



Utilizing digital citizenship education to strengthen elementary students' civic skills: a systematic literature review

Arya Chandra Kirana  ^{1*}, Fathurrohman ¹, Wuri Wuryandani ¹,
David Lailelleru ¹, Ai Haidar Syahmanan ¹, Iftinan R Azzah S ²

¹ Primary Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia, 55281

² School of Education, Johns Hopkins University, Baltimore, United States of America, 21218

Article info	Abstract
Keywords civic skills, digital citizenship education, digital literacy, elementary school, systematic literature review.	Digital Citizenship Education (DCE) has emerged as a critical component in developing civic skills among elementary students amid rapid digital transformation. This study aims to examine how DCE is implemented across diverse educational contexts, identify technological, pedagogical, and socio-cultural challenges in its implementation, and explore effective practices that enhance students' digital literacy and civic engagement. Employing a Systematic Literature Review (SLR) with bibliometric analysis guided by the PRISMA framework, this study analyses 66 articles from the Scopus database and further examines them using VOSviewer to map citation networks, international collaboration, and keyword relationships. The findings reveal a significant upward trend in DCE publications since 2021, with the majority of publications originating from Asian and Western countries. DCE is operationalized through digital-based learning, inclusive multimedia approaches, and the integration of cyber wisdom. Key challenges include inadequate technological infrastructure, gaps in teacher competency, and disparities in digital access among social groups. Effective practices encompass digital privacy awareness, cross-subject collaboration, game-based learning, and systemic policy support. This study concludes that effective DCE implementation requires a holistic approach that includes comprehensive policy frameworks, enhanced teacher professional development, and a supportive educational ecosystem to equip elementary students to become ethical and responsible digital citizens.

* Corresponding Author.

E-mail address: arya118fipp.2024@student.uny.ac.id (Arya Chandra Kirana)

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1. Introduction

Digital Citizenship Education (DCE) has emerged as a critical component in equipping elementary students with the competencies necessary to engage responsibly, ethically, and proficiently in an increasingly digitized world (Singh et al., 2025). At its core, DCE encompasses digital literacy, online safety, digital emotional intelligence, and responsible civic participation competencies that are foundational to students' development as informed and active members of both physical and digital communities (Alenezi & Alfaleh, 2024; Almethen & Alomair, 2024; Wui et al., 2025). These competencies are not merely technical; they include critical thinking, empathy, privacy awareness, and the ability to navigate socio-political dimensions of online life (Martin et al., 2019; Lauricella et al., 2020; Mirra et al., 2022; Anwar et al., 2025).

Despite its recognized importance, the implementation of DCE in elementary schools remains uneven and contested. Technological challenges persist, including inadequate infrastructure and limited internet connectivity, particularly in developing countries (Nugroho et al., 2025). Pedagogical challenges stem from insufficient teacher preparation, limited professional development, and the difficulty of aligning DCE with existing curricular mandates (Alenezi & Alfaleh, 2024; Tomé et al., 2024b). Socio-cultural challenges further complicate implementation, including disparities in students' access to digital devices, minimal parental involvement, and varying cultural norms regarding digital behavior (Cunha et al., 2021; Monteiro et al., 2022). These multi-layered barriers indicate that DCE cannot be addressed through isolated interventions but requires a systemic, context-sensitive approach (Tadlaoui-Brahmi et al., 2022).

As a growing body of literature has examined DCE in secondary and higher education contexts, systematic reviews focusing specifically on elementary school settings remain scarce. Existing reviews have tended to address digital citizenship broadly, without differentiating by educational level or by the characteristics of elementary schools (Ilomäki et al., 2023; Monteiro et al., 2022). Furthermore, prior systematic reviews on DCE have not sufficiently integrated bibliometric analysis to map global research trends, collaboration networks, and emerging thematic clusters, thereby providing a more comprehensive picture of the field's intellectual landscape (Nurikhsani et al., 2026). The absence of such an integrated review represents a significant gap in the literature, particularly given the accelerating pace of digitization and its implications for foundational civic education.

A Systematic Literature Review (SLR) combined with bibliometric analysis offers a rigorous, transparent methodological framework for addressing this gap. SLR enables a structured synthesis of empirical evidence across diverse educational contexts, while bibliometric analysis facilitates the identification of dominant contributors, international collaboration patterns, and keyword co-occurrence networks that reflect the field's evolving priorities (Sousa et al., 2024; Vargas-Murillo et al., 2025). This dual approach is particularly valuable for a field like DCE, where research is dispersed across disciplines including education, communication, policy, and technology. Moreover, evidence indicates that while DCE is increasingly introduced in schools, its implementation remains fragmented and lacks a cohesive pedagogical framework to guide

educators, a gap that systematic reviews are well-positioned to address (Tadlaoui-Brahmi et al., 2022).

This study, therefore, aims to provide a comprehensive, evidence-based synthesis of DCE research in elementary school contexts. Specifically, this study seeks to:

- a) Examine how DCE is implemented across diverse educational contexts at the elementary school level;
- b) Identify technological, pedagogical, and socio-cultural challenges that affect the implementation of DCE; and
- c) Explore effective practices that enhance students' digital literacy, participation, and engagement as responsible digital citizens.

The findings are intended to inform curriculum design, teacher professional development, and educational policy, thereby contributing to a more coherent and inclusive framework for DCE in elementary education.

2. Theoretical Framework

Rapid digital transformation in contemporary society has fundamentally redefined the nature of citizen participation, creating an urgent need for a theoretical framework to guide the integration of Digital Citizenship Education (DCE) and civic skills development in formal schooling. This framework draws on an interdisciplinary perspective encompassing educational theory, citizenship philosophy, media studies, and policy research to explain how young learners, particularly at the elementary school level, can be equipped to participate ethically, critically, and actively in both physical and digital democracies. Crucially, this framework does not merely describe existing theories; it delineates how each theoretical pillar is employed to interpret the findings of the 66 articles reviewed in this study.

2.1. Conceptual Foundations of Digital Citizenship Education

At its core, DCE aims to empower individuals with the competencies necessary to flourish in a democratic society and actively shape the digital landscape. This encompasses not only technical proficiencies but also ethical reasoning, online security, and digital civic skills (Widyaningsih et al., 2023; Huschle et al., 2024; Rana, 2025). This study draws on two foundational theoretical frameworks to examine how these competencies are conceptualized and operationalized in the reviewed literature.

First, Choi's (2016) Digital Citizenship Competency model distinguishes between minimal and actualizing digital citizens: the former engages with digital tools for personal use, while the latter uses digital participation as a vehicle for civic empowerment and social transformation. This distinction is used in the present review to categorize how the 66 reviewed articles conceptualize the goal of DCE, whether as individual skill acquisition or collective civic action. Second, Westheimer & Kahne's (2004) typology of citizenship, which differentiates among personally responsible, participatory, and justice-oriented citizens, provides an analytical lens for interpreting the civic orientations embedded in the reviewed DCE programs. Studies that

emphasize online safety and digital etiquette are interpreted through the lens of personal responsibility, while those promoting critical media literacy and social justice align with the justice-oriented model. Drawing on both frameworks, the Integrated Frameworks for Digital Citizenship Competencies (Infra-DC) synthesizes personal accountability, democratic participation, and critical engagement as mutually reinforcing dimensions of DCE (Choi, 2016; Westheimer & Kahne, 2004).

2.2. Epistemological and Philosophical Assumptions

The theoretical debate surrounding DCE extends beyond competence frameworks to broader epistemological positions. A critical stand of scholarship argues that the dominance of neoliberal and instrumentalist perspectives risks reducing DCE to mere technical training, thereby stripping it of its civic and political dimensions (Mamlok & Abowitz, 2022). This study uses this critique as a lens to evaluate whether the reviewed literature approaches DCE as a neutral skill set or as a transformative educational practice oriented toward citizen empowerment and social justice. Furthermore, Pireddu's (2022) reconceptualization of digital citizenship as a holistic understanding of public life in a networked society, on the artificial separation of online and offline experience, is employed here to assess the degree to which the reviewed studies treat digital and civic participation as integrated, rather than parallel, phenomena.

2.3. Innovative Approaches and Pedagogical Strategies

Theoretical innovations in DCE increasingly emphasize interdisciplinary and technology-mediated approaches. The integration of artificial intelligence into the curriculum, for instance, foregrounds the need for ethical, responsible, and critical engagement with emerging technologies as a core dimension of digital citizenship (Matusevych & Zadorozhna, 2023; Subrahmanyam, 2025). Similarly, project-based learning (PBL) has been theorized as a pedagogical framework that bridges computer science education and civic awareness by fostering collaboration and problem-solving in authentic digital contexts (Damayanti et al., 2025; Rana, 2025). In this review, these theoretical frameworks serve as benchmarks against which the pedagogical approaches documented in the 66 articles are evaluated, specifically, the extent to which they move beyond passive instruction toward active, participatory, and critical forms of DCE.

