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Knowledge Mapping of Digital Ethics in Education: A Bibliometric and Science Mapping Analysis

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Abstract

Although digital ethics has become increasingly important in education, systematic evidence on its global research structure and thematic development remains limited. This study aims to map global research on digital ethics in education from 2015 to 2025 using bibliometric analysis and science mapping techniques. Data were retrieved from Scopus, yielding 782 documents published in 466 sources and involving 3,993 authors. The analysis was conducted using Bibliometrix and VOSviewer to examine publication trends, citation impact, collaboration networks, keyword co-occurrence, co-citation patterns, thematic mapping, and thematic evolution. The findings reveal rapid growth in publication output and interdisciplinary collaboration, indicating the expanding scholarly relevance of digital ethics in educational research. Core keywords, including ethics, education, higher education, and female, form the intellectual backbone of the field. Network, overlay, and density visualizations show a thematic shift from methodological and COVID-19-related topics toward emerging issues such as digital literacy, AI literacy, generative AI, academic integrity, equity, and curricula. High research density remains concentrated around ethics and education, whereas AI-related themes are still comparatively

underexplored. These findings highlight opportunities for future research on ethical AI literacy, AI governance, and responsible AI integration in educational curricula. This study contributes a comprehensive knowledge map by identifying leading actors, thematic domains, and research gaps, offering practical guidance for scholars, policymakers, and practitioners seeking to promote ethical, equitable, and accountable digital transformation in education.

Keywords: Digital Ethics; Education; Bibliometric Analysis; Science Mapping; AI Literacy

INTRODUCTION

Digital transformation has fundamentally reshaped various aspects of educational practices through the adoption of emerging technologies, including artificial intelligence (AI) (Mohan et al., 2026) ; (Nyamwange, 2025) ; (Qablan et al., 2025) ; (Babu et al., 2025), learning analytics (Keržič et al., 2026) ; (Koti & Kumta, 2021), cloud computing (Hao, 2016) ; (Liu et al., 2025), social media (Baytiyeh, 2021) and various digital learning platforms (Akgün & Deniz, 2025) ; (Oubibi et al., 2026). The integration of these technologies has generated numerous educational benefits, including enhanced accessibility(Anamika, 2026) ; (Velastegui-Hernández et al., 2026), improved learning effectiveness (Darginavičienė, 2024) ; (Anamika, 2026), greater instructional flexibility (Anamika, 2026) ; (Karga & Satratzemi, 2018) and support for data-driven decision-making processes (Li, 2024) ; (Pause et al., 2019). Despite these opportunities, the rapid expansion of digital technologies has also introduced increasingly complex ethical challenges, including the protection of students' personal data (Marín & Tur, 2023) ; (Torrisi-Steele, 2025) ; (Ayasrah et al., 2026), information security (de Barros & Vilela, 2025), academic integrity, algorithmic bias (Nayır & Sarı, 2025) ; (Rouabhia, 2025) ; (Praveenkumar et al., 2025), transparency in AI implementation (Rotenberg, 2022) ; (Soni et al., 2026), intellectual property rights (Vetrivel et al., 2025) and accountability for the responsible use of digital technologies digital (Soni et al., 2026) ; (Ying, 2026).

These emerging digital challenges have positioned digital ethics in education as an increasingly important field of study, as it plays a critical role in ensuring that digital transformation in education is implemented in a responsible, equitable and sustainable manner (Akgün & Deniz, 2025) ; (Shao & Li, 2025) ; (Rajput, 2025) ; (Awodiji & Katjiteo, 2023). As the adoption of digital technologies continues to expand across educational institutions, the volume of scholarly publications addressing digital ethics has grown

substantially, indicating that this topic has evolved into one of the major research priorities in technology-enhanced education.

Although research on digital ethics in education has grown considerably (Munasinghe & Hewawasam, 2025) ; (Zvereva, 2023), most previous studies have primarily focused on conceptual discussions or empirical investigations of specific issues, such as digital literacy, academic integrity, the use of artificial intelligence in teaching and learning, educational data governance and user privacy. While these studies have made significant contributions to understanding the ethical challenges associated with digital technologies in education, they provide only a fragmented view of the field. Comprehensive evidence regarding global publication trends, research collaboration networks, institutional and national contributions, intellectual and conceptual structures, thematic relationships and the evolution of research topics remains limited. Furthermore, bibliometric studies in the field of digital education have predominantly examined topics such as digital competence, digital literacy, educational technology and artificial intelligence in education, whereas digital ethics in education has rarely been investigated as an independent research domain. This gap highlights the need for a comprehensive bibliometric investigation to better understand the development of the field and identify future research directions.

