p. 8). Hence, we have examined the aims and RQs that frame the studies we have reviewed to examine how digital agency has been operationalised and framed in and across the studies.

4.3.1 Aims and RQs

As pointed out in the section on analysis, we first examined the verbs that appeared in aims and/or RQs in connection with digital agency, competence, skills, and transformation. This heuristic approach served to identify and categorise the kinds of action and direction that were invoked by the aims and RQs in the studies reviewed. The most frequent category (12 studies) contained diverse types of support for actors (students and teachers) and was typically made up of verbs such as 'develop', 'nurture', 'support', 'enhance', and 'empower', admittedly with some overlap and ambiguity. The second category (7 studies) indicated how actors respond to encounters with digitally enriched practices. This was typically articulated in verbs such as 'engage in', 'perceive', 'understand', and 'experience'. The third category (also across 7 studies) reflected the researchers' perspective and their efforts to make sense of digital agency. This is typically articulated in verbs such as 'conceptualise', 'operationalise', 'design', and 'become manifest'. Finally, six studies were explicitly devoted to agents' use of technologies, constituting a fourth category. In sum, the initial examination of verbs resulted in four categories that could be labelled *support*, *experience*, *conceptualisation*, and *use*. Despite some overlap and ambiguity in the verbs, the fairly

even distribution suggested that when examining digital agency or related terms, the reviewed papers reflected distinct user groups and their perceptions and practices.

While the verbs may indicate that approaches to digital agency were wide-ranging, a closer look at the explicitly formulated aims and/or RQs revealed more specific research endeavours. What emerged was a multifaceted research excursion. The studies showed that operationalisations differ with regard to actors' roles (especially teachers') and agentic capacity (both students and teachers), including the capacity to produce scholarly digital work. Some studies examined the role of a particular technology (e.g., Bader et al., 2021; Engeness and Nohr, 2020; Singh and Engeness, 2021) or framework(s) (such as TPACK or DigCompEdu) to find indications of how these may contribute to fostering digital agency among participants (e.g., Goriss-Hunter et al., 2021; Blankenship, 2019a; Brynildsen et al., 2022). However, more often, the forms applied to questions about conceptualisations and perceptions. For example, one study aimed to promote a more relational understanding of agency (Stenalt, 2021), and another aimed to produce a theoretical model of student agency (Marin et al., 2020). A cluster of studies presented aims or RQs about the transformative dimensions of digital agency. In two studies, this was connected to identify transformation among participants (Blankenship, 2019b; Sultan et al., 2020), but more common were questions asked about connections between digital agency and epistemic change, often articulated in the term transformative digital agency (e.g., Brevik et al., 2019; Lund and Aagaard, 2020; Nagel, 2021). Indicating an emerging issue connected to such agency were studies discussing the blurred boundaries between human and non-human agency (Brox, 2017; Stenalt, 2021).

Of the four categories initially identified by clustering verbs, the category of conceptualisation emerged as the more salient when examining specified aims and/or RQs. Additionally, there were studies that asked how digital agency can be fostered or how it is understood. However, whether this reflected a wish for conceptual rigor or a need to explore diverse understandings cannot be determined from this overview.

4.3.2 Theoretical perspectives and frameworks

Theoretical perspectives or conceptual frameworks reflect fundamental assumptions about a phenomenon, such as learning, teaching, and assessment. Therefore, in this review, we were also interested in how digital agency was conceptualised not only as a proprietary concept but also how it was theoretically framed in a larger perspective. What first emerged was the lack of a distinct perspective in many of the publications. However, nine of the publications displayed an overarching theoretical framework. Of these, five explicitly adhered to sociocultural perspectives, with two studies building on Galperin's theory of orienting phases (Engeness & Nohr, 2020; Engeness et al., 2020), three putting cultural-historical activity theory to work (Ganduri et al., 2021; Aagaard & Lund, 2019; Lund & Aagaard, 2020), and one invoking the Vygotskian tradition in more general terms (Blankenship, 2020). Similarly, but from a relational perspective, one study focused on relations between humans and technologies (Stenalt, 2021). Among the remaining three, the theoretical underpinnings were less clear, but models or principles (such as TPACK) were used to frame the phenomenon of digital agency.

One noticeable feature across the studies was the way digital agency was connected to transformative aims. Altogether, 17 studies involved the transformation (not merely change) of educational practices involving digital technologies, and 12 studies explicitly referred to 'transformative digital agency' (cf. the above section on RQ2). Sometimes, transformative efforts were articulated in aims (e.g., Brevik et al., 2019; Ganduri, 2021; Aagaard and Lund, 2019; Blankenship, 2019a; Brynildsen et al., 2022). More often, digital agency was applied in connection with transformative processes among learners, teachers, and institutions. This might indicate situations in which digital competence is replaced or expanded with the notion of agency.