2.4. Civic Skills in the Context of Digital Citizenship

Civic skills represent the applied dimension of DCE and constitute the primary outcome variable examined in this review. These skills encompass civic knowledge, information, and media literacy, critical evaluation of digital content, and constructive online participation (Vargas-Murillo et al., 2025). Ethical decision-making, respect for diversity, and awareness of digital footprints are equally central to fostering responsible digital citizens (Huschle et al., 2024; Rana, 2025). Importantly, civic skills in the digital context are not confined to the political sphere; they extend to everyday communication, collaboration, and community-building practices. This conceptualization of civic skills as multidimensional, contextually embedded, and

developmentally appropriate provides the analytical lens through which this review assesses the effectiveness of DCE practices documented in the literature, with particular attention to their relevance for the elementary school context.

2.5. Educational Strategies and Challenges

This framework also recognizes pedagogical strategies and obstacles. Effective DCE requires interactive platforms, educational games, simulations, and online discussion forums that support active learning (Vargas-Murillo et al., 2025). However, challenges remain, as teachers often find it difficult to adapt citizenship education to the digital environment, align it with policy mandates, and overcome access disparities (Agus et al., 2025). Professional development and culturally responsive approaches are necessary to effectively implement DCE in diverse contexts (Gazi, 2016).

3. Method

3.1. Research Design

This study employs a Systematic Literature Review (SLR) combined with bibliometric analysis to synthesize empirical evidence on Digital Citizenship Education (DCE) in the elementary school context. The SLR component provides a structured, transparent, and reproducible framework for identifying, screening, and synthesizing relevant literature, while the bibliometric component enables the quantitative mapping of publication trends, international collaboration networks, and keyword co-occurrence patterns (Öztürk et al., 2024; Passas, 2024). This study adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor and reproducibility (Page et al., 2021). Bibliometric visualization was conducted using VOSviewer, which facilitates mapping citation linkages, co-authorship networks, and keyword associations. This dual methodology was selected, as it addresses two complementary research needs: synthesizing qualitative and quantitative findings across studies (SLR) and identifying macro-level patterns in the scholarly landscape of DCE (bibliometric analysis). The article selection procedure is presented in Figure 1.

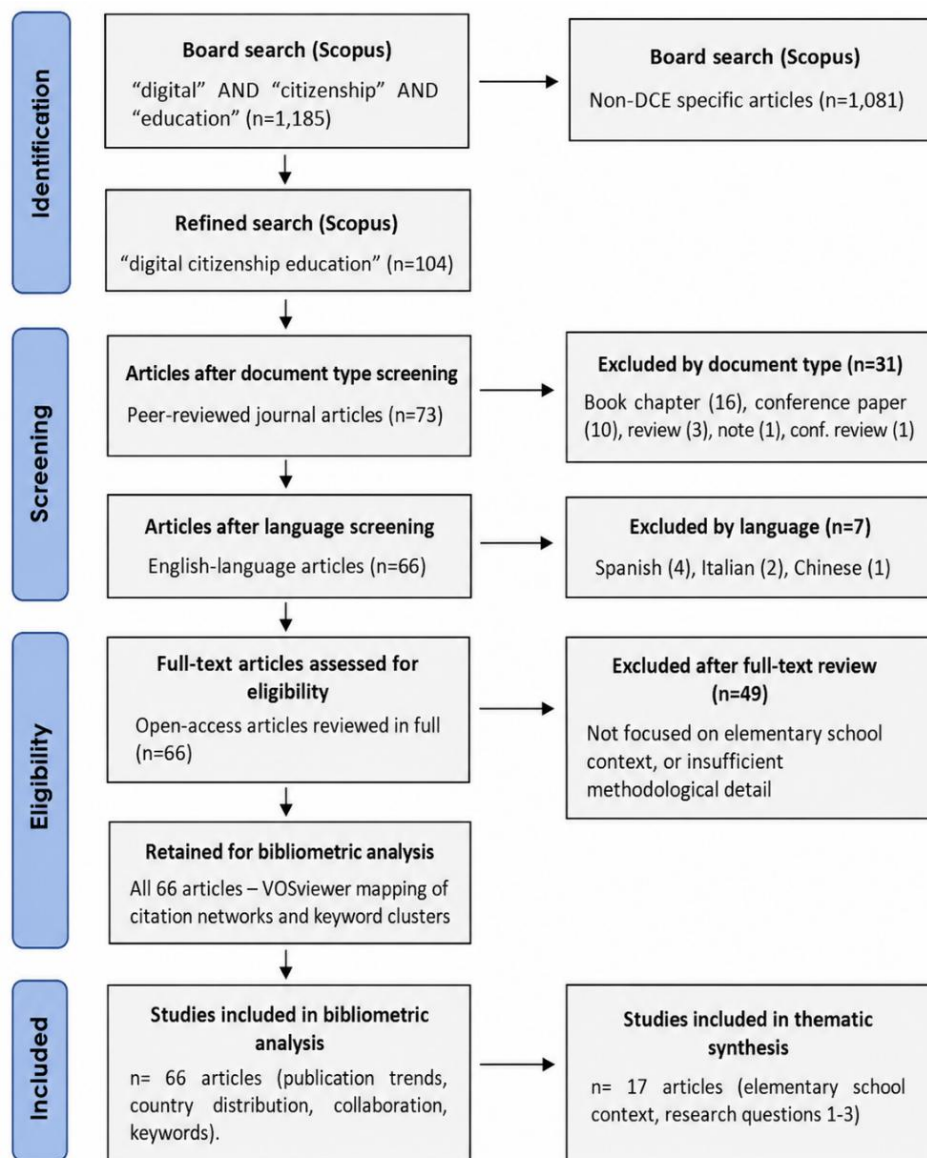


Figure 1. PRISMA 2020 Flow Diagram of Article Selection Process

3.2. Search Strategy and Database Selection

The literature search was conducted exclusively in the Scopus database on 13 September 2025. Scopus was selected as the database for this study because it is one of the largest peer-reviewed databases, offering comprehensive coverage of education, social sciences, and technology fields relevant to DCE research. Its advanced search capabilities, citation-tracking features, and bibliometric export capabilities are particularly well-suited to the dual SLR-bibliometric methodology employed in this study.

A two-stage search strategy was adopted. In the first stage, a broad query using the Boolean operator TITLE-ABS-KEY ("digital" AND "citizenship" AND "education") was used to map the field, retrieving 1,185 articles published between 2017 and 2025. In the second stage, a refined query

using the exact phrase TITLE-ABS-KEY ("digital citizenship education") was applied to ensure topical precision, yielding 104 articles. The publication period from 2017 to 2025 was selected to capture the most recent trajectory of DCE scholarship, particularly the significant growth observed from 2021 onward, while maintaining sufficient historical breadth to contextualize emerging trends. Additionally, the search was filtered to open-access publications to ensure full-text accessibility for all retrieved articles.

3.3. Inclusion and Exclusion Criteria

Articles were included in the review if they met all of the following criteria: (1) published between January 2017 and September 2025; (2) written in English; (3) published as peer-reviewed journal articles (i.e., original research articles); (4) focused on DCE as a primary subject; and (5) available as open-access full-text documents. Articles were excluded if they were (1) book chapters, conference papers, review articles, notes, or conference reviews, (2) written in languages other than English, or (3) tangentially related to DCE without addressing it as a core focus. The application of these criteria is summarised in Table 1 below.

Table 1. Application of inclusion and exclusion criteria

Criteria	Inclusions	Exclusions
Publication type	Peer-reviewed journal articles	Book chapters, conference papers, reviews, and notes
Language	English	Non-English publications
Publication period	January 2017 – September 2025	Articles outside this date range
Subject focus	DCE as primary subject	Studies where DCE is peripheral or incidental
Availability	Full-text accessible	Abstract only or inaccessible full text

3.4. Screening and Study Selection

Following the initial database search, articles are imported into Zotero, a reference management software, to facilitate systematic organization and deduplication. Duplicate entries are identified and removed prior to screening. The screening process proceeds in two stages. In the first stage (title and abstract screening), articles are assessed for relevance based on the inclusion and exclusion criteria outlined above. In the second stage (full-text screening), articles that passed initial screening are retrieved in full and assessed for eligibility. The screening process was conducted by the first Author, with ambiguous cases discussed and resolved in consultation with the co-authors to ensure consistent application of the inclusion criteria.

