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Teaching and Assessment of Digital Literacy in School Education: A Qualitative Systematic Review

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Abstract

The integration of digital technologies into general school education, across all curriculum subjects, is a global megatrend. At the same time, researchers highlight the limited research on the concept of digital literacy. This study addresses a research gap arising from the insufficient investigation into the practical aspects of teaching and assessing digital literacy. The aim of this qualitative systematic review is to explore and conceptualise teaching and assessment approaches to digital literacy within general school education, with a focus on ISCED stages 1, 2, and 3, corresponding to students aged 6 to 18. It is guided by two research questions: (1) How is students' digital literacy taught? and (2) How is students' digital literacy assessed? The following databases were used to search for publications: EBSCOhost, Scopus, and Web of Science. Using two search strings, 22 peer-reviewed empirical studies that met the search criteria were selected, analysed, and conceptualised. In response to Research Question 1 on how students' digital literacy is taught, the findings of this study describe two approaches: the natural development approach, which follows an informal, unstructured process, and the constructivist approach, which is academically guided and structured. Regarding Research Question 2 on how students' digital literacy is assessed, the findings of this study present two approaches, reflecting a process-based (formative) and a result-based (summative) perspective. This study contributes to the current dialogue on digital literacy in education, and its findings can help educators in teaching and assessing students' digital literacy across all curriculum subjects.

Keywords: Digital Literacy, Curriculum, Student, Pedagogy, Conceptualisation

Introduction

The incorporation of digital technologies into various facets of life, including education, is extensively discussed in the scientific literature as an ongoing and global phenomenon (Falloon, 2020; Hays & Kammer, 2021; Ibda et al., 2023). In response to these contemporary global digital transformations, countries are undertaking significant reforms of their school education curricula (Ilomäki et al., 2023; Sharma et al., 2019; Svendsen & Svendsen, 2021).

A range of strategies has been incorporated into school pedagogical practices to enhance students' digital literacy, including BYOD, CYOD, MOOCs, the Flipped Classroom (Tamborg et al., 2018), Hybrid Learning (Alsowat, 2022), DOTS (Colvert, 2022), as well as situated and spiral learning approaches (Hsu et al., 2019), lateral reading (McGrew & Breakstone, 2023), and other constructivist methods (Betín De La Hoz et al., 2023a; Martinez, 2019; Martzoukou et al., 2023). Alongside these developments, students' digital literacy is assessed through international frameworks, such as ICILS and PISA, and through school-based practices, including observation and mixed-methods approaches (Blikstad-Balas & Klette, 2020), interviews (Hagerman & Neisary, 2024), concept mapping (Hankala et al., 2023), and specially designed assessment procedures (Lazonder et al., 2020).

Moreover, students are deeply engaged with the digital environment (Hussein & Hussein, 2020; Martinez, 2019; Razak et al., 2022), making extensive use of digital information sources both within educational settings and across broader societal contexts (Avinç & Dogan, 2024; Dorris et al., 2024; Güngören et al., 2022). As a result, the integration of digital technologies into education is becoming increasingly evident: schools are undertaking comprehensive curriculum reforms, teaching and assessment approaches are evolving, and students are actively interacting with digital technologies.

Within the educational context, 'digital literacy' is defined as the confident and critical application of a comprehensive range of digital technologies for information management, communication, and basic problem-solving across all areas of life within the digital environment (UNESCO, 2021). This definition builds upon the conceptual frameworks proposed by Gilster (1997), Cope and Kalantzis (2000), Knobel and Lankshear (2006), among others, and embraces a broader perspective that extends beyond mere technological competence (Castells, 2004; Koutsogiannis, 2007; Rachayu et al., 2022).

Accordingly, digital literacy in school education is explored within academic settings (Betín De La Hoz et al., 2023a; López-Escribano et al., 2021; Son & Ha, 2024), addressing cultural and social values (Feng & Tan, 2024; Hsu et al., 2019; Pirhonen & Rousi, 2024), improving digital citizenship and digital rights (Avinç & Dogan, 2024; Lagarto & Lopes, 2018; Pangrazio & Sefton-Green, 2021), and supporting efforts to bridge the digital divide (Drossel et al., 2020; Hagerman & Neisary, 2024; Njenga, 2018).

