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Critical digital literacies at school level: A systematic review

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[Correction made on 06 October 2023, after first online publication: The last author's name has been corrected in this version.]

Abstract

The rapid and ongoing technological developments and the changes in societal practices require us to update our understanding and skills relating to digital technology use continuously. Various frameworks have been created in recent years to explore the different aspects of *digital literacies* or *digital competencies* and a range of newer concepts and dimensions have emerged in the literature aiming to capture the complexity of digital engagement. The main aim of this systematic literature review (SLR) was to map out which elements or issues of *critical digital literacies* (CDL) relevant for school education currently feature in the academic literature and international policy documents. The secondary aim was to use the findings of the SLR to inform the creation of a research-based framework for school education. The review process followed a systematic protocol for answering specific research questions. Research articles were sought in two electronic databases—EBSCO (Academic Search Complete) and Web of Science—and policy documents were sought on the Internet using Google search. A total of 139 research articles and policy-related documents were used for the analysis. The main dimensions based on the analysis were the following (in the order of most hits): E-safety, Participation and presence, Digital literacy, Media literacy, Digital citizenship, Technology literacy, Information literacy, Data literacy, Digital game literacy, Online learning, Digital creativity and

innovation, and Digital well-being. The emphasis in the research articles was on negative issues, although publications also outlined several positive issues about digitality. The emphases of the research articles and policy-related documents differed somewhat. The findings of this SLR have implications for researchers, policy makers and educators interested in the changing nature of critical digital literacies and the dimensions and subdimensions relevant for school education.

KEYWORDS

critical digital literacies, digital technology, primary and secondary school, systematic literature review

Context and implications

Rationale for the study: This systematic literature review (SLR) identifies the key elements and issues of critical digital literacies (CDL) relevant to school education, as documented in academic literature and international policy documents. In addition, it utilises the findings of the SLR to develop a research-based framework for CLD in school education.

Why the new findings matter: Our findings contribute to capturing the different aspects of CDL in the context of compulsory education and offer original insights with regard to supporting the development of teachers and students' critical digital literacies in the future.

Implications for researchers, practitioners and policy makers: This SLR has implications for research as it has highlighted the need to continuously update theoretical models and frameworks relating to CDL. Although certain accepted core dimensions can provide a stable foundation for representing emerging phenomena, it is essential to maintain flexibility to address the technological advancements. An implication for policy making is the recognition of the need for continuous professional development and pedagogical support for teachers and students. The value for educational practitioners is that it elucidates the emerging notions of CDL, and it enables educational institutions to enhance their practices and initiatives related to CDL.

INTRODUCTION

The rapid and ongoing technological developments and the changes in societal practices require us to continuously update our understanding of and competence with digital technology. It no longer suffices to have basic skills for using digital technology tools or to use the Internet for surfing and information searches, since many of the new competencies with digital tools and applications relate to social or cultural practices, communication and collaboration, or ethical issues (Griffin & Care, 2015, p. 7; OECD, 2018). For instance, examples of such recent phenomena relate to issues of digital identity and cyber bullying (Gamito Gomez et al., 2017; Kyriacou & Issitt, 2018). The demands for new digital competencies

also stretch to education, to teachers, students and schools at all levels, and as a conse-quence, schools are expected to provide students with relevant digital skills for when they study further, and for life. These demands are expressed both in international documents as well as in national policies and curricula (European Commission, 2018; Olofson et al., 2021; Voogt & Roblin, 2012). As Mills et al. (2022) argued, despite the continuity of schooling's conventional routines and timetables, the fast-paced and unparalleled rate of global, tech-nological and societal change has necessitated the radical expansion of literacy practices. The recent move to online teaching and learning because of the COVID-19 pandemic has further emphasised the need to update the understanding about digital technology use and to consider emerging trends. A timely question is which new phenomena about digitality students should learn at present, and what teachers should know and understand to teach the required contents and competencies.

Although there has been an emerging body of research focusing on several aspects or dimensions of digital literacies and digital competencies, systematic literature reviews in this field remain scarce. Existing systematic literature reviews either focused on digital compe-tencies within higher education (Basilotta-Gómez-Pablos et al., 2022; Spante et al., 2018) or investigated the relation between twenty-first-century skills and digital skills within the context of workforce preparation (van Laar et al., 2017) or pedagogical practices to em-power English language learners with digital literacies (Yuan et al., 2019). Given the lack of systematic literature reviews that look at critical digital literacies within the context of school education, the mapping conducted for this article provides original and much-needed in-sights into this area.

Various frameworks about digital technology in education have been created to conceptu-alise and explain the notion of digital competencies. The frameworks differ in their emphases and contents, and they serve various and multiple purposes at several levels in educa-tional systems. For example, they can support and guide teachers' practice and continuous professional development or provide reference standards for initial teacher education and education professionals' quality (Caena & Redecker, 2019). Pérez-Escoda et al. (2019) sum-marised six frameworks concerning education and digitality—DigCompEdu, the Krumsvik model, the TPACK model, the JISC model, the ISTE Standards and the P21 model—and they created a holistic model based on these frameworks. The summary consists of four dimensions and six content areas. The dimensions are abilities, such as being/practising, making/creating, being able, and learning. The content areas are management of digital information, communication on digital networks and media narratives, creation of digital contents using multimodal languages, development of reputation and digital identity, critical capacity and responsibility, and capacity to solve problems (Pérez-Escoda et al., 2019).