Based on the initial refined search, 104 articles were retrieved. Following the application of exclusion criteria, 38 articles were removed: book chapters ($n = 16$), conference papers ($n = 10$), review articles ($n = 3$), notes ($n = 1$), conference reviews ($n = 1$), and non-English publications ($n = 7$). This resulted in a final corpus of 66 peer-reviewed journal articles, which served as the basis for bibliometric analysis and the primary selection pool for in-depth thematic synthesis.

3.5. Selection of Articles for In-Depth Analysis

While all 66 articles were subjected to bibliometric analysis, a subset of 17 articles was selected for in-depth thematic synthesis to address the study's three research questions. The following criteria guided this purposive selection (1) the study explicitly addressed DCE at the elementary school level (primary school, grades 1–6, or ages 6–12) or included findings that were directly applicable to this context, (2) the study reported empirical findings related to at least one of the three research questions (implementation approaches, challenges, or effective practices), and (3) the study provided sufficient methodological detail to allow for meaningful qualitative appraisal of its findings.

Articles retained for bibliometric analysis but not for in-depth synthesis were those that addressed DCE primarily at the secondary or tertiary level, focused exclusively on theoretical or policy frameworks without empirical data, or lacked sufficient contextual detail about the educational level. The selection process thus ensured that the thematic synthesis was grounded in evidence directly relevant to elementary school contexts, thereby maintaining alignment with the study's stated focus and research questions.

3.6. Data Extraction

Data extraction from the 17 selected articles was conducted using a standardized extraction template developed by the research team. The following information was extracted from each article: (1) author(s) and publication year, (2) country or educational context, (3) research design and methodology, (4) participant characteristics and educational level, (5) DCE implementation approach, (6) reported challenges, and (7) identified effective practices. The extracted data are organized into a synthesis matrix (Table 2) to facilitate systematic comparison across studies and the thematic categorization of findings.

3.7. Validity and Reliability

The validity and reliability of the review were maintained through several procedural safeguards. Search validity was ensured through a systematic, replicable search strategy with pre-specified search strings and a clearly defined date range. Screening reliability was enhanced through consultative decision-making among co-authors for ambiguous cases. To prevent duplication, all articles were managed in Zotero, which automatically flags duplicate entries. The use of the PRISMA checklist and flowchart provided a transparent audit trail of all inclusion and exclusion decisions (Page et al., 2021). For the bibliometric analysis, VOSviewer parameters, including the minimum document threshold, co-occurrence frequency, and visualization settings, were documented to ensure reproducibility (Morgan, 2024).

4. Results

This section presents the findings of the bibliometric analysis and thematic synthesis based on 66 peer-reviewed articles retrieved from the Scopus database on Digital Citizenship Education (DCE). The findings are organized into four subsections: publication trends by year, distribution

by country, international collaboration networks, and keyword co-occurrence patterns. These bibliometric findings are followed by a thematic synthesis of the 17 articles selected for in-depth analysis that addresses the study's three research questions.

4.1. Publication Trends by Year

The 66 articles retrieved span the period from 2017 to 2025, reflecting the trajectory of DCE scholarship over eight years. Publications were limited and inconsistent in the earlier years: 2 articles were recorded in 2017, subsequently declined to 1 in 2018, rose to 4 in 2019, and fell again to 1 in 2020. This pattern indicates that DCE research at the elementary school level remained nascent and unsystematic during this period. A discernible and sustained upward trend emerged from 2021 onward: 6 articles in 2021, 8 in 2022, 10 in 2023, and a sharp increase to 18 articles in 2024, the highest annual output recorded in the dataset. As of September 2025, 16 articles had been recorded, though this figure may be incomplete given the ongoing nature of academic publishing cycles. This annual publication pattern is illustrated in Figure 2.

This significant growth trajectory from 2021 suggests that DCE has increasingly attracted scholarly attention, likely driven by the accelerated digital transformation prompted by the COVID-19 pandemic, the expansion of 21st-century education frameworks, and growing policy concern over students' digital literacy and online civic participation. Notably, most existing studies have been conducted at the secondary or higher education levels, reinforcing the need for an elementary school focus in this review.

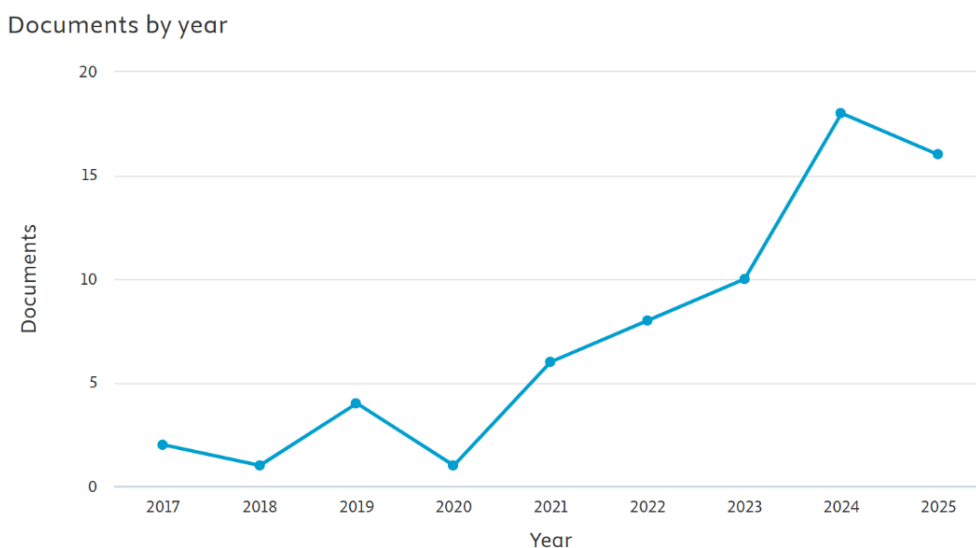


Figure 2. Annual Publication Trend of DCE Research in Scopus (2017-2025)

4.2. Distribution by Country

Analysis of the top 10 contributing countries reveals a concentration of DCE research in Asian and Western nations. Hong Kong leads with 7 articles, followed by the United States (6),

China (5), India (5), Portugal (5), Indonesia (3), New Zealand (3), Saudi Arabia (3), Turkey (3), and the United Kingdom (3). Hong Kong's leading position, accounting for approximately 10.6% of the total corpus, reflects the region's sustained institutional focus on digital literacy and civic education amid rapid socio-political and technological transformation. The co-dominance of Asian countries (Hong Kong, China, India) and Western nations with established research traditions (the United States, Portugal, the United Kingdom) underscores that DCE is a cross-regional concern. However, its emphasis and operationalization vary significantly across cultural and policy contexts. The comparative country distribution is presented in Figure 3.

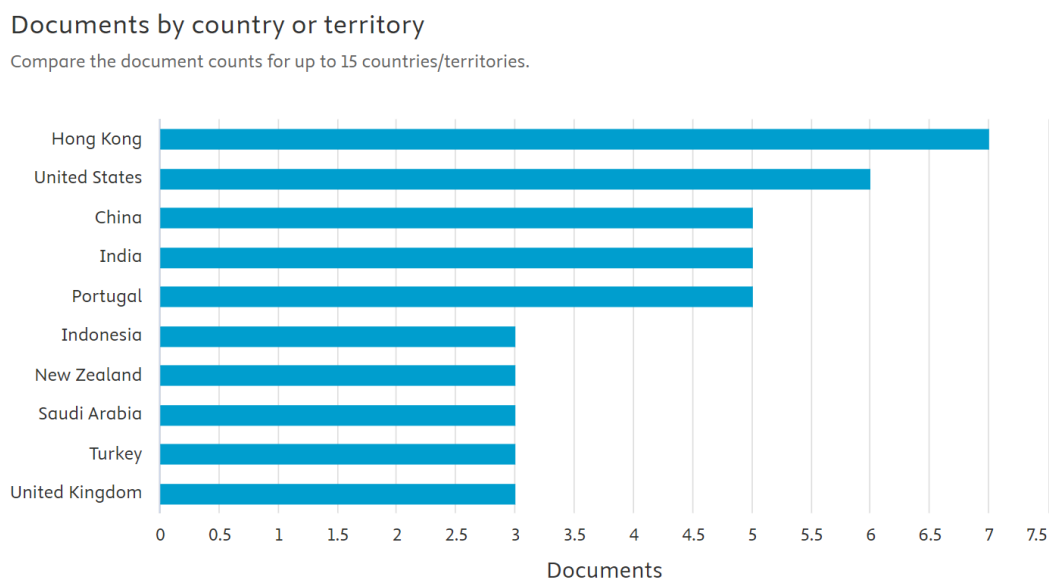


Figure 3. Distribution of DCE Publications by Country or Territory (Scopus, 2017-2025)

4.3. International Collaboration Networks

International collaboration networks were mapped using VOSviewer, with a minimum threshold of 1 document per country and 1 citation link, resulting in a visualization of interconnected research clusters. The analysis identified three primary collaboration clusters.