To address this gap, a bibliometric approach integrated with science mapping provides a robust methodological framework for systematically evaluating scientific publications while simultaneously visualizing the knowledge structure of a research field. Through analyses of publication productivity, authors, institutions, countries, journals, collaboration networks, keyword co-occurrence, co-citation, bibliographic coupling, thematic mapping and thematic evolution, the development of digital ethics in education can be examined in a comprehensive manner. The state-of-the-art contribution of this study lies in integrating multiple bibliometric techniques with science mapping to produce a comprehensive knowledge map that reveals the conceptual structure, intellectual structure and evolutionary dynamics of global research on digital ethics in education. The novelty of this study is the development of a dedicated knowledge mapping framework specifically focused on digital ethics in education, integrating multiple bibliometric indicators to identify core research themes, emerging topics, scientific collaboration patterns, leading research actors and underexplored areas that offer promising opportunities for future investigation.

Based on these considerations, this study aims to map the global development of research on digital ethics in education using bibliometric analysis and science mapping. Specifically, the study seeks to analyze publication trends, identify the most influential authors, institutions, countries and journals, examine research collaboration networks, uncover the intellectual and conceptual structures of the field, analyze the evolution of research themes and identify future research directions and emerging opportunities. The findings are expected to contribute theoretically by enriching the literature on digital ethics in education and to provide valuable insights for academics, researchers, policymakers and educational practitioners in formulating research strategies and promoting the responsible implementation of digital ethics within educational ecosystems.

METHODS

This study employed a bibliometric approach combined with science mapping to examine the development of research on *digital ethics in education*. Bibliographic data were retrieved from the Scopus database using predefined search keywords, with the publication period limited to 2015–2025. Only English-language journal articles, conference papers and review articles relevant to the research topic were included to ensure data quality and consistency.

The retrieved bibliographic records were exported in CSV format and analyzed using the Bibliometrix package in RStudio and VOSviewer. Bibliometrix was used to generate descriptive bibliometric indicators, including publication trends, citation performance, authors, countries, institutions, journals and keyword statistics. VOSviewer was employed to construct science mapping visualizations, including keyword co-occurrence, network, overlay and density visualizations, to identify the conceptual structure and thematic evolution of the field.

Data analysis was conducted through descriptive bibliometric analysis and network analysis. The study examined publication growth, scientific impact, collaboration patterns, conceptual and intellectual structures and the evolution of research themes. The findings provide a comprehensive overview of the current state of *digital ethics in education* research and identify emerging topics and future research opportunities.

RESULTS

The bibliometric analysis revealed that research on digital ethics in education has experienced substantial growth during the 2015–2025 period. Based on data retrieved from the Scopus database, a total of 782 publications were identified across 466 scholarly sources, involving 3,993 authors. The dataset exhibited an annual publication growth rate of 43.7%, indicating the increasing scholarly interest in digital ethics within educational contexts. Furthermore, each publication was authored by an average of 5.29 researchers, with an international co-authorship rate of 26.47%, reflecting the growing extent of cross-institutional and cross-national research collaboration. Overall, these bibliometric characteristics demonstrate that digital ethics in education has emerged as a dynamic and rapidly expanding research field, characterized by increasing scientific productivity, collaborative research networks and a growing academic impact.