These summarised frameworks focus mainly on teachers' pedagogical practices with digital technology; they are compromises between users of various backgrounds and com-petencies, and have been selected to prioritise the topics, which are regarded as being important for teachers predominantly within a policy-making context. In addition, some of the frameworks do not focus only on digital technology but also include other broader com-petencies (as the P21 model); they prioritise technical proficiency (Pangrazio, 2016); or they need updating (three of the frameworks were published between 2009 and 2013). Further, there are several topics which the existing frameworks do not cover but are present in stu-dents' lives, such as digital identity or digital gaming. However, understanding digital tech-nology should also be explored as a societal phenomenon and from a critical point of view. For example, Pötzsch (2019) suggested three frameworks for the development of critical digital literacy in education: the use of and reflection about non-commercial products; di-recting the focus to the history of 'new' technologies and data activism, and increased use of cultural expressions of power, surveillance and exploitation in digital domains. The aim of this approach is to advance understanding of the concept of critical digital literacy by looking

beyond technical competencies and providing a wider contextualisation that includes issues of commercialisation and exploitation. Considering the shortcomings of the previous frameworks presented above, the aim of this systematic literature review was to develop an in-depth understanding regarding the more recent dimensions of *critical digital literacies* (CDL), which are encountered in academic literature and in policy-making documents in school education and which are identified as being relevant in students and teachers' everyday life. We have focused on CDL in order to avoid prioritising technical proficiency (Pangrazio, 2016) and to support a critical attitude to the use of digital technology and various applications.

The concepts *competence* and *skill* are often used interchangeably as synonyms in the academic literature as policy-making documents without often being clearly defined (e.g., Hutmacher, 1997; Rychen & Salganik, 2003, p. 42). *Competence* is a broad and confusing concept, as Westera (2001) wrote, and there are several and different approaches to the concept. In addition to skills and knowledge, competence includes the ability to meet complex demands (OECD, 2005), but also other attributes. It is context-bound and can be divided into sub-competencies (Rychen & Salganik, 2003). Competence also refers to abilities: abilities describe certain levels of expertise—the continuum of competence. Competencies and abilities are learnable and teachable (Rychen & Salganik, 2003, pp. 49–50). *Skill* is a confusing and undefined concept, and it can consist of wide-ranging attributes (Grugulis & Stoyanova, 2011) but in general, it is narrower and emphasises an individual's performance. Although we acknowledge the complexity of these concepts and the conceptual differences between them, for the purposes of this review we chose to include them both as search concepts as they are both pertinent to the aims of this study—to map out which elements or issues in CDL are relevant for school education.

THEORETICAL BACKGROUND

The increased diversity and complexity of contemporary digital practices and processes has led to several researchers calling for new, expanded forms of literacy since the notion of literacy can no longer refer merely to interactions with conventional texts but also needs to include interactions with digital texts and other digital media. Literacy theorists have argued since the mid-1990s that conventional conceptualisations of reading and writing were no longer adequate and literacy pedagogy should instead account for the burgeoning variety of text forms associated with information and multimedia technologies (New London Group, 1996, p. 61). This shift signalled the growing popularity of a range of theories and concepts associated with the changing nature of literacies (see e.g., Erstad et al., 2021; Ilomäki et al., 2016; Martínez-Bravo et al., 2020). As such, various concepts and definitions have emerged over the past two decades in academic and policy-making publications and this is indicative of the multi-faceted and rapidly evolving nature of digital literacies. Although it is not possible to include all relevant conceptualisations of digital literacies and provide an exhaustive overview of the topic in this short review, we have looked at how the notion of literacy has evolved over the past two decades.

Originally coined by Gilster (1997) the concept *digital literacy* was used to describe the range of skills required to access, manage and edit digital information, participate in online networks and evaluate digital resources and services. Around the same time the term multiliteracies was also introduced by the New London Group (1996) to emphasise the need for a new approach to literacy pedagogy to respond to the changing social conditions, the multiplicity of communication channels and the increasing cultural and linguistic diversity. As Cope and Kalantzis (2000) contended, a pedagogy of multiliteracies 'focuses on modes of representation much broader than language alone' and these

modes 'differ according to culture and context, and have specific cognitive, cultural, and social effects' (p. 5).

Furthermore, informed by the need to rethink literacy in the digital age and because of the social, economic, political and cultural factors that appeared to shape new practices, the concept of *new literacies* emerged in the early 2000s (see Lankshear & Knobel, 2003; Leu et al., 2004). More specifically, it has been argued that the 'paradigmatic sense of "new" in relation to literacy is not concerned with new literacies as such, but rather, with a new approach to thinking about literacy as a social phenomenon' (Lankshear & Knobel, 2003, p. 24). In this sense, new literacies have been perceived to be multiple, multimodal, multifaceted and deictic, they change as rapidly as digital technologies change and they can be defined as the 'new social practices, skills, strategies, and dispositions' required for personal, economic and civic participation (Coiro et al., 2014, p. 14).

The concept of digital literacies has continued to evolve and other concepts relating to digital literacy have also been used in academic research publications and policy making. For example, *technology literacy*, *ICT literacy* and *computer literacy* have been used to refer to the technical competencies required for digital technology use. Although these terms are often tightly focused on specific ICT concepts and skills, and even specific computer software products, the strict technology emphasis has shifted over time to include the use of technologies for wider purposes (Wilson et al., 2015). Indeed, broader concepts such as *digital competence* are seen to have replaced previous one-dimensional concepts (Erstad et al., 2021; Godhe, 2019; Ilomäki et al., 2016). Furthermore, advances in mobile technologies and the widespread accessibility of faster Internet have meant that literacy practices became ubiquitous, occurring anywhere, anytime (Mills, 2016). More recently, the notion of digital literacy has been perceived as being wider than technical skills and is now seen to include a cognitive and socio-emotional dimension including problem solving in the digital environment (Martínez-Bravo et al., 2020).

Other concepts have also emerged with the aim of capturing more specific dimensions of digital literacies. These include *information literacy, media literacy* and more recently, *data literacy*. *Information literacy*, for example, includes having the ability to work with existing information in various ways: discover, select and evaluate information sources for specific purposes, use existing information to create new knowledge, or understand how information is produced and valued (Bawden & Robinson, 2009). Furthermore, *online inquiry skills* (Kiili et al., 2021) and the use of web sources have also been included in academic and other discussions whilst new phenomena with societal and political connections like fake news have required new approaches to information literacy. New trends and practices relating to the use of digital media have also resulted in changes in the concept of *media literacy*, and the definitions range in focus. Although Aufderheide (1993) originally defined the concept as understanding and analysing media messages, the term has more recently been used to describe the process of acquiring higher levels of media literacy, which involves analysing, understanding, evaluating and producing messages within the medium as well as developing knowledge and thinking critically about meaning (Potter, 2013).