This review demonstrated that studies involving digital agency often lack theorizing, but when they do provide theoretical underpinnings, sociocultural perspectives are invoked. As this perspective focused on change and development and places human development in relation to cultural artefacts and contextual features, it would seem to be a suitable theoretical approach. However, the absence of other perspectives focusing on such relationships, such as actor-network theory, distributed cognition, or socio-material perspectives, added to the impression that digital agency is seriously under-theorised.

Most studies were empirical. This resonated with the four categories initially presented and of which three (actors' support, experience, use) corresponded with empirical research. Perception data (a variety of interviews and reflection texts) were either a dominant source of information (five studies) or part of a mixed-methods design (five studies, often including surveys). This resonated with the *experience* category. Only three studies were primarily based on activity data (observations, video recordings), while material data (documents, online discussions, podcasts, project drafts, wiki entries) were used in four studies. Three literature reviews also appeared. Thus, while fundamental theoretical assumptions were rare, there was a variety of methods that were put to work. One interpretation is that this reflects the emergence of a recent phenomenon involving complex interrelations and interactions between human actors and sophisticated technologies. This phenomenon is – as of yet – under-theorised but is attempted to be captured in these studies by assembling a variety of methods that can identify diverse manifestations – perceived, observed, and materialised.

4.3.3 Summary of results on RQ3

Looking at the four initial categories constituted by verbs, now in light of articulated theoretical perspectives (or the absence of such) and methods applied in the studies we have reviewed, might add dimensions that make digital agency appear more conspicuous. When operationalised through aims, RQs, and methods, digital agency connects strongly with actors coping with new situations involving digitalisation and transformative efforts. Such efforts were examined to investigate how they are experienced, how they can be supported, how actors use technologies, and how they can be conceptualised. The weak theoretical underpinnings of digital agency may reflect a situation where new educational challenges and needs emerge empirically but where the digital agency required to cope with these is still looking for a shared or consensual conceptualisation.

5 Discussion

5.1 RQ1. What are the characteristics of studies on the concept of digital agency in education?

Our review covered 32 studies in 17 different publication channels. The studies were primarily located in Norway but with some originating in the US or Australia and with singular additions from Sweden and India. Most studies were conducted in the context of higher education and in particular teacher education. The review showed that as for the current state of knowledge regarding the use of the term digital agency (RQ1), 15 studies used the concept of digital agency, and 12 used transformative digital agency. Also, 12 studies had a detailed discussion of the term and/or its application. Almost all the studies were published after 2018. This is an indication that the term is currently gaining ground and enjoys increasing research interest but also that this is a more local than international trend. As the majority of the studies were empirical, it would seem that conceptualizing digital agency emerges from problem situations and challenges found in naturalistic settings and less often from conceptual discussions or papers devoted to theory development.

5.2 RQ2. How is the concept of digital agency conceptualised, and how does it align with digital competence and related concepts?

When digital agency is conceptualised and related to other relevant concepts (RQ2), only one study offered an explicit definition (Passey et al., 2018), and one defined transformative digital agency (Brevik et al., 2019). Passey et al. (2018) position digital agency as an overarching concept, subsuming diverse types of digital competence. Brevik et al. (2019) position transformative digital agency as an aspect of PDC. Both publications are frequently referred to, but we have not identified a discussion on the differences between their positioning of digital agency. Along with a cluster of related terms (digital literacy, technological competence) in the studies, this further underscores under-theorizing and the empirical energy driving this research. Consequently, researchers might experience an even more blurry and complex field; as Tveiterås and Madsen (2022) conclude: 'a somewhat complex understanding of teachers' professional digital competence makes measuring it a difficult task, and it is challenging to link theoretical foundations with conducted research on the subject' (p. 1). However, across the last two decades, the concept of digital competence has evolved substantially (Erstad et al., 2021; Lund et al., 2019; Siddiq, 2018; Siddiq et al., 2016; Spante et al., 2018). Hence, the recent focus on digital agency might be echoing a need for further developing the theoretical and empirical work considering digital competence.

Further, using the terms and concepts professional (digital competence), transformative digital agency, and digital agency similarly and/or interchangeably is problematic as it may create possible bifurcation in the research literature and jangle fallacies (Gonzalez et al., 2021). We argue that clear-cut conceptualisations and definitions are needed to specify what one or the other concept contains and includes. Whether digital competence is considered part of digital agency, or the other way around,

matters. Hence, any empirical study focusing on the description, the assessment, or the crafting of a validity argument of digital agency should specify which elements/aspects are included and which theoretical assumptions it is based on. Moreover, defining whether digital agency is considered to be a concept or a construct, is needed to identify adequate representations (for a discussion on constructs and concepts, please see Henseler, 2021).

5.3 RQ3. How is the concept of digital agency operationalised, and what types of RQs or aims are typically addressed in studies focusing on this concept?

