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The framing of educational digitalization: A scoping review of empirical studies

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Abstract

The aim of this scoping review is to systematically investigate the framing of European empirical research on digitalization for teaching and learning in the classroom within primary and secondary school (K-12/K-13). We believe it is crucial to gain insight in the framing of the knowledge production taking place in the fast-evolving field of educational digitalization. The framing will influence the research results and conclusions published as well as potentially impact on how policy and practices of educational digitalization evolve. Our findings reveal that the studies of educational digitalization are spread relatively thin over a wide variety of academic journals and fields, where journals within the edtech field dominate in numbers. The dominant technological framing could indicate research driven by technological perspectives rather than pedagogical interests. The research is unevenly geographically distributed. There is a lack of European comparative studies as well as studies framing digitalization as something else than a tool for making learning more effective.

1 | INTRODUCTION

Digitalization is currently changing schools and educational systems. Enhanced access to technologies within schools creates new possibilities for teaching and learning (Jahnke et al., 2017). The European Union has defined digital competence as one of the eight key competencies for lifelong learning and encourages member states to

strengthen schools' digital capacities to foster digital competence among students. Bilyalova et al. (2020) define educational digitalization as a 'set of measures used to transform pedagogical processes through the introduction of information products, tools and technologies in education and training'. They further emphasize the importance of critically analysing its advantages and potential risks.

Despite the increasing integration of digital technologies in education, empirical evidence of their positive impact is limited. Findings from existing research are mixed, with studies often small in scale and focusing on the effects of specific digital learning tools (Bulman & Fairlie, 2016; Escueta et al., 2017; Zheng et al., 2016). In a recent scoping review of more than 300 international systematic reviews—Munthe et al. (2022) echoes this ambiguity. Even though the review indicates that digital tools and teaching aids *can* potentially enhance students' learning and competence development, the results will vary based on contextual factors such as subjects' matter and age groups.

Despite the limited empirical evidence supporting the positive effects of educational digitalization, scholars like Biesta (2016, 2019) have criticized the research for adopting a narrow view of digitalization as a neutral project aiming at enhancing learning efficiency. This perspective often overlooks the broader context of education's purpose and its societal role, as well as the wider societal implications of ongoing digitalization (Knox, 2019; Peters & Besley, 2019). Given these arguments, we believe that understanding the scopes and perspectives, or the *framing*, of current research on educational digitalization is important. The major premise behind the concept of framing is the notion that an issue can be viewed from multiple perspectives and that the chosen perspective will influence subsequent thought and opinions on how the issue should be addressed (Hulst & Yanow, 2016). In the context of educational digitalization research, the selected framing will affect the empirical findings and conclusions that are published. Concerning the recent emphasis on evidence-based policymaking in the field of education (Steiner-Khamsi et al., 2020), research results can also potentially influence how policy and practices of educational digitalization evolve. Hence, it is crucial to understand the framing of knowledge production from a broad perspective, such as identifying the academic fields publishing studies on educational digitalization, understanding the dominant methodologies and determining the most commonly studied topics and technologies.

To get an overview of the framing and perspectives that are present within empirical research on educational digitalization, we conducted a scoping review. Unlike systematic reviews and meta-analyses which assess effects, scoping reviews offer a broader investigation and analysis of research trends (Munn et al., 2018). Therefore, scoping reviews are beneficial for reviewing evidence in emerging research fields or topics and for identifying and analysing knowledge gaps (Virtanen et al., 2018; Wagman et al., 2015). This scoping review aims to systematically investigate the framing of empirical research on digitalization for teaching and learning in primary and secondary school classrooms. More specifically, we will present current research perspectives on educational digitalization, identify gaps in the existing literature and contribute to the ongoing discussion about the nature of educational digitalization. With this goal in mind, the research questions guiding this scoping review pertain to the following aspects of the literature:

1. The scope of interest (e.g. learning outcome, social interaction, digital divide)
2. The key characteristics of the studies, including geographical origin, publication details (such as journal and year of publication), participants and involved school subjects
3. The specific technology under investigation
4. The research methods employed

The scoping review will focus solely on European studies. Although the process of digitalization varies across European countries, current developments have been significantly influenced by organizations such as the OECD and the EU. According to Ottestad and Gudmundsdottir (2018) the EU's cooperative systems for educational development represent the most important international framework for national educational policymaking for EU member states and other European countries. The overarching political influence from organizations like the EU

and OECD (Organization for Economic Cooperation and Development) establishes a common platform that makes a European comparison meaningful.

2 | METHODS

2.1 | Search strategy

In this scoping review, we have followed the five steps outlined by Arksey and O'Malley (2005): 1. Identifying the research question, 2. Identifying relevant studies, 3. Selecting studies to include, 4. Charting the data and 5. Summarizing and reporting the results.

Align with the purpose of this review (identified in **stage one**), we developed three sets of keywords that were developed in **stage two**, encompassing *education*, *digital technology* and *digital teaching and learning*. Search terms were identified based on a preliminary literature search (Kerawalla et al., 2013) and further refined in collaboration with a university librarian. Search terms were executed separately and in combination using Boolean operators, with the *AND* operator used between the sets and the *OR* operator used within the set. The search included databases that focused on education and interdisciplinary subjects to cover all aspects of the topic.