More recently, attention has also been given to the relevance of *data literacy* since the unprecedented evolution of digital systems and environments has resulted in digital data from users being collected, shared or simply extracted. Data literacy relates to an intertwined group of abilities including not only the techniques to process data, but also the ability to analyse data as a social and cultural phenomenon with implications for our personal lives (Pangrazio & Selwyn, 2019). These include the skills and knowledge required for reading and understanding data as well as the capacity to understand personal data processing through algorithms and its implications for privacy, equity and social justice (Bhargava et al., 2015; Pangrazio & Selwyn, 2019; Raffaghelli & Stewart, 2020).

For this study we adopted the concept of CDL, which is located in between and connected to the other literacies explained above, and the boundaries between these literacies are vague. The development of CDL has also been informed by critical literacy studies. In particular, the notion of critical literacy is seen to focus on how texts and the relationships they present and sustain, are shaped by power relationships, and how the production of new texts can constitute a means of generating oppositional discourses through repositioning misrepresented or under-represented social groups (Burnett & Merchant, 2011). This emphasises the adoption of a critical and questioning approach when engaging with texts, and advocates for a more nuanced understanding of the relationships between texts, representation, ideology and power (Janks et al., 2013; Luke, 2013).

Critical digital literacies emphasise critical attitudes as an aim for an individual's digital competence, but *critical* can be understood in various ways, such as: (1) the overly technological framing of digital literacy which requires a critical perspective, drawing on theories and pedagogies from critical literacy and media education (Hinrichsen & Coombs, 2014); (2) the problem of fake news and the strong role of digital platforms (Pangrazio, 2018) and developing a critical attitude to digital media in general (Merchant, 2007); and (3) the competing discourses which surround social media use—around positive stories of participation and empowerment on one hand, and more negative associations with consumerism, exploitation, fraud and safety, on the other (Burnett & Merchant, 2011). As such, we perceive criticality as a thread weaved through all aspects of digital literacies, and this can relate to 'critical thinking and understanding regarding digital technology use as well as critical awareness, self-reflection and evaluation of one's own and others' digital practices and online engagement' (Gouseti et al., 2023, p. 5). In addition, this is coherent with the common definition of the term criticality, since it 'refers to the practice of socially situated reflection and evaluation. It means considering an issue from multiple perspectives, even when these involve self-critique' (Banegas & Villacañas, 2016).

In such a rapidly changing phenomenon as digital technology use, it is not meaningful to try to make sense of the exact boundaries or contents of the various literacies; some contents of the literacies stretch from one to another (Ilomäki et al., 2016; Pérez-Escoda et al., 2019; Tinmaz et al., 2022; van Laar et al., 2017), and critical digital literacies have elements of the various literacies previously discussed. Furthermore, because the concepts arise from different backgrounds (such as technology, literacy, information science), it is not possible or even relevant to adopt a single theoretical lens. As Merchant (2007) suggested, we should 'begin to sketch out what a critical digital literacy might look like' (p. 127), and in this study we aim to do this, from a school education perspective.

AIMS OF THE SYSTEMATIC LITERATURE REVIEW

The aim of this systematic literature review (SLR) was to map out which elements or issues of critical digital literacies relevant for school education currently feature in academic literature and international policy documents. The secondary aim was to use the findings of the SLR to inform the creation of a research-based framework for school education. We focused on aspects that relate to critical attitudes and behaviours towards digitalisation and based on that, defined key topics of critical digital literacies. In addition, we focused on the connections of CDL with various other literacies as well as with societal and cultural phenomena of digitality.

To achieve the aforementioned aim, the research question central to this review was:

RQ: Which dimensions and subdimensions form critical digital literacies in the context of school education?

MATERIALS AND METHODS

Our study represents a thematic review aiming to identify, analyse and report patterns (themes) within the topic, in order to gain better understanding of the phenomenon. The topics—which we called dimensions—captured some important issues in relation to our key question, critical digital literacies (Braun & Clarke, 2006). Furthermore, this review was a systematic review: the review process followed a systematic protocol for answering specific research questions. The process consisted of the following steps: (1) preliminary mapping of the topic based on related policy documents, previously recognised research articles, and discussions within the research team; (2) defining the research question; (3) selecting the sources; (4) choosing of the search concepts and conducting the searches; (5) applying practical and methodological screening criteria; (6) doing the reviews, and (7) synthesising the results of the searches (similar to as described in Fink, 2010). However, making the synthesis followed the procedures of narrative reviews, because it is framed through the expertise of individual researchers (see Bearman et al., 2012).

The search procedures

We used the electronic databases EBSCO (Academic Search Complete) and Web of Science, Core collection to search, screen and select relevant articles. From our previous experience, EBSCO produces a wide range of educational and related scholarly articles, it has a multidisciplinary scope, and it also provides results from the ERIC database. Web of Science was chosen because it similarly has a multidisciplinary focus but is different from EBSCO. Because both of these are databases with restricted access, we also decided to do the searches in open Google Scholar, but these searches did not bring any new results. In addition, we included five other articles proposed by the research team as relevant.

The research team created the first search themes by discussing the concepts and terms associated with CDL. The preliminary notion was that CDL is an emerging phenomenon and concept, and that it is located among a range of existing concepts—for example, critical literacy, digital literacy, media literacy, technology literacy and digital competence. In addition, we discussed the meaning of *critical*, with the conclusion that it means both a critical attitude and a central or key element (see the definitions in Theoretical background). Furthermore, our intention was not to focus on basic technological skills ('writing with word processing', 'knowing how to use a computer') even if they are critical for being able to use digital technology, but which are no longer noteworthy from the perspective of emerging and newer dimensions of digital literacies. Although acknowledging that basic technological skills are a precondition for CDL, we argue that the focus of CDL needs to capture other, more relevant and updated dimensions.

The search terms were based on our pre-understanding, but we added new search terms and modified the terms during the search process. In addition, some of the terms created did not work well in the searches (i.e., they produced thousands of hits even with the limitations used, and these terms were then modified; an example of these is digital skills). As such, we used the following terms: literacy, e-literacy, data literacy, critical, digital, e-safety, Internet safety, safe use, competence, critical use, and framework. Because the focus of the review was on school education, we used 'school' as one of the search terms. Education* was initially used first but it produced hundreds of irrelevant searches, so we substituted it with school.