The red cluster is anchored by China and the United States, which exhibit the highest total link strength values in the dataset, indicating the greatest volume of co-authorship connections with other countries. These two nations serve as primary hubs in the global DCE research network, connecting with Germany, Turkey, South Korea, and Cyprus. The green cluster centers on India and Indonesia, extending to Portugal, Italy, France, Saudi Arabia, and Thailand, reflecting a growing network of collaboration among developing and emerging research economies. The blue cluster is anchored by the United Kingdom, Australia, and New Zealand, representing a geographically coherent Anglophone research tradition in DCE.

Notably, Indonesia and Hong Kong occupy strategically significant positions as bridging nodes between clusters. VOSviewer network data reveal that Indonesia recorded a total link strength of 34, surpassing Hong Kong's 27, despite contributing only 3 articles to the corpus

compared to Hong Kong's 7. This disparity between publication volume and collaborative connectivity indicates that Indonesian researchers engage disproportionately across multiple international research clusters relative to their publication output. Hong Kong's total link strength of 27 reflects sustained bilateral collaboration with both Asian and Western research centers, consistent with its role as a regional academic hub. Together, these findings underline that both countries serve as critical intermediaries in the global DCE research network, with Indonesia's higher connectivity index providing a particularly promising foundation for expanding its research contributions through targeted cross-border collaboration initiatives and nationally funded DCE research programs. The international collaboration network is visualized in Figure 4.

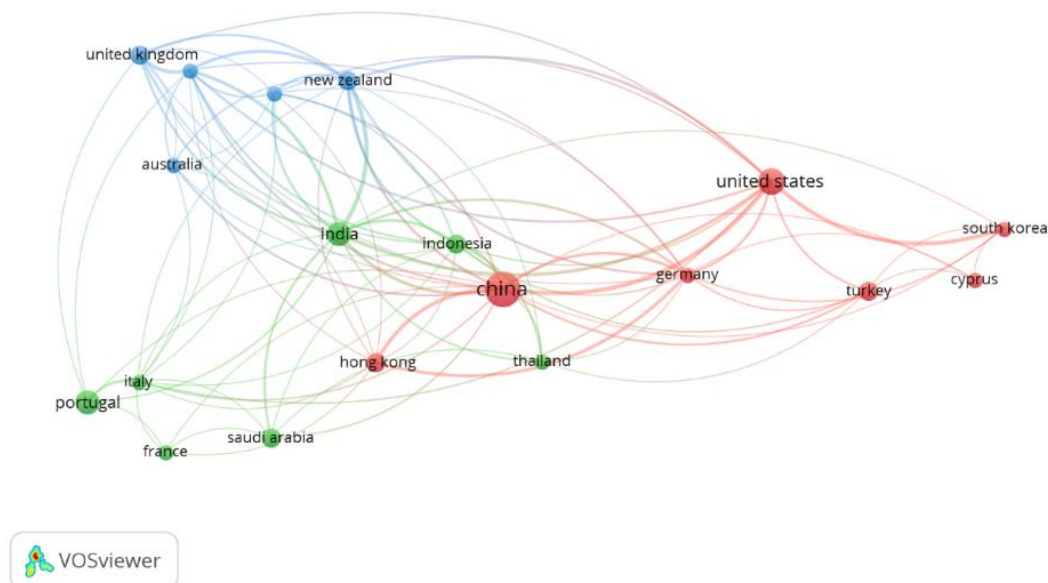


Figure 4. International Collaboration Network in DCE Research (VOSviewer)

4.4. Keyword Co-occurrence Patterns

Keyword co-occurrence analysis was conducted using VOSviewer with a minimum threshold of two occurrences per keyword, yielding a network of thematically related terms that maps the intellectual structure of DCE research. "Digital citizenship" emerged as the most central node in the network, with the highest number of co-occurrence links, confirming its role as the organizing concept of the field. Four thematic clusters were identified. The keyword co-occurrence network is shown in Figure 5.

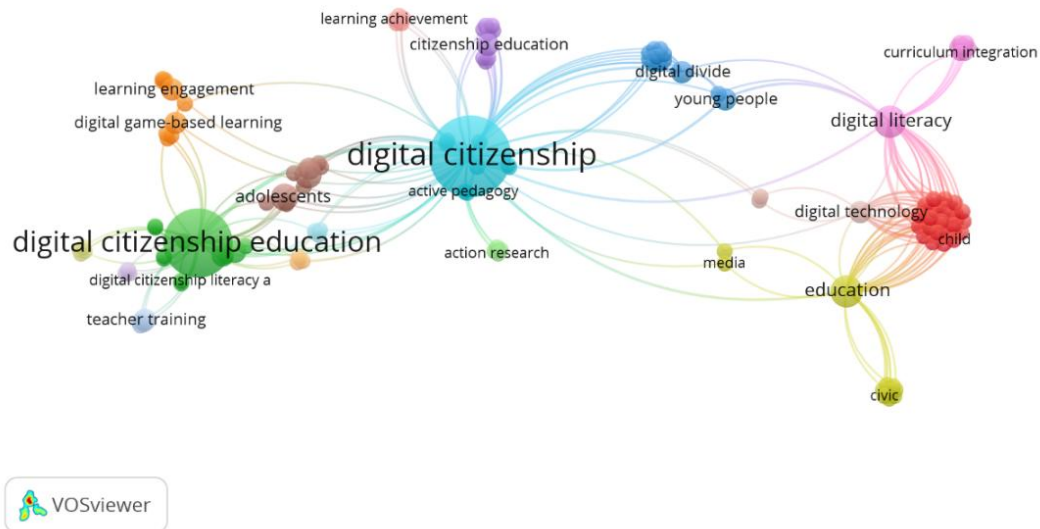


Figure 5. Keyword Co-occurrence Network in DCE Research (VOSviewer)

The green cluster encompasses keywords related to pedagogical approaches and teacher capacity, including "teacher training", "professional development", and "pedagogy", indicating that teacher preparation is a dominant concern in DCE scholarship. The orange cluster highlights "digital game-based learning", "gamification", and "student engagement", reflecting the growing interest in technology-mediated instructional strategies. The red cluster connects "digital literacy", "digital technology", "children", and "education", representing a research strand focused on children's foundational digital competencies. The blue cluster links "digital divide", "young people", and "equity", underscoring the socio-structural dimensions of DCE and the uneven distribution of digital access among youth populations.

The presence of keywords such as "active pedagogy", "action research", and "civic engagement" further indicates that DCE scholarship is increasingly oriented toward empirically grounded and practice-oriented inquiry, moving beyond conceptual or policy-focused discussions toward evidence-based pedagogical frameworks.

4.5. Thematic Synthesis of Selected Articles

From a corpus of 66 articles, 17 were selected for in-depth thematic synthesis according to the criteria described in the methods section. These articles address three interrelated research questions: (1) how DCE is implemented across diverse educational contexts, (2) what challenges affect its implementation, and (3) what effective practices enhance students' digital literacy and civic engagement. A summary of the 17 selected articles, including their methodological approaches and key findings, is presented in Table 2.