Alongside the various directions for improving students' digital literacy, scholars have also noted a lack of research into the concept itself (Nichols & Stornaiuolo, 2019; Peng et al., 2024; Svendsen & Svendsen, 2021). Moreover, several factors have been identified as hindering the practical understanding of digital literacy, including linguistic issues concerning terminology (Gouseti et al., 2023; Gutiérrez & Tyner, 2012; Hankala et al., 2023), challenges

related to practical implementation (Avidov-Ungar et al., 2022; Orakova et al., 2024; Záhorec et al., 2021), and overlapping with other related concepts (Martínez-Bravo et al., 2020; Reynolds et al., 2020; Van Laar et al., 2017).

Therefore, this study addresses a research gap resulting from the limited exploration of the practical aspects of teaching and assessing digital literacy. To address the challenge posed by different terminologies, studies employing linguistically distinct or overlapping concepts were included if they focused on characterising students' digital literacy within the context of general school education.

The purpose of this review is to explore and conceptualise the teaching and assessment approaches to students' digital literacy within general school education, focusing on ISCED stages 1, 2, and 3, corresponding to students aged 6 to 18. It is guided by two research questions: (1) How is students' digital literacy taught? and (2) How is students' digital literacy assessed? The following section, Materials and Methods, outlines the research approach and details the procedures employed for the search and selection of publications. The Results section presents the study's findings. In response to Research Question 1, we describe two teaching approaches identified: the natural development approach and the constructivist approach. In addressing Research Question 2, we present the assessment approaches identified, which reflect a process-based perspective and a result-based perspective. The Discussion section analyses the study's outcomes, methodological considerations, limitations, and offers recommendations. In the Conclusions, we propose a framework for clarifying standpoints within the teaching and assessment approaches to digital literacy, thereby contributing to a clearer understanding of the concept's intricate nature at the practical level.

Materials and Methods

The aim of this study is to explore and conceptualise approaches to the teaching and assessment of digital literacy within general school education across ISCED levels 1, 2, and 3. It is guided by two research questions: (1) How is students' digital literacy taught? (2) How is students' digital literacy assessed?

To achieve this, a qualitative systematic literature review with conceptualisation was conducted following the SALSA framework (Grant & Booth, 2009). This approach identifies and interprets key themes, offering an interpretive synthesis rather than a comparative evaluation of effectiveness. In this context, a qualitative systematic review serves as a highly pertinent method for enhancing the understanding of teaching and assessment of students' digital literacy in general school education.

A systematic search was conducted in March 2025 across the EBSCOhost, Scopus, and Web of Science databases, using two separate Boolean search strings: (1) addressing literacy – "Digital AND (Literacy OR Literacies) AND School"; and (2) addressing competence – "Digital AND (Competence OR Competencies OR Competency) AND School".

The following inclusion criteria were used: the publication must be in English, peer-reviewed, a full-text version, and must directly and empirically address the teaching or

assessment of students' digital literacy within ISCED stages 1, 2, and 3 in the context of general school education.

The results from the first search string (literacy), based on the established selection criteria from the database searches, yielded the following outcomes to be screened: EBSCOhost – 49, Scopus – 109 publications and Web of Science – 50 publications, for a total of 208 publications to be screened. The identified studies were evaluated in accordance with the Cochrane Handbook (Higgins et al., 2023). Publications were excluded if they failed to meet inclusion criteria, lacked relevance to digital literacy teaching or assessment, or were duplicates. This resulted in 197 exclusions – 127 for irrelevance, 35 for unavailable full texts, 15 not practical, 12 for duplicates, 7 for covering a different educational period, and 1 for being in a non-English language. As a result, 11 studies were selected using the first search string (literacy).

The second search string (competence) resulted in the following outcomes: EBSCOhost – 50, Scopus – 63 publications and Web of Science – 67 publications, for a total of 180 publications to be screened. The identified studies were evaluated in accordance with the Cochrane Handbook (Higgins et al., 2023). Publications were excluded if they failed to meet inclusion criteria, lacked relevance to digital competence teaching or assessment, or were duplicates. This resulted in 118 exclusions for irrelevance, 19 for unavailable full texts, 14 not practical, 13 for duplicates, 5 for covering a different educational period. As a result, **11 studies were selected using the second search string (competence)**.