The databases selected for our searches were chosen for their specialized focus on the academic areas of education, teaching and learning, as well as their capacity to provide interdisciplinary insights. These include ERIC (EBSCO), Education Source (EBSCO), Teacher Reference Center and Scopus. These platforms are designed to offer extensive academic insights into education, pedagogy and a wide arrange of interdisciplinary fields. This selection facilitates a thorough exploration and understanding of educational theories, practices and research.

During the **second stage** of the process, we established the following inclusion and exclusion criteria for the search (Table 1). Our searches were limited to peer-reviewed research, written in English and published in scientific journals, reflecting our language proficiency and acknowledging limitations in understanding other languages. Consequently, we excluded 'grey literature' such as book chapters, dissertations, magazine articles, reports and conference proceedings. To review the most recent research developments, we included studies conducted between 2015 and 2021. While studies from preschool and kindergarten, as well as those focusing on students enrolled in special education, could address several relevant issues, they were excluded due to the vast number of studies. Other exclusion criteria were derived from study's purpose, which was to review the digitalization occurring in a *typical classroom-setting* (including the outdoor classroom). Therefore, we excluded studies investigating the use of digital technology in other settings, such as during the COVID-19 pandemic and within online teaching or learning.

In the **third stage,** all articles underwent a review for relevance. Initially, we utilized the Rayyan screening software in combination with manual abstract screenings. Rayyan proved effective in eliminating duplicates and articles that fell outside the predefined period. The software was also somewhat beneficial in excluding non-European articles, but extensive manual screenings was necessary to exclude irrelevant studies as well pinpointing the geographical origin of articles when such information was absent in the abstract. The manual screening was carried out independently by two researchers. Post screening, 650 studies were selected and transferred to an Excel sheet. Subsequently, two researchers screened the abstracts and evaluated full texts as necessary. After this phase, the number of included studies was reduced to 443 (Figure 1).

During the **fourth stage,** the authors developed a codebook (Appendix 1, Table A1).

The categories within the codebook were design to address the research questions of this study and were developed after reviewing the included studies. Establishing the categories of the code book is critical in scoping reviews because the categories will have an impact on the result. While categories like *geographical origin* of the papers and *year of publishing* in general are easy to define, other categories across different disciplines and methodological perspectives could be more challenging to decide on. Our solution to these challenges has been

TABLE 1 Criteria of inclusion and exclusion.

Criteria	Inclusion	Exclusion
Time period	Published from 2015 to 2021	Studies outside this period
Location	European studies[a] International comparative studies like TIMMS and PISA	Non-European studies European studies with one or two non-European participant countries
Literature type	Peer-reviewed journal articles	Literature that are not peer-reviewed journal articles
Language	English	Non-English
Study type	Empirical study	Other methodological scopes
Scope	Digitalization for teaching and learning	Digitalization in administration Cyber bullying etc not linked to learning/teaching
Educational category	Classroom based 1–13 school, including outdoor classrooms	Higher education, special education, kindergarten, COVID-19 studies, e-learning, online courses, digitalization for homework and digitalization and home schooling
Primary research	Reporting primary research	Studies not reporting primary research

[a]Not including Turkey.

a collaborative approach to the establishing of the codebook, as recommended by Roberts et al. (2019). We have also sought to make the codebook easy to follow for our readers, by for instance explaining the differences in journals categorized as either journals in the field of *education* or as *edtech journals* (where the name of the journal refer to technology as well as education/pedagogy).

While additional categories like 'journal' and 'objective' were included, the variance within the included studies did not allow for substantial analyses. In the **fifth stage,** data coding and descriptive analyses were performed using SPSS.

3 | RESULTS

Figure 2 illustrates the number of studies by publication year and categories of study participants. From 2016 to 2021, the quantity of studies remains relatively constant, with the peak observed in 2020, boasting 87 studies. Conversely, 2021 showed the lowest number of studies with 58 studies. When comparing the number of studies across participant groups, students emerge as the most included group. Mixed groups, encompassing more than one category of participants, such as students paired with or parents, are less prevalent. Its noteworthy that studies involving students and parents were only found in 2016, with this category absent in subsequent years.

The 440 included studies were conducted across 33 different countries. As seen in Figure 3, Spain ($n=76$), Greece ($n=45$), UK ($n=37$) and Sweden ($n=33$) were the countries that most frequently published studies on digitalization in educational contexts. A total of 16 countries published less than 10 studies that met the inclusion criteria. These countries include Poland, Serbia, Slovakia, Czech Republic, Estonia, Portugal, France, Switzerland, Austria, Romania, Slovenia, Luxemburg, Malta, Lithuania, North Macedonia and Ukraine.

Figure 4 illustrates the range of included studies. As seen in Figure 4, most of the studies examined learning and skills (216 studies), followed by attitudes (67 studies), teaching and pedagogy (64 studies), digital literacy (52 studies), interactions (21 studies) and social dimensions contributing the least with 12 studies.