The following combinations were used in the searches: (1) e-literac*; literac* AND critical AND digital; (2) data literac*; (3) e-safety AND school; Internet safety AND school; safe use

AND digital AND school (4) competenc* AND critical AND digital; (5) critical use AND digital AND school; (6) framework AND critical AND digital AND literac*.

Search options

We conducted the searches with the following limitations: peer-reviewed articles on the condition that the full text was available, written in English, with a publishing period between January 2005 and January 2020. We chose the publishing period based on the study of searching for digital competence in which the first hits were found in 2005 (Ilomäki et al., 2016). The search procedures produced 1565 articles. In addition, we used five articles which were known previously by the research team, and which related to the searched topics, but which were not found in the searches.

Selection process and criteria for inclusion

To decide on the relevance of the articles, two researchers first read the abstract of each. If the article appeared to be related to the theme, we exported it to RefWorks (277 articles). In the exclusion based on the abstract and title, the emphasis was especially on the aspect of criticality and school education. The topics excluded were the following:

- learning in the early years, adult education, working professionals, teachers and teacher training, use of digital technology at home
- basic ICT or digital skills without emphasis on criticality
- information literacy, critical literacy or library pedagogy without the focus on CDL
- critical attitude or literacy and literacy skills in general
- other topics without connection to school, such as health literacy, digital divide, digital technologies in cultural change.

Following the selection process, the first two authors read the articles and decided which ones should be excluded from the review. The reasons for excluding articles were the following:

- the focus was not school but adult or higher education, informal education (e.g., librarians or clubs), or teachers and their various competencies, general critical attitudes to media and media education, parents' role, special education, learning about sexuality, individual psychology (e.g., individual coping strategies with cyber bullying)
- digital technology, the Internet or media (e.g., a case study about creating games)
- studies concerning learning or teaching various forms of literacy (e.g., supporting writing in digital environment, learning to 'read' various types of multimodal texts)
- societal focus (e.g., the importance of the library to decrease the digital divide, public perceptions about sexual grooming)
- not a scholarly article (e.g., a book chapter, a conference paper) or the full text was not available.

Ultimately, we reviewed 139 articles (134 from searches, 5 from the research team). The authors' affiliations of these articles originated from the continents as follows: Asia 9.8%, Africa 0.9%, Australia 7.2%, Europe 50.8%, North America 31.1% and South America 0.3%.

Search procedure of the policy-related documents

One researcher searched for policy documents on the Internet using Google search. We decided to look for documents from 2016 to 2020 because policy documents are updated regularly, and we wanted to focus on the more recent ones. The search words were critical digital competence, critical digital literacies, digital competence and digital literacy. The aim was to find existing policy documents published in international organisations such as the European Commission, UNESCO, UNICEF and the European Union. In addition, other policy-related documents that came out in the search were considered and accepted in the analysis. The quality of the documents was one criterion; the documents had to include clear competence classifications. In this way, we selected nine documents, such as the Digital Kids Asia-Pacific: Insights into Children's Digital Citizenship by UNESCO (2019), Future of education and skills, Conceptual learning framework, Core foundations for 2030 by the OECD (2019), and DigComp: The European Digital Competence Framework by the European Union. The policy documents we selected represented the following backgrounds: global (4), European (3), American (Canada) (1) and Asia (Japan) (1).

Figure 1 presents the summary of the search and screening procedures of the research articles and the policy-related documents.

The selected articles and policy-related documents are contained in the References section and marked with * and **, respectively.

Coding

First, three of the researchers selected from the articles and the policy-related documents all terms or word combinations, which were related to critical digital literacies. Examples of terms are technology literacy or cyberbullying and examples of word combinations understanding technological concepts or mobile phone harassment. We picked the terms and word combinations from the introduction, research questions, results, conclusions and discussion sections of the articles. We did not pick terms from the theoretical background because those sections are based on previous research and other studies, and we wanted to collect only concepts that were specific for the study in question. We similarly picked the key terms in the policy documents.

All terms and word combinations were first listed in alphabetical order, a total of 551. Many of these were synonyms or almost the same words—for example, critical digital literacies
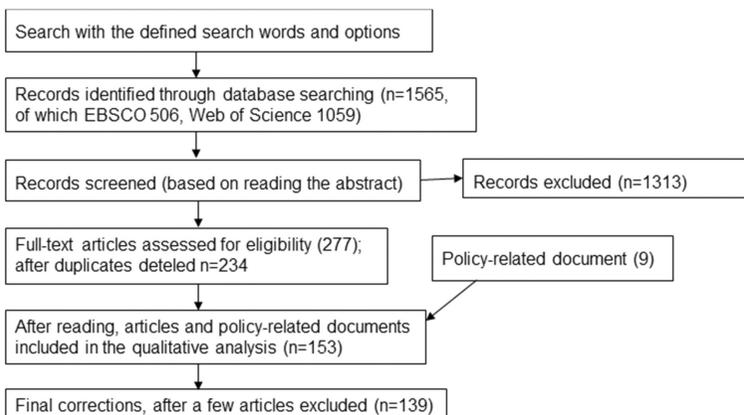

FIGURE 1　Diagram of the search and screening procedures.

and critical digital literacy, media competence and media competency or online reading and online reading comprehension.

We then organised the concepts and word combinations into larger entities based on the topic—for example, digital citizenship or online learning (following the process of a thematic review, Braun & Clarke, 2006). We called these entities 'dimensions'. The dimensions were data-driven: For forming each dimension, we first picked the concepts, which were similar or if the meaning was almost the same, such as Digital citizenship as the key term and the other terms Citizenship, Critical and active citizenship, Digital citizen identity, Digital citizenship skills, Skilful digital citizen, and Online civic engagement.