Thus, a total of 22 peer-reviewed articles that fulfilled all inclusion criteria were identified and selected through this process. The search procedure was conducted in line with the PRISMA 2020 guidelines (Page et al., 2021) for locating and selecting studies within databases, as shown in Figure 1.

A total of 11 studies were identified using the search string "Digital AND (Literacy OR Literacies) AND School" in the EBSCOhost, Scopus, and Web of Science databases. The following list comprises these studies: Avinç & Dogan (2024), Betín De La Hoz et al. (2023a), Colvert (2022), Güngören et al. (2022), Hadad et al. (2023), Hankala et al. (2023), Lazonder et al. (2020), Martzoukou et al. (2023), McGrew & Breakstone (2023), Son & Ha (2024), Zulkarnain et al. (2024).

In a similar manner, 11 studies were identified using the search string "Digital AND (Competence OR Competencies OR Competency) AND School" in the EBSCOhost, Scopus, and Web of Science databases. These studies are as follows: Bastarrachea et al. (2023), Betín de la Hoz et al. (2023b), Blanc et al. (2025), Pedaste et al. (2023), Fernández-Bringas et al. (2022), Hatlevik & Christophersen (2013), Kumpulainen et al. (2020), Niño-Cortés et al. (2023), Pandian et al. (2020), Sobodić et al. (2022), Verdú-Pina et al. (2023).

Following the selection of publications that satisfied the inclusion criteria, the studies were collected and systematically coded to organise the analysis. To support this process, a coding table was designed and applied, as illustrated in Figure 2.

After thoroughly reviewing and analysing each paper using the codification table, we categorised and conceptualised the perspectives (Grant & Booth, 2009) and applied quality control procedures (Braun & Clarke, 2020) to identify ways of teaching and assessing students' digital performance.