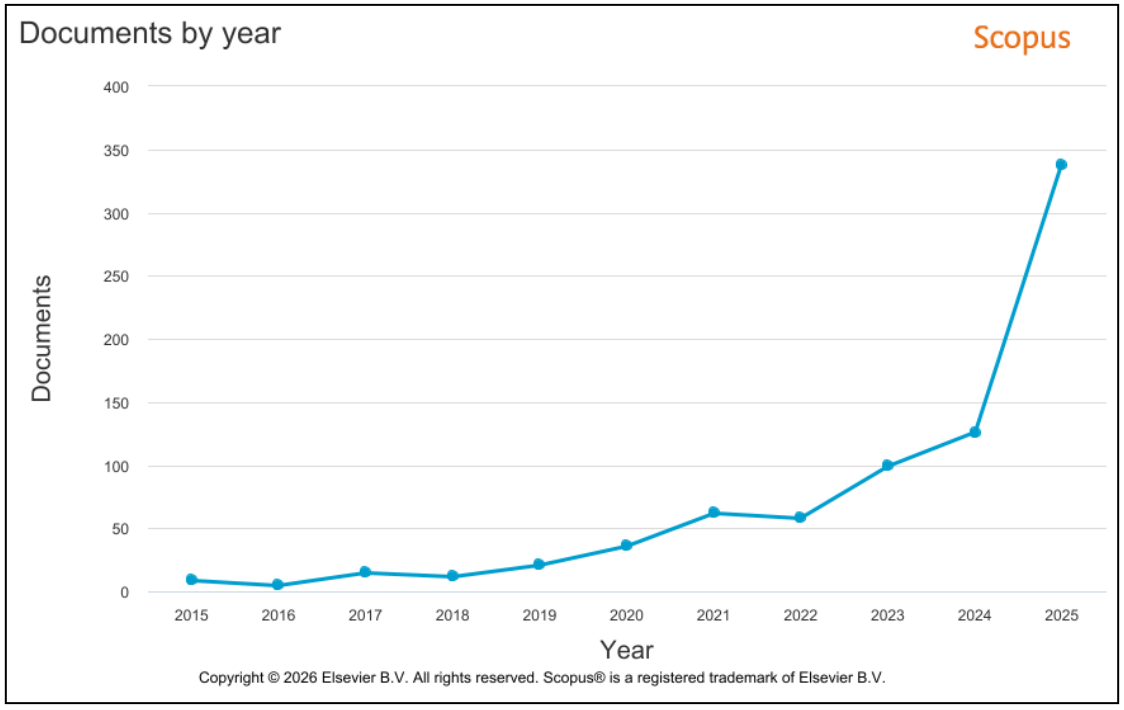

Figure 1. Documents By Year
Source : Scopus Data base 2015-2025

Figure 1 illustrates the annual publication trends in digital ethics in education. Overall, the number of publications exhibits a consistent upward trajectory, particularly following the acceleration of digital transformation in the education sector. This growth indicates that digital ethics has increasingly been recognized as a critical component of educational technology implementation. The rapid adoption of artificial intelligence, learning

analytics and digital learning platforms has significantly contributed to the growing scholarly interest in ethical issues, including data privacy, academic integrity, algorithmic transparency and the responsible use of digital technologies in educational environments.

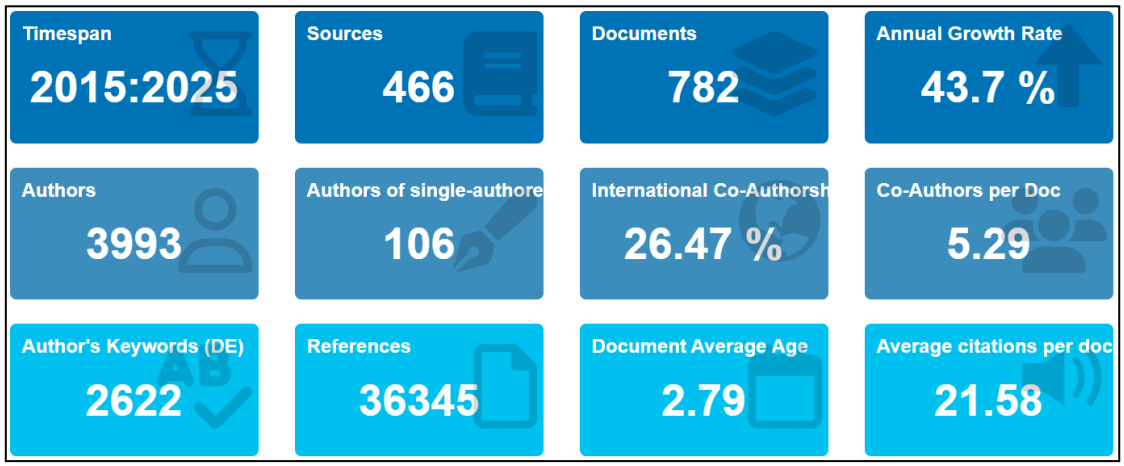

Figure 2 Characteristics Of The Bibliometric Dataset

Source : Processed based on Scopus database data using Biblioshiny software

Figure 2 presents the main characteristics of the bibliometric dataset on *digital ethics in education* indexed in the Scopus database for the period 2015–2025. The dataset comprises 782 documents published across 466 scholarly sources, involving 3,993 authors, of whom 106 contributed as single authors. The average number of authors per document is 5.29, indicating that research in this field is predominantly conducted through collaborative efforts. The international co-authorship rate of 26.47% further reflects a substantial level of cross-country collaboration in advancing research on *digital ethics in education*. Moreover, the dataset demonstrates an annual publication growth rate of 43.7%, highlighting the rapid expansion of scholarly output over the study period. It also includes 2,622 author keywords and 36,345 cited references, reflecting the diversity of research topics and the strong scientific foundation of the field. The average document age of 2.79 years suggests that most publications are relatively recent, while the average of 21.58 citations per document indicates a considerable level of scientific impact. Overall, these bibliometric characteristics demonstrate that *digital ethics in education* has evolved into a dynamic and rapidly growing research field, characterized by increasing publication productivity, extensive research collaboration and a steadily expanding academic influence.