As illustrated in Figure 5, certain technologies were more frequently investigated. Tech and ICT emerged as the largest category ($n=111$ studies), succeeded by hardware (85 studies), games and augmented reality (AR) (77

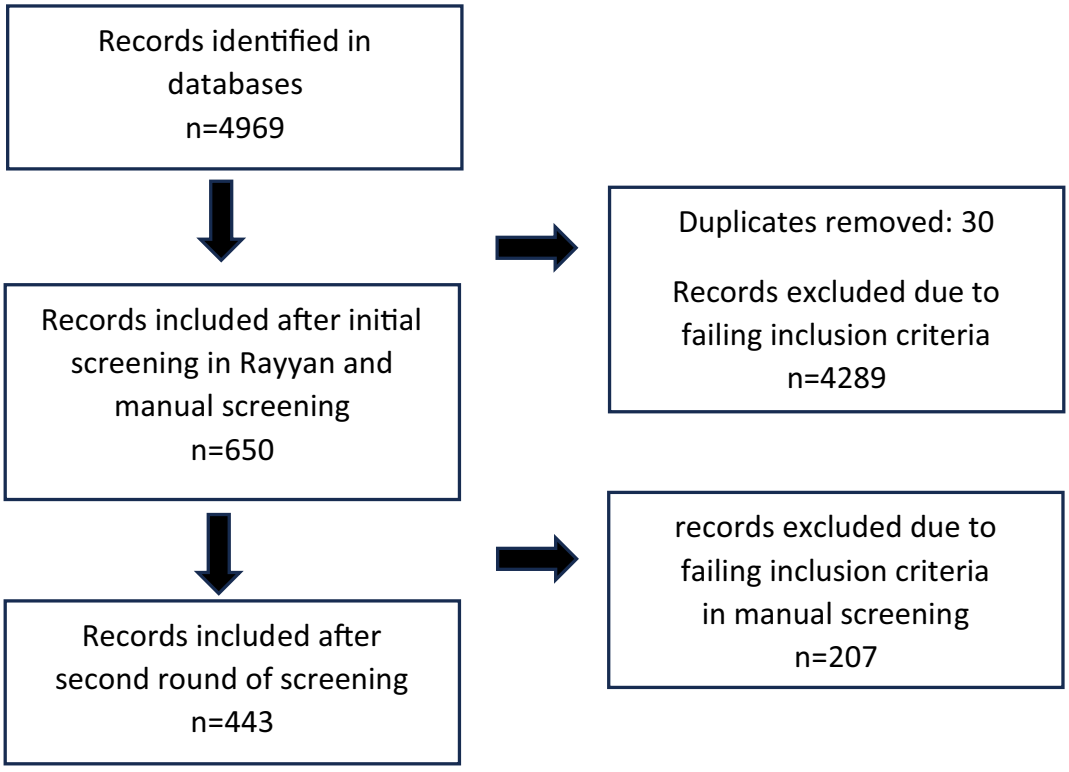

FIGURE 1 Overview over study selection process.

studies), software (59 studies) and learning platforms (43 studies). In contrast, only a few studies examined programming (9 studies) or the impact of artificial intelligence (3 studies).

Figure 6 demonstrated that a majority of the included studies used various types of experimental designs (154), including randomized controlled and quasi-experimental designs. A large proportion also used qualitative designs (133), survey designs (73) and mixed-methods designs (59) combining qualitative and quantitative methods. Conversely, only a few studies relied on registry data or action-research approaches.

Table 2 provides a combined view of publication field and subject of interest. Most studies were published in the domains of education and technology, and education. When compared with the subject matter, publications in education and technology, and education primarily focused on learning and skills. Contrastingly, few studies were published in the fields of methods, health sciences, social sciences and the category labelled as 'other'. Nonetheless, a consistent trend is evident in the publication of studies focusing on learning and skills across diverse fields. For instance, of the 11 articles published in health sciences, 6 were specifically centred on learning and skills. In the category of *social dimension* (including aspects like digital divide, digital implementation, exclusion, sociocultural dimensions, digital transformation etc.) we identified 12 studies, mainly within the field of education.

4 | DISCUSSION

The aim of this scoping review was to present current research perspectives on educational digitalization, identify gaps in the existing literature and contribute to the ongoing discussion surrounding the nature of educational