Table 2. Summary of Selected Articles on DCE Implementation, Challenges, and Effective Practices in Elementary School Contexts

No.	Authors and Years	Methods	Findings
1	(Tomé et al., 2019a)	Action research, which is directly related to school and community intervention projects aimed at developing civic participation skills in children living in low-income areas.	Recent findings reveal that children's social participation through media has grown significantly, evolving from traditional outlets, such as school newspapers, to more sophisticated digital content creation, including video production. Children's media was found to directly influence their learning processes, literacy development, social understanding, and overall learning experiences. In addition, ongoing support from school leaders, along with the continued involvement of researchers and media professionals, has been identified as essential to ensuring the successful implementation and long-term impact of these projects.
2	(Matusevych & Zadorozhna, 2023)	This study uses a conceptual and analytical review.	This study emphasizes the importance of innovative approaches in civic education, particularly through DCE and artificial intelligence, which are reshaping educational theory and practice. It identifies key challenges in developing responsible citizenship in the digital age and emphasizes the role of educational strategies and policies in addressing them. Furthermore, the study highlights that democratic participation depends on citizen initiative and collective action, while lifelong learning and digital literacy remain essential for effective citizenship in the 21st century.
3	(Panjaburee et al., 2024)	This study uses a quasi-experimental design to evaluate the effect of digital citizenship games on students' knowledge and engagement.	This study reveals that the proposed digital citizenship game significantly improves student performance and shapes their positive perceptions of the subject. Eye-tracking data confirms that the game environment increases engagement, underscoring the role of attention in learning. By integrating fuzzy logic and decision trees, the game effectively promotes emotional engagement and sustained focus, both of which are important for learning outcomes.
4	(Webster, 2025a)	This study uses a qualitative Delphi iterative consultation process involving three rounds to develop consensus among experts.	This study conceptualizes digital citizenship as a multifaceted construct that encompasses wise use, community care, and civic action, reflecting its complexity in an ever-evolving digital landscape. Key findings emphasize the importance of balancing online and offline engagement, with digital disconnection identified as a vital element of healthy digital practices.
5	(Iskandar et al., 2025a)	This study uses a mixed-methods approach,	This study emphasizes the urgent need for stronger education on digital security and privacy,

No.	Authors and Years	Methods	Findings
		combining quantitative survey data with qualitative analysis to assess respondents' digital citizenship literacy.	given the insufficient awareness in these areas. Integrating DCE into school curricula is considered essential to prepare students to navigate the complexities of the digital age. The study calls for innovative educational strategies that encourage active participation in digital communities, ultimately empowering individuals and building a more ethical digital society.
6	(Sriwisathiyakun & Dhamanitayakul, 2024)	The present study employs a research-and-development method; researchers developed a course titled "Utilizing Online Media as Digital Citizenship." It uses a MOOC-based design.	This study underscores that the course "Utilizing Online Media as Digital Citizenship" significantly improves learning outcomes for deaf students, with 75% of participants achieving scores above 70 on achievement tests. Furthermore, this study emphasizes the superiority of multimedia formats over text-based media, highlighting their role in enhancing deaf students' understanding and engagement.
7	(Monteiro et al., 2022)	This study uses a qualitative and interpretive orientation, integrating quantitative data within a multi-paradigmatic, multimethod approach.	This study identifies key dimensions of DCE, emphasizing the importance of developing digital literacy and addressing the challenges young people face in pursuing emancipation and social justice. In response, this study proposes an interpretive model that highlights inclusive and emancipatory practices as essential components of DCE. Furthermore, this study emphasizes the importance of examining the relationship between digital technology and youth identity.
8	(Webster, 2025b)	This study employs qualitative methods, utilizing 11 semi-structured interviews.	This study highlights that the teachers consider DCE crucial for equipping students to navigate future social, professional, and academic contexts, with particular emphasis on mastering digital technology to improve productivity and efficiency. Furthermore, this study underscores the role of teachers' personal experiences in shaping their vision of the digital future, which is often framed in comparison with past educational practices.
9	(Harrison et al., 2024)	This provides for research and development, creating and testing a series of new measures for cyber-wisdom education.	This study provides preliminary evidence for a four-component model of cyber wisdom literacy, reasoning, motivation, and reflection that demonstrates its potential application in an educational context. Cyber wisdom is highlighted as an essential policy that enables children and adolescents to navigate digital technology responsibly.
10	(Cassells & Dlamini, 2019)	The present study employs a qualitative approach, drawing on published information	The integration of ICT in education remains inadequate, a situation closely related to historical inequalities in the education system. Furthermore, government efforts have largely

No.	Authors and Years	Methods	Findings
		and existing content analysis to collect data.	prioritized access to technology over comprehensive digital citizenship training, leaving a critical gap in education strategies. These challenges are exacerbated by persistent information poverty stemming from the unequal distribution of resources, which further widens the digital divide in South Africa.
11	(Tangül & Soykan, 2021)	This study uses a qualitative case study model to analyze and evaluate the level of digital citizenship.	This study compares levels of digital citizenship among elementary school teachers and teacher candidates in Northern Cyprus and finds that teachers score higher than teacher candidates on the need for digital citizenship education. This research highlights the importance of integrating digital citizenship into teacher training programs, given the increasing reliance on technology in education.
12	(Kumari et al., 2023)	This study employs a survey methodology to collect data on students' perceptions and experiences with DCE.	These findings underscore the importance of developing tailored DCE curricula that equip adolescents with the competencies necessary for ethical and responsible participation in digital communities. Furthermore, this research highlights the need for ongoing investigation into disparities in internet access and digital literacy across different social groups, which may reinforce existing inequalities in educational outcomes.
13	(Alenezi & Alfaleh, 2024)	This study uses a mixed-method approach, integrating quantitative and qualitative data collection methods.	This study reveals that DCE practices among teachers in Saudi Arabian elementary schools emphasize digital emotional intelligence as well as digital security, privacy, health, and well-being. Furthermore, this study identifies a significant interaction effect between teacher demographics and their perceptions of DCE, highlighting the importance of targeted professional development. The study concludes with recommendations to improve curriculum integration, strengthen teacher training, and develop comprehensive policies to align DCE practices with global standards.
14	(Tomé et al., 2024b)	This study employs an exploratory sequential design, combining qualitative methods with quantitative analysis to gather comprehensive data.	This guide discusses issues parents face, such as online safety and cybersecurity, while recognizing the challenges children face in the digital environment. These findings further highlight the importance of ethical parenting in the digital age, which encourages a balanced approach to technology use. Furthermore, this study underscores the multidisciplinary nature of DCE by identifying the need for cross-subject

No.	Authors and Years	Methods	Findings
			collaboration to ensure its effective integration into the curriculum.
15	(Zheng et al., 2024)	This study uses a quasi-experimental design to compare digital etiquette literacy among students involved in digital game-based learning.	This study explores the effectiveness of digital game-based learning (DGBL) in improving digital etiquette literacy among elementary school students in China. The findings of this study reveal that DGBL significantly improves students' digital ethics and learning enthusiasm compared with conventional approaches, thereby highlighting its benefits in DCE.
16	(Almethen & Alomair, 2024)	This study is a quantitative research design to investigate teachers' perceptions of digital citizenship in the basic curriculum, using a survey questionnaire as the main data collection instrument.	This study reveals significant differences in teachers' integration of digital citizenship elements across demographic factors, including age, grade level, and subject area, underscoring the need for tailored educational approaches. The findings also highlight the urgent need for a comprehensive digital citizenship curriculum to address internet addiction, which is now a pressing issue among children, adolescents, and youth in Saudi Arabia. Furthermore, the study emphasizes the importance of fostering a balanced approach to technology use that safeguards students' physical and mental health, thereby reducing the negative consequences of excessive screen time.
17	(Iskandar et al., 2025b)	This study employs a cross-sectional design, and the analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM).	These findings emphasize the role of digital privacy awareness mediation in improving digital citizenship literacy, underscoring the importance of integrating privacy education into the curriculum. A concerning trend has also been observed, whereby students often equate frequent online activity with informed digital citizenship, without critically considering the ethical implications of their actions. Using a quantitative causal research design, this study provides strong empirical evidence of the interaction between digital citizenship education, technological literacy, and digital citizenship literacy.

5. Discussion

The findings of this systematic literature review and bibliometric analysis reveal a complex and evolving landscape of Digital Citizenship Education (DCE) in elementary school contexts. Interpreted through the theoretical frameworks of Choi (2016) Digital Citizenship Competency Model and Westheimer & Kahne (2004) citizenship typology, the 17 articles selected for in-depth synthesis indicate that DCE in elementary schools is operationalized along a spectrum from

individually focused skill acquisition to more participatory and justice-oriented civic engagement. The discussion is organized around three thematic areas directly corresponding to the study's research questions: (1) how DCE is implemented across diverse contexts, (2) what challenges constrain its effectiveness, and (3) what practices have demonstrated efficacy in enhancing students' digital literacy and civic engagement. Where relevant, findings are contextualized against the broader bibliometric patterns identified among the 66-article corpus.

5.1. DCE Implementation: From Individual Skill to Collective Civic Action

The reviewed literature reveals that DCE implementation in elementary schools is conceptually diverse and contextually contingent. Webster (2025a) conceptualizes DCE as encompassing wise use, community care, and civic action, a framing that aligns with Choi's (2016) distinction between minimal and actualizing digital citizenship. However, the majority of the studies reviewed reflect a predominantly minimal orientation: DCE is operationalized primarily as the transmission of technical skills, safety behaviors, and digital etiquette, rather than as a vehicle for civic empowerment and social transformation. This is consistent with Westheimer & Kahne's (2004) model of the personally responsible citizen, which emphasizes individual compliance over collective agency.