The rest of the concepts in each dimension were divided into subdimensions based on their content. The concepts that were mentioned most often in the articles were chosen as the titles of the dimensions. For the subdimensions, the title was the concept that had either most hits or which we regarded as the most relevant one. For example, in digital citizenship, such subtitles were digital law, digital equity, ethical responsibility and critical digital consumption. Because the coding was thematic, even the terms that were rare were coded into independent subdimensions; this produced categories and subcategories of different sizes.

Three of the authors did the categorisation, revising it several times, and it was revised again according to feedback and comments from other members of the research team.

Validation and reliability

For assessing validity and reliability in our study, we focused on rigorousness in the research process, such as 'investigator responsiveness, methodological coherence, theoretical sampling and sampling adequacy, an active analytic stance, and saturation' (Morse et al., 2002, p. 9). The investigator responsiveness was based on the expertise of the research team whereas the process of deciding the search concepts, the criteria for inclusion or exclusion, the sampling procedure as well as the coding, were collaborative activities and refined several times during meetings. Methodological coherence was ensured by following well-structured data collection and analysis guidelines, which are explained in the detailed description of the process.

The theoretical sampling was ensured by the research team members' various theoretical expertise, which was used both in creating the search concepts and the overall theoretical design of the study. The sampling was wide, research-based and consisted of essential articles. However, most of the journals were European or North American, with fewer from Asia, and we acknowledge the limitation that they are primarily focused on Western digital education. The policy documents were from worldwide organisations, thus representing a more global approach. Because the search focused on most parts of the articles selected, the quantity of the hits was substantial. However, it is not possible to compare statistically the number of hits in the subdimensions, but defining the trends is possible.

The option to generalise to contexts other than education is probably possible, and to other educational levels (see, e.g., Anfara et al., 2002) because the various dimensions of critical digital literacies are up to date, but at a detailed level, such as what students should learn about the phenomenon, and further consideration regarding relevance might be needed. Furthermore, despite adopting a systematic approach to literature searching, there is no guarantee that 100% of the literature concerning CDL at the school level has been reviewed. We are also aware that it is likely that more material has been published since we stopped searching the literature. However, the 16 years (2005–2020) of research literature covered by this SLR presents an accurate and comprehensive sample of research in the area of CDL for school education.

RESULTS

In this section, we describe the dimensions and subdimensions of CDL relevant to school education assembled from the systematic literature review. In addition, we present the plethora of concepts relating to CDL that were used in research papers and policy documents.

We found 551 concepts, and 486 concepts appeared only once (but, as mentioned, often the concepts were similar). This demonstrates the large variety of concepts and issues related to CDL. The 10 most often used concepts were digital literacy (26), cyber bullying (19), Internet safety (14), media literacy (14), information literacy (10), ICT competence (10), e-safety (9), online risks (8), online safety (7), and digital competence (7).

As explained previously, it was anticipated that some of the concepts overlap. The concepts of critical digital literacy (6 hits) and critical digital literacies (12 hits) were not included in the separate dimensions because these represent the phenomenon which we were exploring in this study in order to summarise which topics should be included in critical digital literacy. In addition, we did not include the concept of digital competence to any of the dimensions because it summarises concepts of many of the dimensions, and we did not want to categorise it artificially to some of the dimensions. Digital competence had seven hits, and the concepts with the same or similar meaning were digital competencies (three), digital age skills and knowledge (one), digital 'bildung' (one) and digital skill (three).

Dimensions

Based on our analysis, the 10 main dimensions identified through thematically categorising the individual concepts are presented in Table 1 in the order of hits (N=hits).

Based on the method of selecting the hits, the numbers do not indicate the exact order or relational size of the dimensions, but they can be interpreted indicatively. On one hand, some dimensions include various literacies, which have been closely related to digital technology use, as explained in the Introduction. In particular, these are Media literacy, Technology

TABLE 1 Main dimensions in the order of hits and the number and percentage of hits in research papers and policy documents.

Dimension	Research papers		Policy papers		Total	
	N of hits	% of hits	N of hits	% of hits	N of hits	% of hits
E-safety	232	33.4	13	15.5	245	32.8
Participation and presence	85	12.2	33	39.3	118	15.8
Digital literacy	64	9.2	7	8.3	71	9.5
Media literacy	63	9.1	2	2.4	65	8.7
Digital citizenship	48	6.9	14	16.7	62	8.3
Technology literacy	56	8.1	1	1.2	57	7.6
Information literacy	50	7.2	5	6.0	55	7.4
Data literacy	42	6.1	4	4.8	46	6.2
Digital game literacy	22	3.2	0	0.0	22	2.9
Online learning	10	1.4	0	0.0	10	1.3
Digital creativity and innovation	4	0.6	4	4.8	8	1.0
Digital well-being	2	0.3	1	1.2	3	0.4
	678	100.0	84	100.0	746	100.0

literacy, Information literacy, and Data literacy. These literacies already have 'names', defined contents and focuses, although they are not static constructions. On the other hand, some dimensions formed were based on topical issues that have emerged during newer practices relating to digital technology use, such as E-safety, Participation and presence, Digital citizenship, Online learning, Digital creativity and innovation, and Digital well-being. In these, the names as well as the categorisations are our suggestions.

E-safety was the dimension that obtained the most hits, and it consisted of several issues from sexual harassment to cyber bullying and Internet addiction. Participation and presence was the second-largest dimension. As expected, the various previously identified literacies were essential dimensions of critical digital literacies, and the number of hits for these dimensions were approximately the same. Online learning, Digital game literacy, Digital creativity and Digital well-being were the least frequently encountered dimensions in the literature.

The number of hits of the dimensions in research articles and in policy documents differed markedly. In research papers the major dimension was E-safety, then Participation and Presence, and the various literacies followed with almost the same proportion of hits. Digital creativity and Digital well-being were rare. In policy documents, Participation and presence was the major dimension, and Digital citizenship and E-safety the second most mentioned dimension. Media literacy and Digital literacy had few hits, and Digital game literacy and Online learning had no hits. Digital creativity and innovation as well as Digital well-being were minor dimensions, but they both had relatively more hits in policy documents than in research articles.

Criticality in the concepts

One of the aims of this SLR was to explore whether and how the notion of criticality features in the reviewed literature. To this end when conducting the searches, we used concepts related to criticality, but critical* (* = shortened to include all concepts consisting of this) was not used very often and was only found in the following contexts.