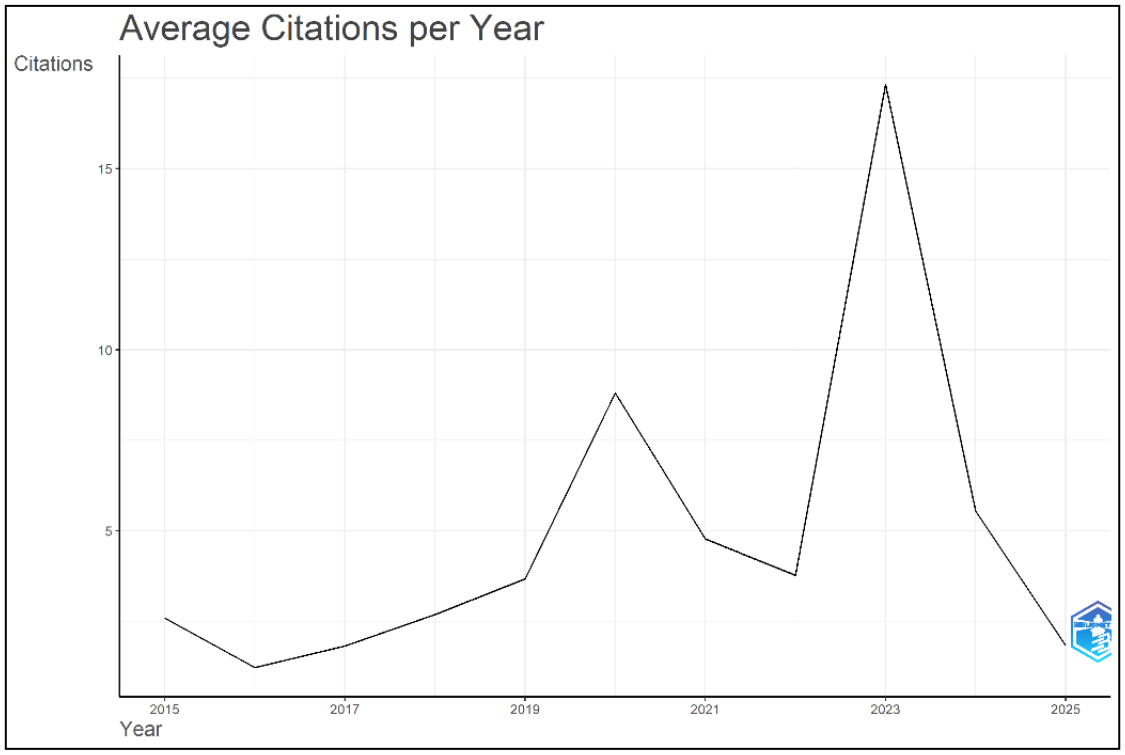

Figure 3. Average Citations Per Year
Source : Processed Based On Scopus Database Data Using Biblioshiny Software

Figure 3 illustrates the annual average citations of publications on *digital ethics in education* during the 2015–2025 period, revealing a fluctuating citation pattern. Between 2015 and 2019, the average number of citations remained relatively low but increased gradually, reaching approximately four citations per publication by 2019. A more substantial increase was observed in 2020, when the average citation count approached nine citations per publication, followed by a decline in 2021 and 2022. The highest average citation rate was recorded in 2023, with approximately 17 citations per publication, indicating that articles published during this period achieved the greatest scientific impact and were more frequently referenced by subsequent studies. The average citation count declined again in 2024 and 2025, which is likely attributable to the citation window effect, as recently published articles have had insufficient time to accumulate citations. Overall, this pattern suggests that although research productivity in *digital ethics in education* has continued to increase, the scientific impact of individual publications is strongly influenced by publication age and the evolving nature of research trends within the field.