Context-specific implementation patterns are evident across the reviewed literature. In Saudi Arabia, Alenezi & Alfaleh (2024) document a teacher-centered approach that prioritizes digital emotional intelligence and security competencies, with implementation quality varying significantly by teacher demographics. This finding highlights DCE's reliance on individual teacher capacity rather than systemic curriculum design. In contrast, Zheng et al. (2024) demonstrate, in a Chinese elementary school context, that digital game-based learning (DGBL) shifts the pedagogical orientation toward active, student-centered participation, resulting in significant improvements in digital etiquette literacy and learning motivation compared to conventional instruction. This contrast illustrates a broader pattern in the reviewed literature: countries with stronger digital infrastructure and policy mandates tend toward more participatory DCE models, while those in earlier stages of digitalization remain anchored to instructional transmission.

The integration of DCE into formal curricula represents a significant implementation challenge in itself. Tomé et al. (2024b) emphasize the interdisciplinary nature of DCE and advocate for cross-subject collaboration as a structural solution, arguing that DCE cannot be sustained in isolation but must permeate the broader curriculum. This position finds empirical support in Iskandar et al. (2025a), who identify curriculum embeddedness, specifically the integration of privacy awareness and digital rights into core subjects, as a significant predictor of digital citizenship literacy among elementary students in Indonesia. These findings collectively suggest that the effectiveness of DCE implementation is determined not only by pedagogical strategy but also by the degree to which DCE is institutionalized within curriculum structures and supported by school-level policy.

5.2. Challenges: A Multi-layered and Interconnected Constraint System

The challenges facing DCE implementation in elementary schools are multi-layered and mutually reinforcing. Rather than representing isolated barriers, the technological, pedagogical, and socio-cultural challenges identified in the reviewed literature constitute an interconnected system of constraints, a finding with significant implications for policy design. Addressing infrastructure alone, for instance, does not resolve teachers' pedagogical unpreparedness, and improving teacher competency without addressing socio-cultural barriers such as parental disengagement and digital inequality yields similarly limited outcomes.

From a technological perspective, Cassells & Dlamini (2019) document how historical inequalities in ICT integration in South Africa have created a structural gap in which government investment has prioritized device access over meaningful digital citizenship training. This critical distinction echoes the broader bibliometric finding that numerous DCE studies remain anchored in infrastructure concerns rather than pedagogical transformation. Kumari et al. (2023) further identify unequal distribution of digital resources as a factor that actively reinforces existing educational inequalities, creating what they describe as a "double disadvantage" for students in low-resource contexts who simultaneously lack access to devices and to the critical digital literacy instruction needed to use them responsibly.

Pedagogically, the reviewed literature consistently identifies teacher readiness as the most proximate determinant of DCE quality. Almethen & Alomair (2024) demonstrate that the degree to which teachers integrate digital citizenship elements into instruction varies significantly by age, grade level, and subject area, suggesting that DCE implementation is currently contingent on individual teacher characteristics rather than embedded in systemic professional development. Tangül & Soykan (2021) reinforce this finding by showing that practicing teachers score significantly higher on DCE competency measures than pre-service teachers, indicating that field experience compensates for gaps in initial teacher education that ought to be addressed institutionally. Interpreted through Westheimer and Kahne's (2004) framework, these pedagogical deficits constrain DCE at the level of personal responsibility, preventing most programmes from advancing students toward participatory or justice-oriented citizenship.

Socio-cultural challenges extend beyond individual or institutional actors. Monteiro et al. (2022) situate DCE within broader struggles for emancipation and social justice, emphasizing that digital technology intersects with cultural identity in ways that elementary school curricula have yet to address adequately. Tomé et al. (2024b) document the compounding effects of parental disengagement, noting that online safety challenges children face in digital environments are often invisible to families who lack the digital literacy to supervise or mediate their children's online experiences. Almethen & Alomair (2024) additionally raise the concern of internet addiction among elementary students as a mental health dimension of digital citizenship that is systematically under-addressed in current curricula, a finding that resonates with Pireddu's (2022) argument that DCE must be reconceptualized as a holistic understanding of public life in a networked society, one that integrates well-being alongside civic competence.

5.3. Effective Practices: Toward a Holistic and Inclusive DCE Framework

Despite the challenges documented above, the reviewed literature identifies a coherent cluster of effective practices that, taken together, point toward a more holistic and inclusive DCE framework for elementary education. These practices share a common orientation—they move beyond passive instruction and individual skill transmission toward active, participatory, and contextually embedded forms of digital citizenship—an orientation that aligns more closely with the actualizing digital citizenship and participatory citizen models advanced by Choi (2016) and Westheimer and Kahne (2004), respectively.

Digital game-based learning (DGBL) emerges as one of the most empirically supported practices in the reviewed corpus. Panjaburee et al. (2024) demonstrate, using eye-tracking data as a proxy for cognitive engagement, that personalized digital citizenship games produce measurable improvements in both academic achievement and students' perceptions of DCE, with attention patterns indicating deeper processing than conventional instruction elicits. Zheng et al. (2024) corroborate this finding in a Chinese elementary school context, reporting significant gains in digital etiquette literacy and intrinsic motivation among DGBL participants. Critically, both studies attribute the effectiveness of DGBL not merely to its technological novelty, but to its capacity to create authentic decision-making contexts and environments in which students must exercise digital ethical judgment rather than reproduce declarative knowledge.

Inclusive pedagogical design represents a second cluster of effective practices. Sriwisathiyakun & Dhamanitayakul (2024) demonstrate that a MOOC-based design-thinking approach significantly improved digital citizenship learning outcomes among deaf elementary students in Thailand, with 75% achieving mastery-level scores, underscoring the superiority of multimedia-rich, differentiated instruction over text-heavy, teacher-directed formats. This aligns with the universal design for learning (UDL) principle that accessible DCE benefits all learners, not only those with identified learning differences. Tomé et al. (2019a) further demonstrate that children's active media production, including video creation and digital content authorship, serves as a powerful vehicle for simultaneously developing civic voice, literacy, and social understanding, bridging the gap between digital skills and civic participation.

The cultivation of cyber wisdom, as theorized by Harrison et al. (2024) through a four-component framework encompassing literacy, reasoning, motivation, and reflection, offers a particularly promising conceptual and practical anchor for elementary DCE. Unlike narrower constructs such as digital safety or online etiquette, cyber wisdom integrates cognitive, affective, and metacognitive dimensions, addressing not only what students know about digital citizenship, but how they reason about it, why they are motivated to act responsibly, and whether they can reflect critically on their own digital behavior. This comprehensive orientation resonates with Choi's (2016) vision of the actualizing digital citizen and with the justice-oriented citizenship model of Westheimer and Kahne (2004).

Finally, systemic and sustained institutional support is consistently identified across the reviewed literature as a prerequisite, not merely a facilitator of effective DCE. Tomé et al. (2019a) demonstrate that community-based DCE projects achieve sustained impact only when supported by ongoing engagement from policymakers, academics, and media professionals.

Iskandar et al. (2025b) underline that digital privacy awareness, a core DCE competency, is most effectively developed when embedded in a curriculum supported by social campaigns and institutional policy, rather than delivered as a stand-alone intervention. These findings collectively indicate that the most effective DCE practices are not the most technologically sophisticated, but those most deeply embedded in a coherent, multi-stakeholder educational ecosystem.

5.4. Synthesis: Implications for Elementary DCE Policy and Practice

Taken together, the findings of this review underscore that effective DCE in elementary school contexts requires a fundamental shift in conceptual orientation: from a compliance-based, individually focused model of digital skill transmission toward a holistic, participatory, and justice-oriented framework of digital civic education. This shift is not merely theoretical; it has direct implications for curriculum design, teacher professional development, and educational policy. Curricula must move beyond digital safety and etiquette to incorporate privacy awareness, media production, cyber wisdom, and critical engagement with digital inequality. Teacher preparation programs must address DCE not as a supplementary competency but as a core pedagogical orientation, continuously supported through in-service professional development rather than front-loaded in pre-service training. Moreover, educational policy must establish the systemic conditions, infrastructure, institutional mandate, cross-subject coordination, and community engagement, without which even the most effective individual DCE practices cannot achieve lasting impact.