- As expected, considering the definition we addressed in the theoretical background section, the concept of criticality appeared most often in Information literacy critical* since the synonym of Information literacy was Critical information competencies. An example of what critical means in the information literacy context can be found in the study by Rodriguez et al. (2014) whose focus was copyright compliance and academic integrity and their use. The authors asked whether these critical information competencies are being addressed in education. In the subdimension of Information literacy Online inquiry, the concept was used in Critical evaluation of sources, Source criticism, Online critical evaluation, Critical thinking, and Criticality.
- Second most often critical* appeared in relation to Media literacy (including critical media literacy), in which the following concepts were found: Critical consumption, Critical digital production, Critical prosuming (meaning participation and creation of products), Critical digital distribution and Critically curating (girls). As an example, Costa et al. (2018) used the term critical media literacy, and they emphasised that it requires the development of reflexive knowledge—for example, to integrate and reflect on everyday media experience. In the article about critically curating girls, Almjeld (2015) wrote about critical awareness as users reinscribe, resist or reinforce cultural norms of femininity. Nagle (2018) emphasised critical social media literacy to increase understanding that social media spaces are not neutral, and students need strategies and tools to work within these spaces and they need to be aware of how a diversity of people (including their peers) use and experience social media. These examples regard

reflection as the key function of criticality but also awareness as a tool to uncover the hidden aims and backgrounds.

- In Data literacy the following synonyms were used: Critical data literacies, Critical data literacy, Critical approach to data. For example, Gebre (2018) emphasised the importance of students' broader awareness related to the nature of data in everyday life; awareness meaning a critical attitude. Pangrazio and Selwyn (2018) wrote that because digital technologies continue to permeate everyday life, and so do the opportunities for data extraction, it is prudent to work towards cultivating a new discourse around personal data that impel a more critical disposition. In addition, critical* was used in the Data uses subcategory: Critical inquiry in datafication.
- In Digital citizenship critical* appeared three times: Critical digital consumption, Critical understanding of Internet advertising, and Critical consuming. In their article, Mirra et al. (2018) articulated a new critical theory of multiliteracies encompassing four types of digital engagement: critical digital consumption, critical digital production, critical digital distribution, and critical digital invention. In their approach, critical means the politically engaged term that considers the ways that race, class, gender, and other social constructs are formed and influenced.
- Critical* was used twice in Participation and presence: Critical communication and Critical self-reflection; and twice in Online learning: Critical awareness of learning (in the twenty-first century), Critical engagement (in learning in digital worlds).
- Critical* appeared once in Technology literacy: Critical Internet literacy; once in Digital literacy**:** Critical multimodal literacy; and once in Digital creativity and innovation**:** Critical digital invention.

In E-safety, Digital game literacy and New literacies, the concept was not used.

As the examples show, criticality had several meanings, similar to those mentioned in Gouseti et al. (2023), in the Theoretical background section. It consisted of reflection, and self-reflection, critical attitude, awareness of the background, sources, aims and hidden background. In some studies, the last one was also related to the political agenda of revealing the power relations and empowering the underprivileged.

Subdimensions

The main dimensions were organised into subdimensions, as explained in the Methods section. Table 2 presents the main dimensions, the subdimensions and the number of hits in the key concepts (=name of the subdimension and concepts close to it) and subdimensions.

In research articles, the Online risks subdimension (in E-safety) had the most hits of all subdimensions (90); Cyber bullying also had many hits (34). E-safety had a strong negative approach; only E-safety awareness did not directly address negative issues. In Participation and presence, the Online communication and collaboration and Digital identity subdimensions had many hits, both in research articles and policy documents. In Digital citizenship, Digital law had the most hits, consisting mainly of various issues about copyright.

In Technology literacy, the ICT competence and ICT skills (related to practical skills) subdimensions were the most common; only Computational literacy had few hits. Technology literacy is close to Data literacy and in that, Personal data literacies had the most hits within this dimension. Digital well-being, Digital creativity and innovation and Digital game literacy did not have many hits in any of the subdimensions. Online games literacy consisted of hits which focus on competencies of creating games, and the addiction for games and similar 'dangers' were in E-safety, Risky online behaviours.

TABLE 2 The main dimensions, the subdimensions and the number of hits.

Main dimensions	N of hits Research papers	N of hits Policy papers	Subdimensions	N of hits Research papers	N of hits Policy papers
E-safety	42	8	E-safety awareness	13	4
			Risky online behaviours	25	
			Online risks	90	
			Cyberbullying	33	1
			Sexual harassment	18	
			Online victimisation	11	
Participation and presence	1		Online presence	10	3
			Digital identity	25	5
			Online privacy	12	7
			Online communication and collaboration	30	12
			Digital emotional intelligence	3	6
			Social media literacy	4	
Digital literacy	44	2	Digital content creation	11	5
			Digital design literacy	3	
			Critical multimodal literacy	6	
Media literacy	25		Media use	16	1
			Distribution and production	22	1
Technology literacy	3		ICT competence	22	
			ICT skills	13	
			Understanding digital technologies	7	
			Confident and responsible use of digital technologies	4	
			Risks related to hard/software	5	
			Computational literacy	2	1

TABLE 2 (Continued)

Main dimensions	N of hits		Subdimensions	N of hits	
	Research papers	Policy papers		Research papers	Policy papers
Information literacy	12	6	Online reading	4	
			Online inquiry	24	1
Digital citizenship	6	4	Digital law	17	1
			Digital equity	6	3
			Ethical responsibility	7	6
			Critical digital consumption	12	
Data literacy	12	4	Personal data literacies	16	
			Digital data agency	5	
			Data uses	9	
Digital game literacy	2		(Game) Constructor	2	
			Online games	7	
Digital creativity and innovation		1	Various practices	4	3
Digital well-being	2	1			
Online learning	1		Various practices	9	

The number of hits in the subdimensions showed an important trend, although they were not exact or comparable. For example, within policy documents, Online communication and collaboration had the most hits and Online privacy, Digital Emotional Intelligence and Ethical responsibility were the next ones. In research articles these were not at all as relevant, compared to the number of hits of other subdimensions. On the other hand, Technology literacy had many hits in research articles (56) but only one in policy documents.