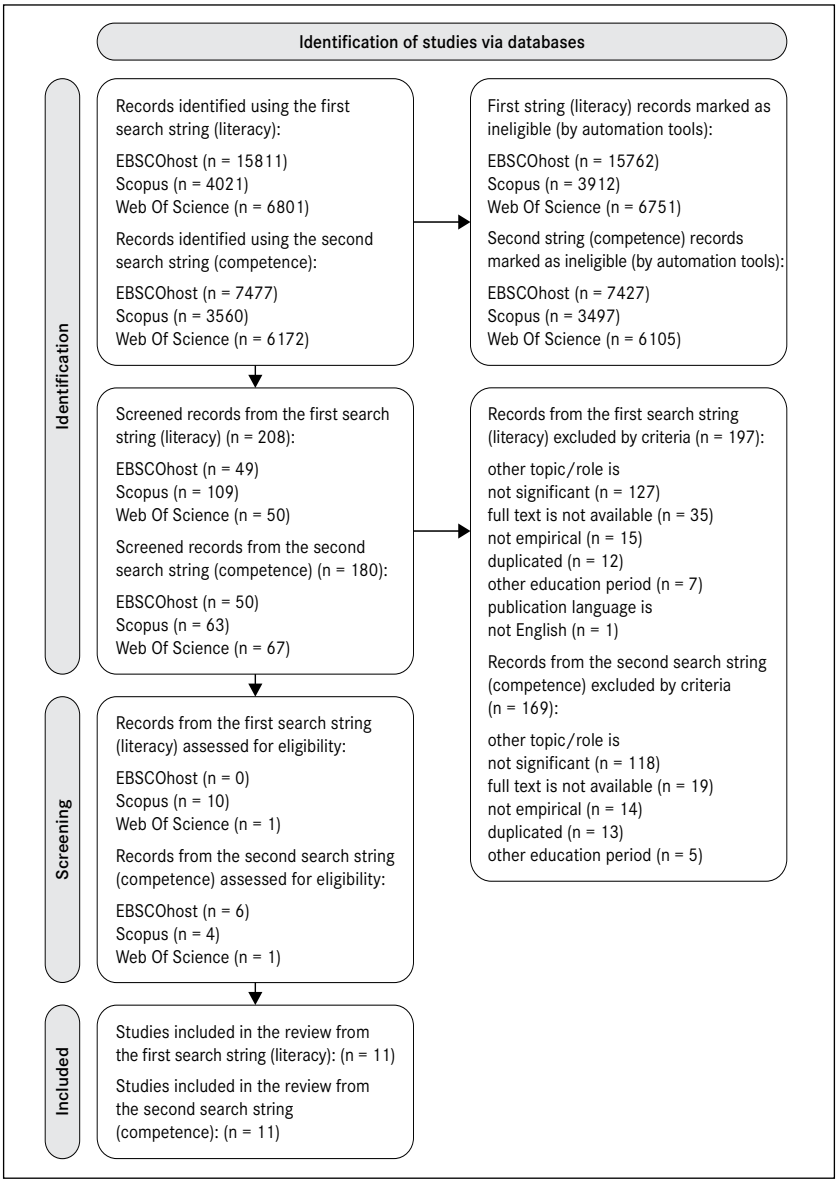

Figure 1 **The process of finding and selecting studies in databases**

Reference	Topicality, research gap	The aim of the research	Definition and usage	Intervention, impact measurement	Limitations (mentioned and found)	Suggestions for future research	Results

Figure 2 **The codification table that was devised and used**

Results

This section presents the findings of the study, addressing the teaching and assessment of students' digital literacy within general school education across ISCED levels 1, 2, and 3. The results section is structured into two parts: the first part focuses on the teaching of digital literacy, while the second examines its assessment.

In response to the first research question (How is students' digital literacy taught?), two teaching approaches were identified:

1. The natural digital literacy development approach (Lazonder et al., 2020) can be characterised as a 'no formal teaching' approach, where students' digital literacy progresses as a result of their out-of-school activities within the digital environment.
2. The constructivist approach is manifested through practice-oriented methods, such as Active Learning and Learning by Doing (Betín De La Hoz et al., 2023a; Kumpulainen et al., 2020; Sobodić et al., 2022), Problem-Based Learning (Blanc et al., 2025; McGrew & Breakstone, 2023), and emotional engagement methods like Emotional and Drama-Based Pedagogy (Colvert, 2022; Sobodić et al., 2022), Creative Storytelling, and children's experiences (Martzoukou et al., 2023; Pandian et al., 2020).

These two teaching approaches differ significantly in terms of their pedagogical manifestation: the natural development approach represents an unregulated process, while the constructivist approach represents the opposite—an academically guided and regulated process.

The following section addresses the second research question (How is students' digital literacy assessed?). Four assessment approaches were identified:

1. Observation (Colvert, 2022; Kumpulainen et al., 2020), which aimed at analysing students' activities.
2. Interviews and group discussions (Colvert, 2022; Hankala et al., 2023; Martzoukou et al., 2023; Pandian et al., 2020) – used to conduct diagnostic assessments and supplement results with introspective data.
3. Performance tests (Hadad et al., 2023; Hatlevik & Christophersen, 2013; Lazonder et al., 2020; McGrew & Breakstone, 2023; Pedaste et al., 2023) – designed to measure students' performance in relation to a standard (norm).
4. Written tests (Avinç & Dogan, 2024; Bastarrachea et al., 2023; Betín De La Hoz et al., 2023a; Betín De La Hoz et al., 2023b; Blanc et al., 2025; Fernández-Bringas et al., 2022; Güngören et al., 2022; Hadad et al., 2023; Hatlevik & Christophersen, 2013; Niño-Cortés et al., 2023; Pandian et al., 2020; Sobodić et al., 2022; Son & Ha, 2024; Verdú-Pina et al., 2023; Zulkarnain et al., 2024), which aim to assess students' performance based on measured indicators.

These four assessment approaches differ in terms of their pedagogical orientation – one follows a process-based and formative perspective (observation, interviews), while the other represents a result-based and summative perspective (performance tests, written tests).

Discussion of results

This study aimed to explore two key questions, addressing (1) the teaching and (2) the assessment of digital literacy.

In relation to the first research question, the study's findings revealed two teaching approaches: the natural digital literacy development or 'no formal teaching' approach, and an academically guided and regulated constructivist approach. The natural digital literacy development or 'no formal teaching' approach identified in this study illustrates a view in education regarding students' digital performance development as a natural process that occurs both within and outside the academic context (Franco-Mariscal et al., 2021; Nasir et al., 2021; Neochoritis et al., 2020). The study's results are also in alignment with the paradigm that emphasises students' active engagement and the integration of their internal resources into the learning process (Nabelkova et al., 2018; Orosz et al., 2023; Witkowska-Tomaszewska, 2019).