The bibliometric finding that DCE research is disproportionately concentrated in a small number of countries, most notably Hong Kong, the United States, and China, has significant implications for the field. Particularly noteworthy is the finding that Indonesia recorded a total link strength of 34 in the VOSviewer collaboration network, surpassing Hong Kong's 27, despite contributing only 3 articles compared to Hong Kong's 7. This disparity between publication volume and collaborative connectivity underscores that those Indonesian researchers are already embedded in multiple international research networks, a structural advantage that has yet to translate into a proportional increase in publication output. With targeted investment in research funding, institutional support, and nationally grounded DCE studies, Indonesia is well-positioned to become a significant contributor to the global DCE literature, particularly in the elementary school context, which remains underrepresented in the 66-article corpus.

6. Conclusion

This systematic literature review (SLR) and bibliometric analysis examine 66 peer-reviewed articles on Digital Citizenship Education (DCE) in elementary schools, of which 17 were analyzed thematically. The findings underscore that DCE is implemented through various approaches, including digital game-based learning, multimedia instruction, cyber-wisdom development, and curriculum integration. However, its implementation remains primarily focused on individual digital skills rather than on participatory and justice-oriented civic engagement.

The present study also identifies interconnected challenges, including technological barriers (limited infrastructure and unequal access), pedagogical barriers (insufficient teacher competence and professional development), and socio-cultural barriers (digital inequality, limited parental involvement, and concerns about students' digital well-being). These challenges reinforce one another and cannot be addressed through isolated interventions.

Effective practices supported by the literature include digital game-based learning, inclusive multimedia design, cultivation of cyber wisdom, integration of privacy and digital rights education, and sustained support from multiple stakeholders. Together, these practices promote a holistic DCE framework that develops students' cognitive, affective, and civic competencies as ethical, critical, and responsible digital citizens. The study's main contribution is providing the first integrated SLR–bibliometric synthesis of DCE research at the elementary school level, offering both a broad overview of global research trends and an evidence-based foundation for educators and policymakers.

7. Implications

The findings have important implications for policy, practice, and future research. At the policy level, there is a need for comprehensive and nationally integrated DCE frameworks that address not only digital infrastructure but also curriculum development, teacher competency standards, and school accountability. In Indonesia, the limited representation of local studies in the global DCE literature highlights the importance of conducting contextually relevant research that reflects the characteristics of Indonesian elementary education. For teacher professional development, DCE should be integrated into pre-service teacher education and supported through continuous in-service training. This would enable teachers to implement inclusive, context-sensitive, and participatory DCE practices across different subjects.

For curriculum developers and school leaders, the evidence supports embedding digital citizenship competencies across existing subjects rather than treating DCE as a separate discipline. School leaders are also essential in fostering supportive institutional conditions, including collaborative cultures, policy alignment, and community engagement. Future research should focus on longitudinal, mixed-methods studies to examine the long-term civic impacts of DCE and to develop locally validated implementation frameworks, particularly within Indonesian and Southeast Asian elementary school contexts. Greater use of qualitative approaches would also enhance understanding of how students, teachers, and families experience and engage with DCE in everyday educational settings.

8. Limitation

This study has several limitations. First, the exclusive use of the Scopus database may introduce publication bias, as relevant studies from non-indexed journals, institutional repositories, and national databases may be excluded. Consequently, research from low- and middle-income countries, including Indonesia, may be underrepresented. Future reviews should

include additional databases, such as ERIC, Web of Science, Dimensions, Garuda, and SINTA, to achieve broader, more inclusive coverage.

Second, limiting the review to English-language publications creates language bias by excluding research published in other languages, such as Indonesian, Spanish, Portuguese, and Mandarin. This restriction may overlook diverse DCE practices and findings from essential research contexts worldwide. Third, the focus on open-access publications may have excluded relevant studies behind paywalls, resulting in access bias in which inclusion is influenced by publication accessibility rather than solely by quality or relevance.

Finally, as an SLR based on published empirical studies, the review is constrained by variations in research designs, measurement instruments, and educational contexts across the included studies. Therefore, the thematic findings derived from 17 studies should be viewed as emerging evidence rather than definitive causal conclusions.

Credit authorship contribution statement

Arya Chandra Kirana: Conceptualization, Methodology, Investigation, Visualization, Data Curation. **Fathurrohman:** Writing-review, Supervision, Validation. **Wuri Wuryandani:** Writing-review, Supervision, Validation. **David Lailelleru:** Investigation, Data Curation. **Ai Haidar Syahmanan:** Investigation, Data Curation. **Iftinan R Azzah S:** Investigation

Declaration of competing interest

The authors declare no conflict of interest.

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding Author on reasonable request.

Ethical Declaration

Ethical approval is not applicable, as this study is based on the analysis of publicly available literature and does not involve direct engagement with human participants, the collection of personal data, or any experimental interventions. The authors confirm that all cited sources were appropriately acknowledged and that no plagiarism, data fabrication, or falsification occurred in the conduct of this review.

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Declaration of AI statement

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contributions, including conceptualization, literature analysis, interpretation of findings, critical synthesis, and scholarly argumentation, were conducted exclusively by the authors. The AI tools did not generate, fabricate, or replace any analytical or interpretive content in this manuscript. The authors take full responsibility for the accuracy, originality, integrity, and ethical soundness of all content presented in this work.

References

- Alenezi, N., & Alfaleh, M. (2024). Enhancing Digital Citizenship Education in Saudi Arabian Elementary Schools: Designing Effective Curriculum-Integration Activities. *Frontiers in Education*, 9. <https://doi.org/10.3389/educ.2024.1494487>
- Agus, A. A., Rizal, A., Muhajir, M., & Jamalong, A. (2025). From awareness to action: Rethinking high school civic education for the digital generation in Indonesia. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2534156>
- Almethen, A. A., & Alomair, M. A. (2024). The role of age, grade level, and subject area in determining the inclusion of digital citizenship elements in elementary school curricula: Perspectives of teachers in the Kingdom of Saudi Arabia. *Heliyon*, 10(14), e34597. <https://doi.org/10.1016/j.heliyon.2024.e34597>
- Anwar, Moh. F. N., Wijaya, E. M. S., & Woe, H. (2025). Design and development of a digital game to support civics education for fourth-grade students. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, 14(6), 916–927. <https://doi.org/10.33578/jpfkip.v14i6.916-927>
- Cassells, L., & Dlamini, N. N. (2019). Educating digital citizens through curricular incorporation: A South African solution to information poverty. *International Journal of Information and Communication Technology Education*, 15(3), 11–29. <https://doi.org/10.4018/IJICTE.2019070102>
- Choi, M. (2016). A concept analysis of digital citizenship for democratic citizenship education in the internet age. *Theory & Research in Social Education*, 44(4), 565–607. <https://doi.org/10.1080/00933104.2016.1210549>
- Cunha, J., Silva, C., Guimarães, A., Sousa, P., Vieira, C., Lopes, D., & Rosário, P. (2021). No children should be left behind during the COVID-19 pandemic: Description, potential reach, and participants' perspectives on a project using radio and letters to promote self-regulatory competences in elementary school. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.647708>
- Damayanti, T., Herpratiwi, Rohman, F., & Nurhanurawati. (2025). Cultivating critical thinking: The development and impact of PBL worksheets in elementary science learning. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, 14(6), 1011–1025. <https://doi.org/10.33578/jpfkip.v14i6.1011-1025>
- Gazi, Z. A. (2016). Internalization of digital citizenship for the future of all levels of education. *Education and Science*, 41(186), 137–148. <https://doi.org/10.15390/EB.2016.4533>
- Harrison, T., Polizzi, G., McLoughlin, S., & Moller, F. (2024). Measuring cyber wisdom: Preliminary validation of a new four-component measure. *Education and Information Technologies*, 29(4), 4317–4336. <https://doi.org/10.1007/s10639-023-11953-9>
- Huschle, L., Kindlinger, M., & Abs, H. J. (2024). Personal responsibility and beyond: Developing a comprehensive conceptualization of digital citizenship competences. *Weizenbaum Journal of the Digital Society*, 4(4). <https://doi.org/10.34669/wi.wjds/4.4.5>