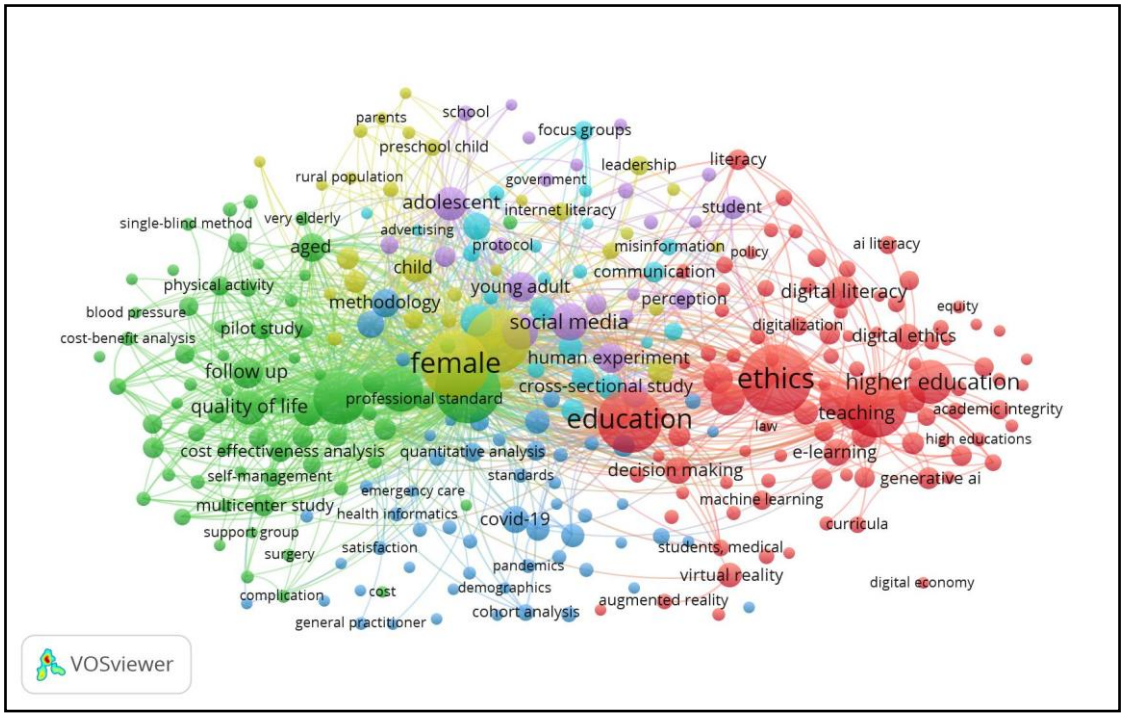

Figure 4. Network Visualization

Source : Processed Based On Scopus Database Data Using VosViewer Software

Figure 4 presents the network visualization generated from the keyword co-occurrence analysis using VOSviewer, illustrating the conceptual structure of research on *digital ethics in education*. The visualization reveals that the research landscape is organized into several interconnected clusters linked through keyword relationships. The keywords *ethics*, *education*, *higher education* and *female* represent the largest nodes with the highest link strength, indicating their roles as the core concepts within the research network. This finding suggests that research on *digital ethics in education* has evolved into a multidisciplinary field that integrates ethical, educational, technological and human-centered perspectives. Furthermore, the strong connections among keywords such as *digital ethics*, *digital literacy*, *AI literacy*, *generative AI*, *academic integrity*, *social media*, *communication* and *leadership* indicate a shift in research focus from general discussions of digital ethics toward more specialized topics related to digital transformation in education and the integration of artificial intelligence. Meanwhile, the presence of keywords such as *quality of life*, *pilot study*, *cross-sectional study*, *COVID-19* and *cohort analysis* demonstrates that this field is increasingly supported by interdisciplinary empirical research investigating the impact of digital technologies on human behavior, teaching and learning processes and educational environments. Overall, the network visualization highlights that *digital ethics in education* is a rapidly evolving research domain characterized by

a complex and highly interconnected conceptual structure, reflecting the integration of diverse research themes and the expanding scope of scholarly inquiry.

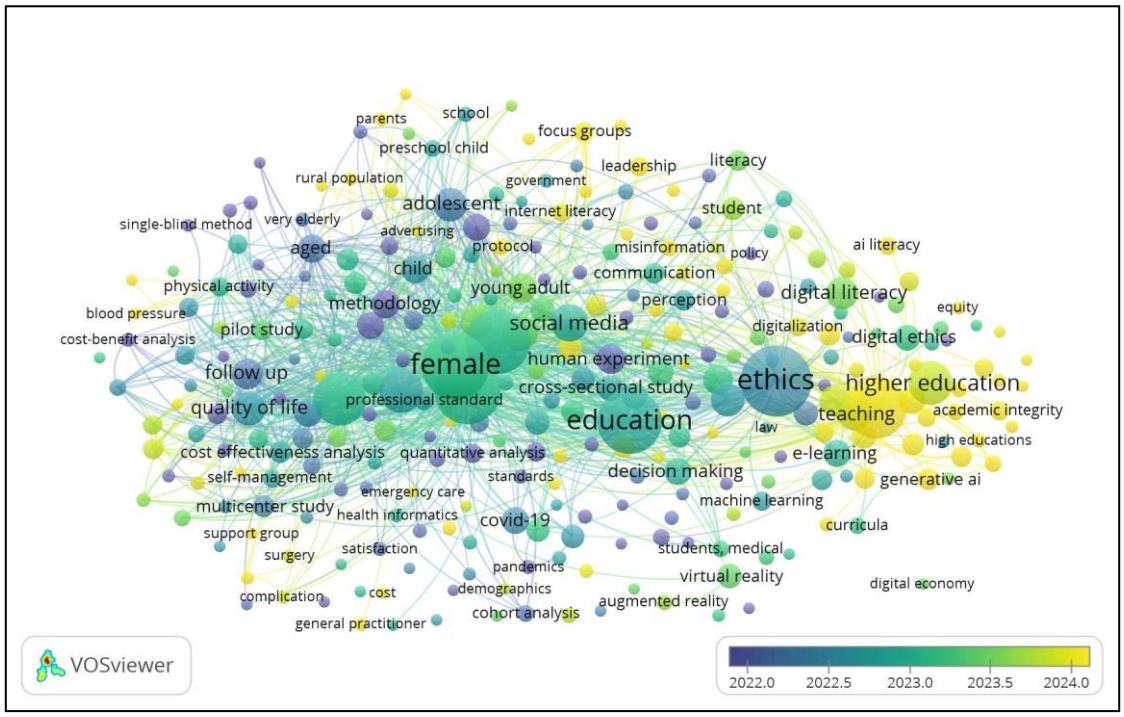

Figure 5 Overlay Visualization

Source : Processed Based On Scopus Database Data Using VosViewer Software

Figure 5 presents the overlay visualization generated from the keyword co-occurrence analysis using VOSviewer, illustrating the temporal evolution of research themes in *digital ethics in education* between 2022 and 2024. The color assigned to each keyword represents its average year of occurrence, with purple and blue indicating earlier research topics, green representing themes that emerged during the intermediate period and yellow highlighting the most recent and emerging topics that have attracted increasing scholarly attention. The visualization shows that core keywords such as *education*, *ethics*, *female*, *methodology*, *social media* and *quality of life* have served as the foundational themes of the field since the early stages of its development and continue to maintain strong connections with other research topics. In contrast, more recent keywords, including *digital ethics*, *digital literacy*, *AI literacy*, *generative AI*, *academic integrity*, *higher education*, *equity*, *curricula* and *higher educations*, indicate a noticeable shift in research focus toward issues related to artificial intelligence, digital literacy, academic integrity and the development of educational policies and curricula in higher education. Overall, the overlay visualization demonstrates that research on *digital ethics in education* has evolved from studies emphasizing methodological aspects and user