When examining how digital agency has been put to work or operationalised through aims, RQs, and research methods (RQ3), another complex picture appears. However, one common denominator seems to be situations or challenges that cannot be sufficiently explained or theorised using concepts that reflect various perceptions of competence. Whether facing new technological development or pedagogic affordances, the studies show that actors (students and teachers) are required to demonstrate agency to overcome or negotiate such situations. Some of the studies point to the distributed agency between human actors and digital technologies or epistemological implications – how we come to knowledge and by what means – as emergent research issues.

Finally, we would like to draw attention to an additional research aspect that emerged from our review. Nersessian (2008), studying the emergence of new concepts (although mostly related to natural science), asked the fundamental question about how they came into being. Blunden (2012) finds, she identifies the genesis of a concept to be found 'in a situation created by contradictions' (p. 43), often found within stable and well-defined conceptual frameworks. Nersessian (2008) studied notes and 'mental models' (analogies, metaphors) left by scientists in order to identify how they solved problems in their scientific communities. Mundane relations and everyday concepts act as steppingstones towards scientific concepts: 'The new concept arises as a solution to a problem which the development of the science up to that point had posed but could not solve' (Blunden, 2012, p. 44). This excursion into concept development would seem to resonate with the review of digital agency. We argue that this review has also managed to capture a stage in concept formation and, thus, how the learning sciences develop and prepare for uncertain futures.

5.4 Implications for theory, research, and practice

Following the results of this conceptual systematic review, there are several implications emerging for research, theory, and practice.

Reflecting implications for theory, our review points to the need to advance theories of digital agency, further develop theories integrating digital agency and digital competence, and position digital agency within the larger frameworks or models of digital competence or 21st century skills. Whether and how digital agency can be developed as a more enduring orientation and in stable form is an important question for researchers and practitioners. A thorough developmental model of digital agency

would aid understandings of how digital agency can be fostered within educational contexts.

Our results have several implications for research. For instance, the bulk of the studies are conducted within teacher education. Acknowledging the needs for further developing pedagogical practices in technology-rich environments, in particular away from simply 'using' technology or replacing chalk boards with smartboards, there is also a need for investigating the concepts' relevance and application in other educational contexts, such as other subject disciplines and educational levels.

Finally, our review points to implications for practice. Educators and learners may not merely be seen as recipients and (skilled) executors of digital technologies but exercising agency to cope with new tasks, challenges, and wicked problems in informed interaction with such technologies. Thus, the needs for both developing their digital agency but also detecting it is important. Consequently, professional development programs for educators would benefit from being revised and expanded to include and facilitate the development of educators' and their students' digital agency.

5.5 Limitations and future directions

We offer the above analysis while acknowledging some limitations of the present study. First, this conceptual systematic review aims at investigating how digital agency has been conceptualised, defined, and used in current studies. Further, the alignment of digital agency with digital competence is discussed. However, this paper does not investigate how the included studies measure/assess/detect digital agency nor its impact and contributions to the field. Therefore, we suggest that future research expand this focus to further contribute to the knowledge.

Second, our inclusion criterion of studies in English, German, or one of the three Nordic languages (Danish, Norwegian, Swedish) might have resulted in studies covering certain parts of the world. While this criterion was applied to provide all studies in the field equal chances to be included, we might have missed reports or research in other languages. Hence, we encourage future studies to broaden this inclusion criteria and include studies in several languages.

Finally, we utilised verbs in our initial attempt to explore the operationalisation of digital agency (RQ3). These were used as a heuristic for categorising the RQs, aims, and purposes of the reviewed papers, and we further analysed these categories in light of the theoretical perspectives and methods applied in the studies. However, there might be more profound ways than such 'mental shortcuts' to approach aims and RQs, and we encourage future studies to employ a variety of methodologies and approaches.

6 Conclusion

The purpose of this review was to examine the state of the knowledge on digital agency. The recent increased use of digital agency along with digital competence and other related concepts warrants investigations of its conceptualisation, definition,

use, and alignment with more established concepts as well as its impact and contributions to the field.

We conclude that digital agency does not necessarily appear to be a conceptual intruder or replacement in the conceptual space inhabited by various forms of digital competence. We see few, if any, papers where digital competence is contested or disputed in favour of digital agency. Rather, we see a non-antagonistic co-existence possibly because a new concept also contains the explanatory power found in its precursors. However, in light of the rapid development of algorithms, artificial intelligence, learning analytics, and social robots, digital agency may well seem to be a conceptual contender for theorizing and scientifically explaining the delicate balance between human consciousness and digitalised skills and intelligence when making decisions, coping with wicked problems, or furthering research in the years to come – contributing to the 'new normal'. Hence, it is utterly important that along with the empirical drive, the theoretical development is emphasised to avoid confusion or bifurcation in the research literature and jangle fallacies (Gonzalez et al., 2021).

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Data Availability All data analysed during this study are included in this published article. Moreover, the larger dataset generated during the current study is available from the corresponding author on reasonable request.

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Note: An asterisk symbol (*) indicates that the source is included as a part of the corpus for the review.

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