DISCUSSION

The aim of the review was to explore which elements and issues relate to and compose the dimensions of critical digital literacies in school education. Based on the results, the concept of critical digital literacies has its roots in two types of entities: in various literacies and in societal and cultural phenomena that inform practices and experiences. The first ones appear to be defined in the literature, although often with vague boundaries and emerging content. These include digital literacy, media literacy, technological literacy, information literacy and data literacy. The second ones consist of phenomena in which digital technology is used in ways that have changed the previous manners, practices and even contents and therefore have also been reshaping our conceptualisation of critical digital literacies.

Based on our search strategy, the number of various concepts obtained was substantial but most of them appeared only once. This is an indication of the emerging and fast changing nature of the phenomena related to digitality. Technological change is continuous—new concepts appear with new applications and services, and commonly agreed concepts or definitions are not fixed, as also suggested about digital competence (Ilomäki et al., 2016). An example of the rapid change is the discussion about the applications of artificial intelligence—this was not addressed in the documents but is also a current burning issue within education.

In general, criticality was not often addressed in the publications reviewed. It was not unexpected that it appeared most often in relation to information literacy, which consists of issues such as evaluating the sources and information and an increasing awareness of the critical approach. Criticality was also typically connected with media literacy, as it is often associated with a critical disposition and attitude towards the content of various media. Similarly, the relevance of criticality in Data literacy is tied in with the current discussion about data ownership and data use and the need to develop teachers' data literacies and promote critical data education in school contexts (Pangrazio & Selwyn, 2020).

There was a strong emphasis on issues about e-safety in the research articles (232, 33.4% of hits in research papers) and less so (13, 15.5% of hits) in policy documents. The focus in both research articles and policy documents was on the risks associated with digital engagement in children's and youngsters' lives. This heightened attention regarding issues of e-safety could stem from the increase in access to the Internet and social media and use by children and young people during the past two decades (see Livingstone et al., 2011; UNICEF, 2019). Given that this surge in digitisation and online access has somehow reshaped children's lives, it does not come as a surprise that issues associated with e-safety appeared to be the focus of a large body of research conducted during 2005–2020.

One of the more surprising findings of this study was that there were few results about the benefits or inspiring opportunities of digitality in any dimension, despite the potential of digital technology use to facilitate collaboration, communication, access to inspiring contents, opportunities to find new friends and connect with like-minded peers or share one's own products and thinking, not to mention the popular recreational gaming. It is understandable that it is important to protect children and teenagers, and some articles (case studies) reported positive results of students working with digital technology, such as making videos,

writing lifestyle blogs, and engaging in online role-playing games (Kupiainen, 2013). However, these were exceptions. Digital well-being was primarily explored in relation to issues of e-safety, such as active parental involvement leading to an increase in e-safety and thus also digital well-being (Vanderhoven et al., 2016), or reporting a project for increasing cyber wellness, such as by preventing cyber bullying (Liau et al., 2017), but also the subdimension Engagement and empowerment could be addressed under Digital well-being. We also missed topics related to ergonomics; there were no hits for this.

Understanding and managing online and digital identity (one's own and others) is part of social skills. However, these are only seldom topics in school education, although identity shaping is a fundamental developmental task in youth. An exception was one positive example of teenage girls crafting powerful, positive articulations of girlhood of digital identities through their own production of technologies (England & Cannella, 2018). After conducting the review, we noticed that our searches did not recognise the phenomenon of a raciolinguistic approach—the complex connection between race, power, identity and language. Indeed, digital technology use can provide students who are not from the 'white majority', such as immigrant or Black students, a useful means for identity creation, engagement and communities that support their making and remaking of home (McLean, 2010; Skerrett & Omogun, 2020). As Omogun (2018) further highlights, the use of multimodal writing can enable students to share aspects of their identity that may not be visible when traditional writing styles and genres are used in school.

Another important subdimension of CDL with only a few hits was Critical digital consumption (in Digital citizenship), and this was associated at large with understanding Internet commerce, trading and advertising. That relates to having a critical understanding of media, such as advertising, but also to home economics. Along with copyright issues, digital citizenship is a new issue in society, but it is emerging in general, such as in digital voting. Social media is the main media source on societal issues for young people. As Gleason and von Gillern (2018) report, it is critical that young people develop digital citizenship and civic engagement using social media. Furthermore, Castellví et al. (2020) argued that teachers need to have better competencies in CDL, to teach about the societal issues related to digitality for democratic participation and they suggested working with social problems in citizenship education.

There were not many hits related to Creativity and innovation, and these were mainly encountered in policy documents. Perhaps it is not considered as relevant for school education or important for students? Adapting to and coping with digital phenomena seems to be more important than proactive or agentic role taking with digital technology. Does this explain the more generic conceptions of learning or how teachers see the students' role? In practice, students have creative tasks with digital technology, such as creating digital stories for learning English (Yang et al., 2020).

A general difference between the policy documents and research articles reviewed for this study was that the former look forward and give guidelines regarding future trends and needs in relation to digital literacies, whereas research documents examine something that has already happened. Our results reflect this difference and the three issues with most hits in policy documents (Online communication and collaboration, Digital Emotional Intelligence and Ethical responsibility) were among the ones that will be more important in the future.

Drawing on the discussion above and also based on the results in Tables 1 and 2, we present the following summary of CDL in the context of school education:

Critical digital literacies entail a range of complex skills, competencies and dispositions which include: understanding the principles of digital technology and being able to act as producers and makers; using the digital services and tools in a meaningful way in one's daily life and for studying and work; working with digital technology in a creative way, alone and in collaboration with others, including online collaboration; understanding the use and

implications of digital data, such as for learning, e-commerce or offering services; understanding the role of digitality in various issues in society and culture, such as democracy, influencing or activism; understanding the principles and ethics of online communication and collaboration; knowing how to participate online and understanding an individual's responsibilities for everyone's well-being, and understanding issues relating to digital presence and identity, knowing how to protect oneself and taking responsibility not to participate in harmful or even illegal online activities.