characteristics toward more specialized, innovative and application-oriented themes associated with digital transformation in education. This evolution also highlights promising opportunities for future research on AI governance, ethical artificial intelligence and the development of digital ethical competencies within educational settings.

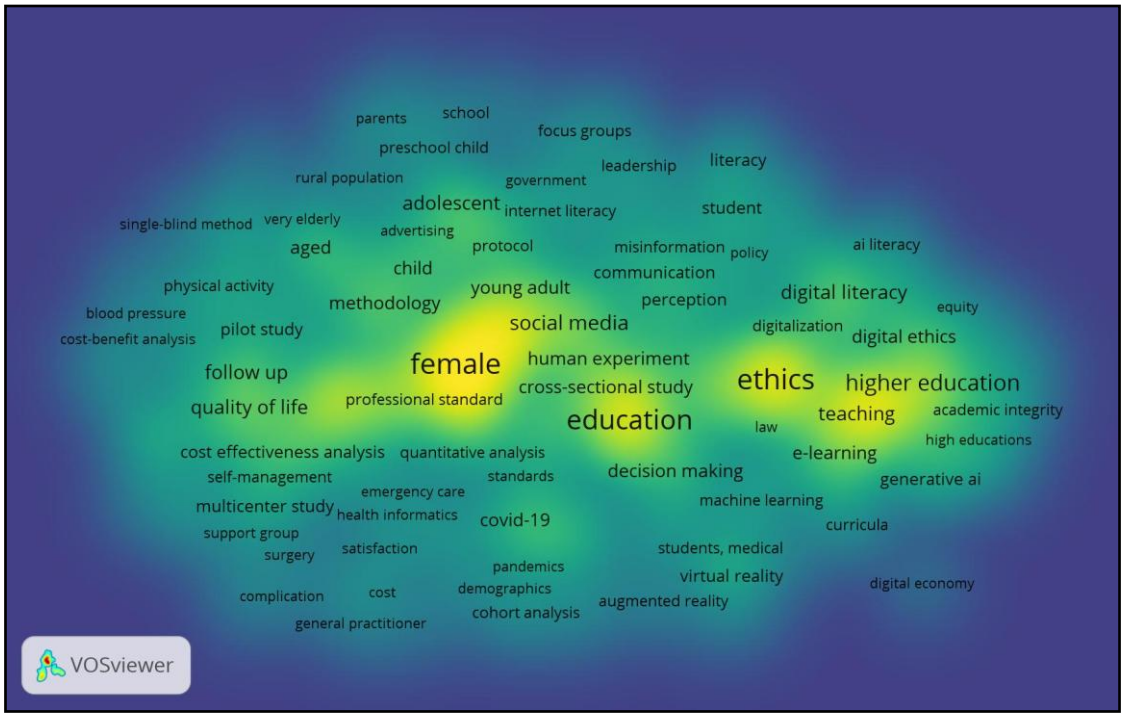

Figure 6. Density Visualization

Source : Processed Based On Scopus Database Data Using VosViewer Software

Figure 6 presents the density visualization generated from the keyword co-occurrence analysis using VOSviewer, illustrating the density or frequency of keyword occurrence within the research field of *digital ethics in education*. Brighter colors (yellow) indicate keywords with higher occurrence frequencies and stronger connections to other keywords, whereas green and blue represent topics that have received comparatively less research attention. The visualization reveals that *female*, *education* and *ethics* exhibit the highest density, identifying them as the central themes that have dominated the development of the field. Surrounding these core themes are keywords such as *higher education*, *teaching*, *digital literacy*, *social media*, *quality of life*, *methodology* and *cross-sectional study*, which also demonstrate relatively high densities, indicating that they have become well-established areas of research within *digital ethics in education*. In contrast, keywords such as *AI literacy*, *generative AI*, *academic integrity*, *equity*, *digital economy*, *virtual reality* and *augmented reality* are located in lower-density regions, suggesting that these topics are relatively recent and remain underexplored, thereby offering

considerable opportunities for future research. Overall, the density visualization indicates that research on *digital ethics in education* continues to be anchored in foundational themes related to ethics and education, while emerging topics associated with artificial intelligence and advanced digital technologies are gaining increasing scholarly attention and are expected to shape future research directions.