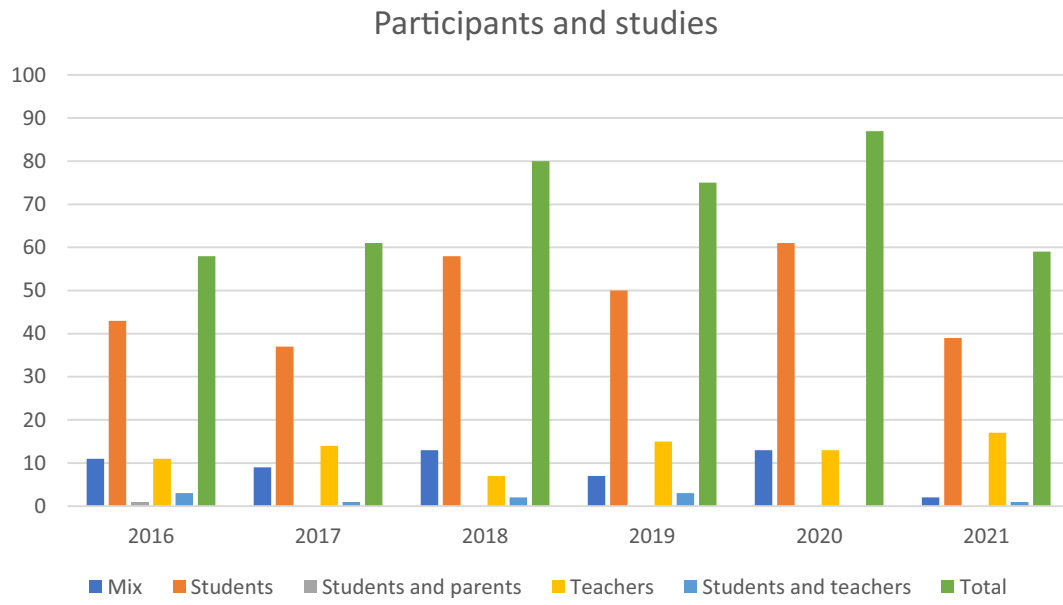

FIGURE 2 Number of studies by publication year and study participants.

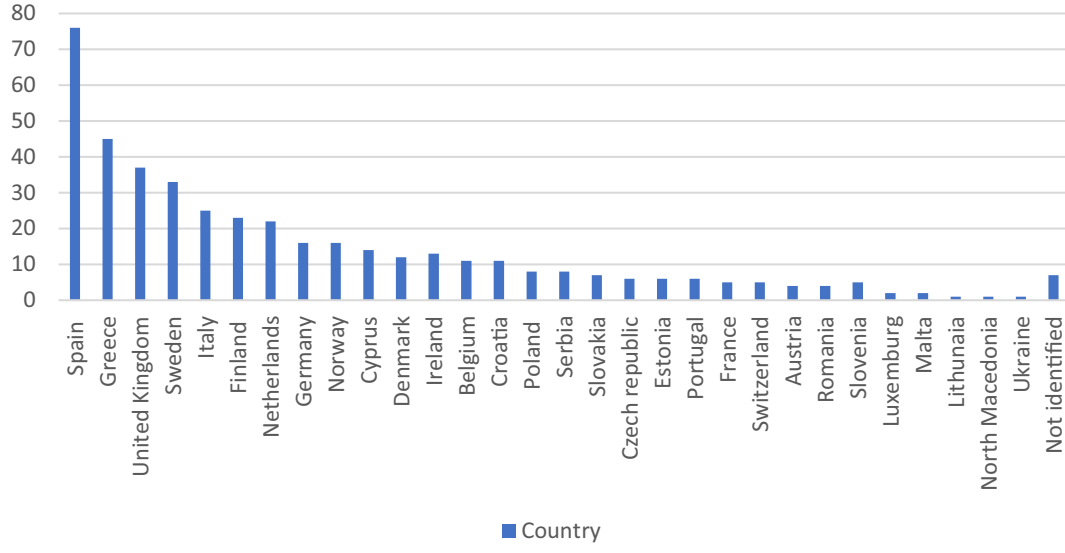

FIGURE 3 Number of included studies by country.

digitalization. The search resulted in 443 studies, which were subsequently categorized based on study participants, geographical distribution, scope and research method.

4.1 | Geographical distribution

Research on educational digitalization appears to be geographically unevenly distributed. A handful of countries from Southern and Northern Europe dominate the review, while the majority of countries are represented by

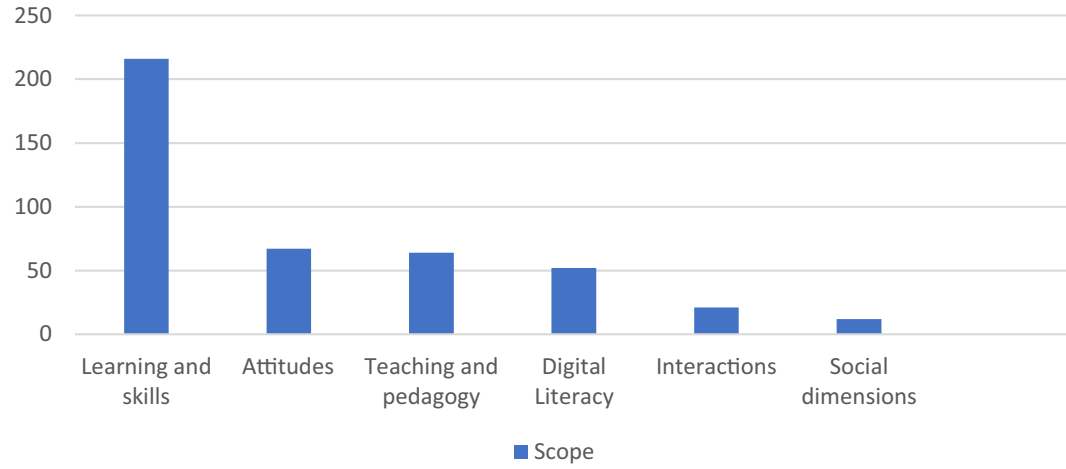

FIGURE 4 Number of studies by scope of interest.

a small number of studies. Spain holds a dominant position in our review, followed by Greece, Sweden and the UK. It remains unclear whether this distribution mirrors the actual intensity of the various national digitalization processes, or if there are other factors contributing to this uneven distribution of research. Spain and the UK are large European nations, with populations of approximately 47 and 67 million, respectively. Conversely, Greece and Sweden are smaller countries, each with around 10 million inhabitants. When population size is considered, the academic interest in the digitalization of education in Greece and Sweden becomes even more pronounced. France, despite of its population of 67 million, has a limited number of studies. This could be attributed to several studies being published in French, rather than English. However, if a substantial number of Spanish digitalization studies are also published in the native language, we anticipate an even stronger Spanish dominance in this research field.