Implications for theoretical discussion

Digitality is in constant change, so theoretical models and frameworks should also be constantly updated. It is possible to define some widely agreed main dimensions that could be more sustained and permanent and could be used to represent emerging phenomena in the future, such as information literacy, but in general, it is important to be flexible and reflect the needs of society and individuals as well as the development of technology. In addition, the content of the various main dimensions will change.

In our study, one concept was criticality. There were various interpretations of it. The meaning, besides reflection and awareness, is often a critical attitude but a critical attitude without content knowledge and understanding is often unproductive. More in-depth investigation of the concept used in practice is needed.

We suggest that further research is needed to explore how gender, race, class, sexuality and other forms of identity shape students' experiences of and interactions with technology and digital media within formal education.

Implications for school education and educational policy

The CDL dimensions and subdimensions presented here are a result of a systematic literature review and it has shown the accent of various dimensions and subdimensions, based on the investigated documents. As such, it is not a practical framework for educators and policy makers, but it can also inform practitioners about the interesting trends concerning critical digital literacy.

The review focused on school-level education, but the results can probably be applied in other levels of education as well. However, the subdimensions especially need to be investigated if applied to other levels of education; the content may not be appropriate, or the depth of content might need revision. Similarly, the results for CDL in the workforce might need different focuses and emphases.

The continuous change in digital technologies puts demands on educational systems, schools and teachers. At the macro level—the educational policy level—an update to the curricula and competence requirements is needed, and it is also necessary to provide relevant teacher training in relation to the different dimensions of CDL. At the meso level—the school level—it is important to take care of relevant educational practices and teachers' collaboration regarding the use of digital technology. At the micro level—the teacher level—there is a need to update teachers' competence related to critical digital literacies and digitality in general.

The subdimensions of critical digital literacy are connected to various domains, and in this way, the responsibility for teaching the related competencies at school should be shared among several teachers. This offers a good starting point for natural and authentic learning activities, which integrate individual subjects into larger entities and offer opportunities for inquiry learning, problem-based learning, creative activities and group works. For an individual teacher, competence in CDL means an active role as a guide for fostering students'

CDL as well as their criticality, and the need to provide students with situated and significant learning experiences to apply CDL in their academic and personal lives.

Limitations of the study

Review results are always based on the search words used. As explained, we used various concepts. *School* as a search concept restricted the searches, but very probably in an effective way. We were surprised about the large number of e-safety related articles, and this might be explained by it becoming a topical issue during recent years. It is important to see the numbers as trends, not as absolutes. Furthermore, our searches were for peer-reviewed articles written in English, which might have led to an emphasis on the Anglo-American and European contexts. However, we suppose that the culture and phenomena of digitality are international—for example, the question of e-safety, fake news or collaboration in digital environments. The searches for the review were conducted just before the COVID-19 pandemic, hence the studies concerning students' critical digital literacies during various types of distance and hybrid learning are missing from this review; these might have expanded the contents of digitality and learning.

Last, we acknowledge the complexity of digital literacy as well as its increasingly expanding conceptualisations to capture the various aspects of 'literacies' or 'competencies'. We also recognise that criticality can be perceived and interpreted in several ways and digital literacies studies can be informed by critical race theory, feminist perspectives, postcolonialism and gender studies among others, and the absence of these in this paper can be perceived as a limitation. However, our review was informed by our search results and in the searches these issues did not emerge as such. For example, sexuality was one of the topics within cyberbullying, and it also relates to such subcategories as Digital equity and Ethical responsibility. These issues bring also broader societal consequences that are important for both research and practice and relate critical digital literacy to critical global education.

CONCLUSIONS

Critical digital literacies is a concept that integrates various subject domains and is strongly related to societal phenomena, such as goals, expectations and developmental trends, as well as to the rapid technological change. Its necessary precondition is the availability of digital technology resources for digital technology, but its content is rapidly changing, which leads to the need to revise the definition and the content regularly. As Nichols and Stornaiuolo (2019) argue, CDL should be perceived more as an assemblage of meanings and practices and less as a finite and tightly bound concept. To this end, our study contributes to capturing the different aspects of CDL in the context of compulsory education at a particular time and highlights how these feature in the academic literature and policy documents. Still, we acknowledge the ephemeral nature of this conceptualisation and emphasise the need to repeat such systematic literature reviews frequently, due to the ongoing technological and societal developments that influence digital practices and therefore critical digital literacies.

The emphases in research articles and policy-related documents differed from each other and the policy-related documents raised new emerging trends whereas research articles focused on existing school practices. This difference is interesting and introduces the role of evidence in policy making. Research is an important resource for policy making, but societal and technological development also shape the understanding about necessary competencies of the future.

The literature review allowed us to suggest the relevant major elements of today for critical digital literacies at school. First, one basis is *information literacy* and its elements:

competence in online inquiry, which includes skills in searching, evaluating the sources and verifying them, using and creating information and creating reliable and evidence-based information. The second basis is the expanded *digital media literacy* practices: digital multimodal content creation and production, including digital design, form an essential part of critical digital literacy. This consists of creative expressions with digital tools and sharing the outcomes online. *Technological literacy i*s also a basis for CDL; not only basic skills but also understanding digital technologies and having a critical approach to them, using them in a confident and responsible way, and knowing how to cope with the technological risks. Furthermore, technology literacy includes understanding computational literacy, such as programming and game creation. *Participation in the digital society and culture* is one basis. This demands knowledge of legal basics such as copyright, ethical responsibility and e-safety, but also digital commerce and consumption from a consumer's point of view, as well as the societal basis of digital participation—for example, the digital divide and inequalities. Digital participation is closely related to social competence in general; digital competencies are not separated from general competencies. *Digital identity and privacy* is the last major element: understanding the online presence, digital self and identity as well as understanding how to protect and take care of one's own digital space and well-being but also of others.

The importance of this review for educational practices is that it makes explicit the emerging concepts of CDL. It allows educational institutions to analyse and improve CDL practices and new initiatives and in this way, it will help to define strategies for the adoption of CDL-based pedagogical approaches.

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