DISCUSSION

Publication Growth of Digital Ethics in Education

Figure 1 illustrates the annual publication trend on *digital ethics in education* indexed in Scopus during the 2015–2025 period. Overall, the number of publications demonstrates a substantial upward trajectory, although fluctuations were observed during the early years. Between 2015 and 2019, publication output remained relatively limited, ranging from approximately 5 to 20 documents per year, indicating that this research area was still in its formative stage. Beginning in 2020, publication activity increased to approximately 35 documents, followed by a further rise to more than 60 publications in 2021. Although a slight decline occurred in 2022, the overall trend remained positive, reflecting growing scholarly interest in the ethical implications of digital technology adoption within educational contexts.

Publication growth accelerated considerably during the 2023–2025 period. The number of documents increased from approximately 100 publications in 2023 to around 125 publications in 2024, before rising sharply to approximately 340 publications in 2025. This remarkable increase suggests that digital ethics in education has entered a phase of rapid growth, driven by the widespread adoption of digital technologies and Artificial Intelligence (AI) in education (Awad & Oueida, 2024) ; (Salloum et al., 2024) ; (Bhavana et al., 2025). Technological advancements, including Generative AI, learning analytics and digital learning platforms, have introduced a range of emerging ethical challenges, such as personal data protection (Abuzir, 2026) ; (Vetrivel et al., 2025) ; (Kayyali, 2025), academic integrity (Diyaolu et al., 2024; Çiftci, 2026), AI bias (Khan et al., 2026; Timchenko et al., 2025) and the governance of responsible technology use (Bahja et al., 2025; Shashwat & Pundhir, 2025). These developments have stimulated increasing research interest across multiple disciplines in examining the ethical dimensions of digital transformation in education.

Overall, the publication trend presented in Figure 1 demonstrates that *digital ethics in education* has emerged as a rapidly expanding research domain with strong potential for

sustained future growth. The increasing volume of publications not only reflects enhanced scholarly productivity but also indicates a shift in research focus from the general ethics of digital technology use toward more specialized themes, including AI literacy (Matusevych et al., 2024), academic integrity (Shishakly & Nachouki, 2026) *;* (Andari et al., 2025), responsible AI (Shorouk et al., 2025) *;* (Çiftci, 2026) and AI governance in education (Wu et al., 2024) ; (Kim et al., 2024). These findings are consistent with the objective of this study, which is to map the development of the *digital ethics in education* research landscape. Furthermore, they indicate that this topic has become a strategic area of educational research in the era of digital transformation while continuing to offer substantial opportunities for future scholarly investigation.

Figure 1 shows the development of the number of Scopus-indexed publications on digital ethics in education over the period 2015–2025. Overall, the publication trend exhibits a significant increase, although early years show some fluctuation. Between 2015 and 2019 the annual number of publications was relatively low, ranging from approximately 5 to 20 documents per year, indicating that the field was still in an early stage of development. Beginning in 2020, the number of publications rose to about 35 documents and reached more than 60 documents in 2021. Although there was a slight decline in 2022, the overall trend remained positively upward, indicating growing scholarly attention to ethical issues arising from the use of digital technologies in educational settings.

Publication growth accelerated markedly during 2023–2025. The number of documents increased from roughly 100 publications in 2023 to about 125 in 2024, then surged sharply to approximately 340 publications in 2025. This surge reflects that digital ethics in education has entered a phase of rapid growth concomitant with the broader implementation of digital technologies and Artificial Intelligence (AI) in education. Technological developments such as generative AI, learning analytics and digital learning platforms have given rise to new ethical concerns, including personal data protection and academic integrity (Diyaolu et al., 2024) ; (Çiftci, 2026), AI bias (Khan et al., 2026) ; (Timchenko et al., 2025) and governance for responsible technology use (Bahja et al., 2025) ; (Shashwat & Pundhir, 2025). These conditions have stimulated increased attention from researchers across disciplines to examine ethical aspects of digital transformation in education.

In sum, the trend shown in Figure 1 indicates that digital ethics in education is a rapidly evolving research area with strong prospects for continued growth. The rise in publication counts not only reflects greater scientific productivity but also signals a shift in research focus from general discussions of digital technology ethics toward more specific issues, such as AI literacy. These findings align with the aims of this study, namely to map the development of the field of digital ethics in education and suggest that the topic has become a strategic area of educational research in the digital transformation era while still offering ample opportunities for future investigation.

Scientific Impact of Publications

Figure 3 shows the average citations per year for publications on digital ethics in education during 2015–2025. Overall, the scholarly impact of publications fluctuates from year to year. Between 2015 and 2019 the average citation rate remained relatively low, ranging from approximately one to four citations per article, although it showed a gradual upward tendency. A notable increase occurred in 2020, when the average citations approached nine per publication, indicating that articles published around that time received greater attention from the scientific community. After a decline in 2021–2022, the average citation rate rose sharply and peaked in 2023 at about 17 citations per publication.

The high average citation rate in 2023 indicates that publications from that period exerted a strong scientific impact on the development of research in digital ethics in education. This pattern suggests that topics such as academic integrity, digital literacy, AI ethics, generative AI and governance of artificial intelligence in education became primary focal points and frequent references for subsequent studies. In other words, the citation increase not only reflects the quality and relevance of those publications but also demonstrates that research from that period made significant contributions to conceptual development and research directions in digital ethics in education.