In terms of national research agendas, the Spanish studies span all the primary categories of *scope of interest* in the review, a pattern not mirrored by other countries. The geographical distribution of studies is interesting, especially in light of what Ottestad and Gudmundsdottir (2018) describe as a *European access divide*. This suggests that Northern European countries appear to have an advantage in terms of equipment levels and policies promoting a diversity of technologies in education, compared to Eastern and Southern European countries. Our results, which reveal a high proportion of digitalization studies from Spain and Greece, offer a more nuanced perspective. However, it remains unclear whether the national priorities regarding educational digitalization and the national academic interests in digitalization are separate phenomena.

Despite the international character of digitalization of education and the EU's role as a driving force in the digitalization of European schools (Høydal & Haldar, 2022), only nine studies in the review involved more than one European country. There seems to be a lack of comparative research within the digitalization field, and data from international comparative studies like PISA seem underutilized. This could indicate missed opportunities for cross-border learning within a shared European context.

4.2 | Academic fields

Within contemporary academia, scholarly knowledge is primarily created and communicated through research papers, with academic journals as platforms for determining academic quality and defining academic fields (Aksnes et al., 2019). According to Wellington and Nixon (2005) the field of educational studies is elaborated and shaped

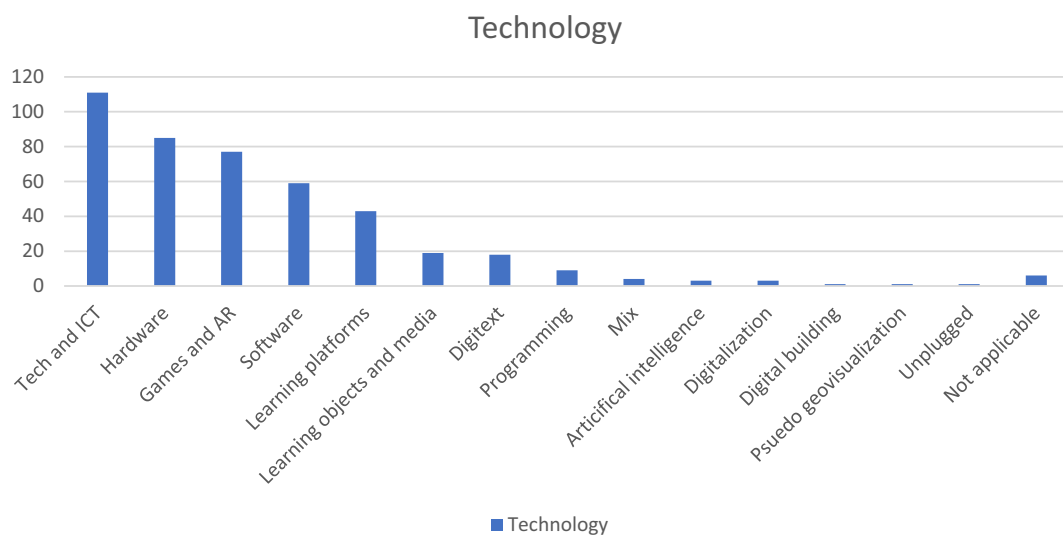

FIGURE 5 Number of studies by scope of technology.

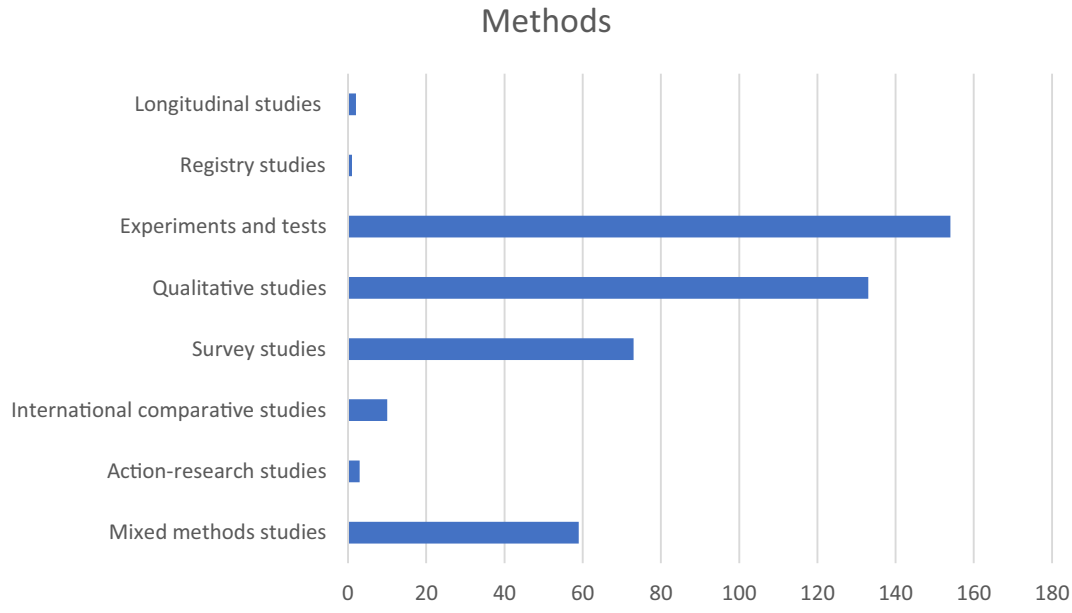

FIGURE 6 Number of studies by research method.