- Ilomäki, L., Lakkala, M., Kallunki, V., Mundy, D., Romero, M., Romeu, T., & Anastasia, G. (2023). Critical digital literacies at the school level: A systematic review. *Review of Education*, 11(3). <https://doi.org/10.1002/rev3.3425>
- Iskandar, R., Maksum, A., & Marini, A. (2025a). Bridging the gap in digital citizenship literacy: Insights from young digital natives. *Multidisciplinary Reviews*, 8(12), 2025383. <https://doi.org/10.31893/multirev.2025383>
- Iskandar, R., Maksum, A., & Marini, A. (2025b). Digital citizenship literacy in Indonesia: The role of privacy awareness and social campaigns. *Social Sciences & Humanities Open*, 12, 101697. <https://doi.org/10.1016/j.ssaho.2025.101697>
- Kumari, N., Sachdeva, M., & Verma, K. (2023). Examining the need for digital citizenship education for adolescents in the current digital landscape. *Journal of Higher Education Theory and Practice*, 23(11). <https://doi.org/10.33423/jhetp.v23i11.6228>
- Lauricella, A. R., Herdzina, J., & Robb, M. (2020). Early childhood educators' teaching of digital citizenship competencies. *Computers and Education*, 158. <https://doi.org/10.1016/j.compedu.2020.103989>
- Mamluk, D., & Abowitz, K. K. (2022). 132 words: A critical examination of digital technology, education, and citizenship. *Technology, Knowledge and Learning*, 27(4), 1237–1257. <https://doi.org/10.1007/s10758-021-09540-3>
- Martin, F., Gezer, T., & Wang, C. (2019). Educators' perceptions of student digital citizenship practices. *Computers in the Schools*, 36(4), 238–254. <https://doi.org/10.1080/07380569.2019.1674621>
- Matusevych, T., & Zadorozhna, O. (2023). Innovative approaches in citizenship education research: Conceptual perspectives and ethical cautions. *Studia Warmińskie*, 60, 93–103. <https://doi.org/10.31648/sw.9566>
- Mirra, N., McGrew, S., Kahne, J., Garcia, A., & Tynes, B. (2022). Expanding digital citizenship education to address tough issues. *Phi Delta Kappan*, 103(5), 31–35. <https://doi.org/10.1177/00317217221079976>
- Monteiro, A., Guedes Teixeira, E., Leite, C., Barros, R., Fernandes, P., & Soares, F. (2022). Education towards literacy and digital citizenship of young people: Beyond being online. *Revista Conhecimento Online*, 2, 89–107. <https://doi.org/10.25112/rco.v2.2991>
- Morgan, D. E. (2024). Zotero is a teaching tool for independent study courses, honors contracts, and undergraduate research mentoring. *Journal of Microbiology & Biology Education*, 25(3), e00132-24. <https://doi.org/10.1128/jmbe.00132-24>
- Nugroho, I., Wilujeng, I., & Pujaningsih, P. (2025). Digital transformation of HOTS assessment in elementary school science learning: Technological challenges, human resource readiness, and contribution to SDGs achievement. *E3S Web of Conferences*, 622, 03004. <https://doi.org/10.1051/e3sconf/202562203004>
- Nurikhsani, F. A., Wasino, W., Handoyo, E., & Sarwi, S. (2026). A hybrid systematic review and bibliometric analysis of character education in science and social studies. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, 15(2), 518–539. <https://doi.org/10.33578/jpfkip.v15i2.518-539>
- Öztürk, O., Kocaman, R., & Kanbach, D. K. (2024). How to design bibliometric research: An overview and a framework proposal. *Review of Managerial Science*, 18(11), 3333–3361. <https://doi.org/10.1007/s11846-024-00738-0>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher,

- D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Reviews*, 10(1), 89. <https://doi.org/10.1186/s13643-021-01626-4>
- Panjaburee, P., Hwang, G.-J., Intarakamhang, U., Srisawasdi, N., & Chaipidech, P. (2024). Effects of a personalized game on students' outcomes and visual attention during digital citizenship learning. *Cogent Education*, 11(1), 2351275. <https://doi.org/10.1080/2331186X.2024.2351275>
- Passas, I. (2024). Bibliometric analysis: The main steps. *Encyclopedia*, 4(2), 1014–1025. <https://doi.org/10.3390/encyclopedia4020065>
- Pireddu, M. (2022). Educating in platform societies: From digital citizenship to public values in a connected world. *Journal of E-Learning and Knowledge Society*, 18(3), 58–65. <https://doi.org/10.20368/1971-8829/1135822>
- Rana, P. (2025). Bridging ethics and code: A PBL framework for digital citizenship in CS. In *Computing Education Research (Communications in Computer and Information Science, Vol. 2400, pp. 170–180)*. https://doi.org/10.1007/978-3-031-84391-4_14
- Singh, B., Wongmahesak, K., & Kumar, S. (2025). Global digital education fostering digital citizens: A blueprint for the future and a worldwide initiative enhancing e-governance. In *Public Governance Practices in the Age of AI (pp. 377–392)*. <https://doi.org/10.4018/979-8-3693-9286-7.ch018>
- Sousa, C., Oliveira, A., Casimiro, C., Léste, J., & Yaman, H. (2024). Exploring the impact of game-based learning on young people's news literacy and digital citizenship. *Media e Jornalismo*, 24(45). https://doi.org/10.14195/2183-5462_45_10
- Sriwisathiyakun, K., & Dhamanitayakul, C. (2024). Empowering deaf and hard-of-hearing learners for digital citizenship: A Thai MOOC-based design thinking approach. *Electronic Journal of E-Learning*, 22(8), 12–23. <https://doi.org/10.34190/ejel.22.8.3365>
- Subrahmanyam, S. (2025). Developing digital citizenship skills. In *Advancing Society 5.0 Through AI-Driven Curriculum Innovation (pp. 357–390)*. <https://doi.org/10.4018/979-8-3373-1062-6.ch012>
- Tadlaoui-Brahmi, A., Çuko, K., & Alvarez, L. (2022). Digital citizenship in primary education: A systematic literature review describing how it is implemented. *Social Sciences & Humanities Open*, 6(1). <https://doi.org/10.1016/j.ssaho.2022.100348>
- Tangül, H., & Soykan, E. (2021). Comparison of students' and teachers' opinions toward digital citizenship education. *Frontiers in Psychology*, 12, 752059. <https://doi.org/10.3389/fpsyg.2021.752059>
- Tomé, V., Lopes, P., Reis, B., & Dias, C. P. (2019a). Exercício de cidadania ativa e participação através dos média: Um projeto comunitário focado em crianças do Pré-escolar e 1o Ciclo. *Comunicação e Sociedade*, 36, 101–120. [https://doi.org/10.17231/comsoc.36\(2019\).2347](https://doi.org/10.17231/comsoc.36(2019).2347)
- Tomé, V., Sikharulidze, M., Lobzhanidze, S., & Urchukhishvili, G. (2024b). Digital citizenship education: Perceptions on the concept, self-reported competences, and practices of Georgian school society. *Journal of Media Literacy Education*, 16(2), 71–84. <https://doi.org/10.23860/JMLE-2024-16-2-6>
- Vargas-Murillo, A. R., Pari-Bedoya, I. N. M. D. L. A., & Gordillo Bedoya, S. M. (2025). Digital education strategies and tools in developing citizenship skills: A literature review based on Scopus (2014–2024). *Proceedings of the 2024 8th International Conference on E-Society, E-Education and E-Technology*, 50–55. <https://doi.org/10.1145/3704217.3704237>

- Webster, J. (2025a). Defining digital citizenship and digital citizenship education: A Delphi study. *Journal of Research on Technology in Education*, 1–16. <https://doi.org/10.1080/15391523.2025.2536564>
- Webster, J. (2025b). Sociotechnical imaginaries in a postdigital world: Teachers' perceptions of digital citizenship education. *Postdigital Science and Education*, 7(3), 770–787. <https://doi.org/10.1007/s42438-025-00557-w>
- Westheimer, J., & Kahne, J. (2004). What kind of citizen? The politics of educating for democracy. *American Educational Research Journal*, 41(2), 237–269. <https://doi.org/10.3102/00028312041002237>
- Widyaningsih, V., Hidayat, O. S., & Adnan, E. (2023). Development of a gamification-based digital educational game for civic education on rights and obligations for grade III elementary students. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, 12(5), 1227–1237. <https://doi.org/10.33578/jpfkip.v12i5.10063>
- Wui, M. G. L., Claudio, J. S. R., Zhang, J., Reyes, C. R. R., Reyes, R. T. M., & Leviste, E. N. P. (2025). Role of classroom openness in digital literacy and online civic engagement among Filipino high school students. *Journal of Applied Youth Studies*, 8(2), 287–306. <https://doi.org/10.1007/s43151-025-00169-y>
- Zheng, Y., Zhang, J., Li, Y., Wu, X., Ding, R., Luo, X., Liu, P., & Huang, J. (2024). Effects of digital game-based learning on students' digital etiquette literacy, learning motivations, and engagement. *Heliyon*, 10(1), e23490. <https://doi.org/10.1016/j.heliyon.2023.e23490>