Regarding the second research question, the study revealed both process-based (formative) and result-based (summative) assessment perspectives. In this way, the study's results align with the approaches to digital performance assessment defined in previous research: self-assessment, knowledge-based assessment, and performance-based assessment (ITU Handbook, 2020, as cited in Dabengwa et al., 2024). Additionally, our findings supplement these approaches with a process-based (formative) perspective, which is manifested through observation and interviews.

Discussion of methodological considerations

This section provides a comprehensive overview of the methodological considerations of this study, as recommended by Joshkun et al. (2024) and Siddiq et al. (2016).

We selected search terms that serve as core concepts, including overlapping terminology to account for the field's linguistic issues (Gouseti et al., 2023; Gutiérrez & Tyner, 2012; Hankala et al., 2023). Due to the terminological ambiguity of the concept, as outlined in the Introduction, this study employed the search terms 'literacy' and 'competence' where they referred to students' digital literacy. This approach is based on the occasional interchangeability of the terms digital literacy and digital competence (Gutiérrez & Tyner, 2012; Hankala et al., 2023; Spante et al., 2018), as well as on the fact that assessment methods for one concept are often applied in the teaching of the other (Alsowat, 2022; Betín De La Hoz et al., 2023a; Zulkarnain et al., 2024). Both search terms in this study yielded identical perspectives. However, it is crucial to acknowledge that some potentially relevant publications might not have been included due to the authors' differing terminology choices (Bula-Biteniece et al., 2023; Hlianenko et al., 2024; Zhylin et al., 2024).

An unrestricted time frame was selected for the search period, in line with the full-time period recommendations for systematic reviews (Higgins et al., 2023; Radičuks et al., 2025). As a result, in our study, the use of an unrestricted time frame was advantageous, allowing for a broader range of interpretations over a longer period.

The search and selection procedures of publications in this study were presented using the PRISMA protocol, which is widely utilised (Dorris et al., 2024; Liu & Zhong, 2024; Ng et al., 2023). In contrast, the approach of this study differs significantly from those where the procedures are presented in a general, descriptive format (Gibson & Smith, 2018; Hong & Hua, 2020; Reddy et al., 2020). As a result, in our study, the use of the PRISMA protocol provided a detailed explanation and an overview of each stage of the search and selection procedures and proved to be useful.

Limitations

To address the study's objectives, a qualitative approach was employed, grounded in an interpretive and explanatory perspective. This approach offers an 'interpretive translation' of the concept of digital literacy application in teaching and assessment practices. Although valuable for interpreting phenomena within the framework of qualitative research, this approach has limitations when applied outside of this context.

Additionally, it is crucial to recognize the limitations regarding the inclusion of recent and potentially relevant studies, as outlined in the Cochrane Handbook (Higgins et al., 2023). This study excluded publications classified as 'studies awaiting classification' or 'ongoing studies' which were still in progress.

The search strategy excluded other types of publications, focusing exclusively on peer-reviewed journal articles on studies that directly and empirically addressed the teaching or assessment of students' digital literacy. Although this approach aligned with the study's objectives, future research in different contexts could benefit from refining the search strategy to address the limitations related to publication types.

Recommendations

Further research is needed to explore the operationalisation of the concept of digital literacy. There is a need for studies focusing on specific curriculum subjects, addressing teaching and assessment. Specifically, as an example, studies that empirically and directly address school physical education within this context, in the EBSCOhost, Scopus, and Web of Science databases, are currently non-existent, highlighting the need for further research.

Conclusions

This study investigated two key questions: (1) How is students' digital literacy taught? and (2) How is it assessed?

In response to the first question, two distinct teaching approaches were identified: the natural digital literacy development approach, which follows an unregulated process, and the constructivist approach, which is academically guided and regulated.

For the second question, two distinct assessment perspectives were identified: one follows a process-based and formative perspective, while the other represents a result-based and summative perspective.

The findings of this study may inform the integration of students' digital literacy across all curriculum subjects within general school education. This study conceptualised perspectives on the teaching and assessment of students' digital literacy, while also outlining practical methods used in these processes. It contributes the current dialogue on digital literacy within education and underscores the importance of further research into its implementation and impact across a range of school curriculum subjects.

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