by market forces, favouring the growth of specialist subfields. The studies included in our review are disseminated across 281 different journals, of which 18 journals have published five or more studies, and eight journals have published 10 or more studies. Most of the journals included in the review, precisely 137, have published only a single study within the digitalization field during this period. This suggests a fragmented field that may not yet be consolidated into strong sub-disciplines. These findings could also be interpreted in line with Wellington and Nixon (2005), as being influenced by market forces. Nevertheless, the multitude of academic journals and the diverse academic niches they represent allow researchers from various academic traditions and interests to find their preferred journal(s) and academic community. This can lead to a rich and significant variety within relatively

TABLE 2 Field of interest and subject matter ($n = 422$).

	Assessment	Attitudes	Digital literacy	Interaction	Learning and skills	Social dimensions	Teaching and ped	Total
Edtech	1	30	28	11	110	2	29	211
Education	1	27	18	3	76	10	29	164
Methods					1			1
Health Sciences		2	2	1	6			11
Social sciences		4	1	1	3			9
Technology		3	3	4	15		4	29
Other		1		1	2			4
Total								422

new fields of research. However, when the task of defining academic quality is delegated to journals, and studies based on this review appear to be thinly dispersed among different publications, it raises questions about the quality assessment of this broad, relatively new and expanding research field(s). According to Saperas and Carrasco-Campos (2015), the quality of journals is related to the number of studies they have published—or the maturity of studies, in terms of, for instance, research methods or theoretical constructions.

Regarding the framing of the research on digitalization, the predominant role of edtech journals could be perceived as an indicator of the ongoing digitalization of education as a process driven more by technological opportunities and technological enthusiasm, rather than pedagogical ideas.

4.3 | Technological focus and school subjects

European education systems adopt diverse strategies to integrate digital technology in their curricula. Several EU member states teach both ICT and technology are taught as independent themes or subjects, while 17 states include computer programming or coding into their national or local curricula (Ottestad & Gudmundsdottir, 2018). At a glance, most studies take a general interest in the use of tech and ICT ($n = 111$) rather than specific tools, such as smart phones, apps or laptops. Similarly, most studies do not confine to a single school subject, but instead focus on the broader use of digital technology across subjects. Both results could suggest a more holistic perspective on the ongoing process than some critic's advocate. However, if we collapse the categories of *software* and *games/AR*—this would form the largest category ($n = 126$). Consistent with previous studies, these findings indicate a research field dominated by an interest in specific software, such as apps, programmes and games.

In the studies stating a focus on the use of digital technology in specific subjects, the sciences dominate. Forty-six studies (11%) are classified in the languages-category, 20 studies (5%) focus on the arts, while only 13 studies (3%) focus on school subjects like social sciences, history, home economics or geography. These findings could suggest a technological spiral—where the use of technology is primarily focused on STEM (science, technology, engineering and math education) and tailored to these subjects.

4.4 | Participants and scope of interest

Generally, end-users are studied more frequently than the implementation of digital technology at a broader level. Students are the most common participants in the studies. However, teachers play a significant role in the transformation from analogue to digital schooling, and studies have revealed several shortcomings in teachers' digital training and competence. This includes a limited ability to holistically integrate technologies into their teaching (Fernández-Batanero et al., 2022; Gudmundsdottir & Hatlevik, 2018; Skantz-Åberg et al., 2022). Only a handful studies analyse the home/school-relationship and how the digital school impacts aspects of life beyond the learning situation within school hours. The lack of studies with a broader societal perspective is also reflected in the *scope of interest category*. In this category, only 12 studies adopt a broader perspective to investigate the social dimensions of digitalization. Studies that take such a broader perspective primarily focus on what Van Dijk (2012), would describe as a first-order digital divide, understood as unequal access to ICT among different population groups.

Learning/skills is the dominating category when investigating *the scope of interest* in the sample. Following learning/skills, the most common subjects are *attitudes*, *teaching and ped* and *digital literacy* both within edtech and ed/ped publications. Biesta (2016) criticizes research on educational digitalization for its focus on technological opportunities and efficiency. He advocates for research that contextualizes digitalization in relation to the purpose of education or the aims society has for students' learning and the position or role schools, and education play in society. The academic interest in the students *learning/skills* could be interpreted as an indication of how digitalization is primarily framed as

a means of enhancing learning efficiency or improving students' skills. It appears less focused on implementation, that is *how* students achieve these results and the pedagogical dimension of this process.

According to Skantz-Åberg et al. (2022), the literature tends to assign the responsibility for developing technological competence to individual teachers, while the organizational level of school leadership is not held accountable for providing teachers with such competence. By examining the relationship between *participants* and the *scope of interest*, we find that attitudes (including acceptance and values, etc.) are primarily studied in relation to teachers.

In their examination of *teachers´ professional digital competence* in the research literature, Skantz-Åberg et al. (2022) found that the concept was widespread, but seldom defined. It includes aspects like teachers' ability to use digital technology in teaching, their proficiency in using ICT in teaching, and their attitudes to use ICT in teaching, Therefore, *Teachers´professional digital competence* might overlap to some extent with the concept of *digital literacy*. Digital literacy is another widely used term, but as with all forms of semantic magnet (Vedung, 2017), its meaning varies. However, a dominant perspective is that digital literacy refers to the ability to find, evaluate, utilize, create and share content in meaningful ways that require critical and creative thinking skills (Spires et al., 2018). Hence, the meanings of *Teachers´professional digital competence* and *digital literacy* overlap to some degree. While the former is naturally used in relation to teachers, *digital literacy* could apply to both students and teachers. However, in our sample *digital literacy* is primarily a term used in relation to students. This suggests that the literature uses different terms to describe overlapping phenomena taking place within different groups, thereby underscoring the importance of considering the framing.

Teachers dominate as participants when the scope of interest is teaching/ped, yet in this category, the groups of participants in focus are more evenly distributed. This suggests an academic interest in both teachers and students when pedagogy and digitalization are in focus.

While studies investigating topics like collective learning are categorized as *learning/skills*, there is a separate category for digital technology and *interaction* (*including aspects like* social interaction, collaboration, cooperation, social skills). These 21 studies constitute 4.8% of the total number of studies included in the review. In summary, the research focus of the review is primarily centred around students' learning/skills, followed by studies concerned with teachers' attitudes, competence etc., in relation to digitalization, teaching/pedagogy in the digital school and digital literacy—while other aspects are rarely investigated.

4.5 | Methods

Given the focus on students' learning or skills and the question of whether digital tools have a (positive) effect or not on academic achievement or learning, it is not surprising that experiments and tests are the most used methodological approaches. However, it is worth noting that qualitative methods such as observational studies and interviews are nearly as frequently used as experiments and tests. When assessing the effectiveness of digital interventions, experiments and tests often provide information about 'what works', while qualitative studies offer insights into the mechanisms that facilitate or hinder effectiveness. While mixed-method approaches are less commonly used than qualitative or experimental approaches, this is not surprising given the numerous challenges associated with carrying out and publishing mixed-methods research, such as time constraints, integrating results and opposing viewpoints regarding methodological merit (Adu et al., 2022).

Just ten studies, or 2.3%, are based on international comparative studies like TIMMS or PISA. We believe this indicates an underuse of high-quality data that could have contributed to a better understanding of the global phenomenon of digitalization as well as the relationship between the various national levels of digitalization and school results. Similarly, we identified only two longitudinal studies and a single study based on registry data. While this could be attributed to the relatively short history of more intensive educational digitalization, it underscores the need for more registry data that allows us to study trends of digitalization among large samples.

4.6 | Strengths and limitations

This scoping review is associated with some limitations. Firstly, the selection of keywords included in the search strategy influences which studies will be included. More comprehensive searches could have resulted in studies with a wider scope on digitalization, for instance to study its organizational perspectives through school management. Still, we believe the search to be comprehensive enough to provide an overview of tendencies in an emerging field. An overview that so far has been missing. Secondly, the search only considered peer-reviewed English-language studies. This could, for instance, explain the shortage of studies reporting from French schools in the review. Hence, including other languages could have resulted in a different geographical distribution of studies. Nonetheless, because English is used in over 90% of scientific communication (MacKenzie, 2015), we believe our search identifies relevant tendencies. Thirdly, while we included large comparative studies like PISA in our sample, other studies involving one or more non-European countries were left out. This simplifies the categorization of 'European studies', but also portrays the field as less international than it actually is. Fourthly, categorization is seldom clear-cut. The myriad of different digital tools or solutions present in the included studies could, in some cases, have been merged into other groups or be given different labels. Uncertainties concerning categorization apply to both the labels given to the studies by their authors and the categorization taking place during the review process. For instance, *action-research* rarely appears as a defined category in the initial categorization, yet several of the studies in the review could be described as action-research due to the involvement from researchers and the cyclic nature of the interventions (Vaccarino et al., 2007). Also, the categorization of the codebook will affect the results of the scoping review, and a different categorization may have produced different results.

To strengthen the quality of this study, we collaborated with a university librarian during the initial search process, and at least two researchers interdependently assessed the articles. The development of the codebook and the following categorization of the articles were also done in collaboration. The cooperative process strengthens the review and the results of this study (Roberts et al., 2019).

5 | CONCLUSION

By investigating some overarching aspects of the framing of articles about educational digitalization, we have identified a few clear tendencies. The research is unevenly geographically distributed, with Spain occupying a dominant position in our sample, followed by Greece, Sweden and the UK. This is interesting in relation to previous discussions concerning a *European access divide* (Ottestad & Gudmundsdottir, 2018), suggesting that Northern European countries should be leading the way in the digitalization of the school system. We also find a lack of comparative European studies, and our results indicate an underuse of comparative international studies like TIMSS and PISA. This implies limited research-based opportunities to understand the ongoing digitalization across national contexts and priorities, and a lack of evidence based on a large number of participants. The findings are interesting given the global characteristic of digitalization, the strong signals from organizations like EU and OECD to prioritize digital competence, and the way digital competence is interwoven with central aspects like lifelong learning and twenty-first-century skills in the European education discourse (Høydal & Haldar, 2022; Williamson, 2013).

The studies are spread relatively thin across a wide array of academic journals and fields, with journals within the edtech field dominating in numbers. While this variety allows for a rich spectrum of research framing, it could also suggest a field experiencing some challenges in defining itself and setting standards regarding quality and relevance. For instance, despite a rapidly growing body of empirical studies on digitalization in education, it remains challenging to draw conclusions about the positive effects of digitalization (Bulman & Fairlie, 2016; Escueta et al., 2017; Munthe et al., 2022; Zheng et al., 2016).

The dominant technological framing indicates research driven more by technological perspectives than by pedagogical interests. Coupled with the interest in learning outcomes of specific digital tools and the methodological

preference for experiments, these finding echo criticism of the current digitalization for being driven by an instrumental efficiency in focus. While national policymakers' interest in effect could be justified due to tight budgets and concerns related to national academic performances, one could argue that research should, to some extent, challenge or critically scrutinize such ideologies rather than merely reproduce them through academic studies.

Teachers play an important role in the transition to the digital school. Our findings suggest that the most common academic perspective on the teachers' role is to critically investigate their attitudes towards the ongoing digitalization as well as their digital competences. These findings seemingly support previous claims that the literature tends to assign the responsibility for developing technological competence to individual teachers (Skantz-Åberg et al., 2022). Although our review has focused on students and teachers, we suggest, in line with (Pettersson, 2018), that digital competence also needs to be investigated within a broader organizational context, such as school management.

The framing of the studies reveals a general lack of studies aiming to understand the use of digital devices outside the STEM subjects. There is also less interest in the social and communicative opportunities of digitalization compared to the focus on skills in relation to defined school subjects. In addition, there is a lack of studies involving the home-school dimension and a broader perspective on social aspects of ongoing digitalization. This apparent lack of interest in the incorporation of technology more socially and within a wider social context echoes a recent review of empirical literature on gamification and education (Majuri et al., 2018). We believe future research should focus more on the broader aspects of the digitalization of education to get a better understanding of digital schooling and its societal consequences.

CONFLICT OF INTEREST STATEMENT

None of the authors have a conflict of interest to disclose.

DATA AVAILABILITY STATEMENT

The files are available on request.

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APPENDIX 1

TABLE A1 Codebook for variables and values in the scoping review.

Variable	Description	Value
Country	Country where the study took place	30 countries 1–30 values/labels for the countries
Year	Year of study	2015–2021
Academic field	Academic field of journal where the study was published	1 = Education: education/pedagogy 2 = Edtech: name of journal includes education/pedagogy + technology 3 = Tech: technology 4 = Health: psychology, neurosciences, medicine, public health 5 = Social sciences: social sciences, politics, working life, media 6 = Methods 7 = Other
Participants	Participants in study	1 = Students 2 = Teachers 3 = Mix = students + teachers 4 = Home = including parents/home-dimension
Tech	The technology in focus	1 = Tech/ICT: technology in general + ICT 2 = Learning platforms: learning platforms 3 = Digitalization: digitalization as process/phenomenon 4 = Software: Apps/software 5 = Games/AR: games, AR 6 = Hardware: IPads/laptops/one-to-one/mobiles/computers etc. 7 = AI 8 = Digitext: Digital texts: e-book, digital books, interactive texts, digital storytelling 9 = Programming: Programming, coding, robots, robotics 10 = Learning objects/media: Learning objects, interactive tabletops, tangible interactive objects, materials, Video, animations, podcasts, internet, computer simulations, simulations 11 = Other
Subject	The subject(s) in focus	1 = n.a.: more than one subject, subject not specified 2 = Sciences 3 = Languages 4 = Arts: history, music, visual arts 5 = Social sciences: Social sciences, history, geography 6 = Sports/PE 7 = Digital literacy

(Continues)

TABLE A1 (Continued)

Variable	Description	Value
Scope of interest	The scope of interest in the paper	1 = Teaching/ped: Pedagogy, teaching, teaching/learning, self-assessment, assessment 2 = Learning/skills: Learning in all forms, working memory, performance, skills, competence, practice etc 3 = Digital literacy: Cyber ethics, digital security, e-safety, computational thinking, digital literacy, digital intelligence 4 = Interaction: Social interaction, collaboration, cooperation, social skills, co-creativity 5 = Attitudes: attitudes, acceptance, values, female interest in STEM, perceptions 6 = Social dimensions: digital divide, digital implementation, exclusion, sociocultural aspects, digital transformation etc.
Methods	The applied methods	1 = Qualitative: qualitative/action research/ethnographic studies, interviews, observations 2 = Mixed methods 3 = Survey 4 = Experiment/test: test, and all form of experiments and quasi experiments 5 = International comparative studies: PISA, TIMMS, PIRLS