Although average citations decline for 2024 and 2025, this decrease does not necessarily imply a drop in research quality. The decline is largely attributable to the citation window effect: recent articles have had less time to accumulate citations compared with older publications. Articles published in the most recent years are typically still in the early stages of dissemination and therefore have not yet been widely cited. Consequently, this analysis indicates that research on digital ethics in education has grown not only in publication

productivity but also in academic impact, particularly during the period when AI ethics and digital transformation became central concerns in education.

Conceptual Structure of Digital Ethics Research

Figure 3 presents a network visualization of the intellectual structure of research on digital ethics in education. The map indicates that the field is multidisciplinary and composed of several interrelated thematic clusters. The largest and most highly connected nodes are ethics, education, higher education and female, suggesting that discussions of digital ethics extend beyond technological issues to encompass higher education, teaching and learning processes, participant characteristics and empirical studies involving human subjects.

Cluster 1 centers on ethics, education, higher education, teaching, e-learning, digital ethics, digital literacy, generative AI, academic integrity and AI literacy. This cluster illustrates that research on digital ethics has emerged as part of broader digital transformation in education, particularly in response to the use of artificial intelligence (Sachan, 2026) ; (Burkett, 2025) ; (Pang et al., 2026) ; (ElSayary, 2025), online learning (Verma et al., 2026) ; (Brandon & Farkas, 2026) and concerns about academic integrity (Ayasrah et al., 2026) ; (Shishakly & Nachouki, 2026) ; (Dwihadiah & Purba, 2024). The strong linkage between digital ethics and digital literacy indicates that digital literacy is regarded as an important prerequisite for cultivating ethical behavior when using digital technologies in educational contexts (Rad, 2025) ; (Kwon & Ahn, 2017) ; (Munasinghe & Hewawasam, 2025) ; (He & Li, 2025). The emergence of keywords such as generative AI(Chavez et al., 2024) ; (Maliuta et al., 2025) and AI literacy (Simms, 2025) ; (Krakowska & Zych, 2026) signals a shifting research focus toward ethical challenges posed by the deployment of AI technologies in teaching and learning..

Cluster 2 links social media, communication, misinformation, internet literacy, student and leadership, reflecting attention to the influence of digital media on communication, information dissemination and students' literacies. The interconnections among these keywords suggest that digital ethics research increasingly emphasizes students' ability to filter and evaluate information (Patalauskaitė, 2024) ; (Subrahmanyam, 2025), prevent the spread of misinformation (Kwon & Ahn, 2017) ; (Munasinghe & Hewawasam, 2025) ; (Japar et al., 2024) and promote responsible digital communication (Japar et al., 2024) ; (Zvereva, 2023). The presence of leadership indicates that institutional leadership plays a

critical role in fostering a culture of digital ethics within schools and higher education institutions.

A further cluster is dominated by terms such as quality of life, follow-up, pilot study, cross-sectional study, COVID-19 and cohort analysis, showing that research on digital ethics frequently employs empirical, cross-disciplinary designs especially within psychology and education. This pattern demonstrates that digital ethics is examined not only conceptually but also through quantitative study designs that evaluate the effects of digital technology use on individual behavior (Raj et al., 2024) ; (Ubaidur Rehman et al., 2026) ; (Ubaidur Rehman et al., 2026) ; (Oztosun et al., 2023)) and on learning processes (Koç, 2024) ; (Berger et al., 2025).

Overall, the network visualization indicates that the conceptual structure of digital ethics in education has developed across three primary domains: (1) digital ethics and higher education transformation, (2) digital media, communication and information literacy and (3) empirical research on the impacts of digital technology on behavior and learning. Strong inter-cluster linkages suggest that digital ethics has evolved into a multidisciplinary area that integrates perspectives from education, technology, psychology, communication and artificial intelligence. These findings imply that research has moved beyond a narrow focus on technology use toward the development of ethical competencies, AI governance and the formation of responsible digital education ecosystems.

Evolution of Research Themes

Figure 4 illustrates the thematic evolution of research on digital ethics in education, based on each theme's centrality and density. The thematic map shows that research in this field has developed through several groups of themes with varying maturity and contributions to the discipline. Some themes have matured into core topics that play a central role in shaping research directions, while others remain in development or serve as foundational themes supporting overall field growth.

The visualization also indicates a shift from broad, general discussions toward more specific and applied studies. Themes related to digital technologies, human behavior and empirical research approaches occupy more strategic positions within the research network, reflecting increasing attention to the practical implementation of digital ethics in educational settings. In contrast, foundational themes such as ethics and education continue to provide

the conceptual basis that connects diverse research strands, although they are no longer the primary focus.

Overall, the thematic map suggests that digital ethics in education is evolving in step with the digital transformation of the education sector. This evolution reflects integration among technological, educational and human behavioral perspectives in building a more ethical and accountable educational ecosystem. The findings indicate that research on digital ethics has moved beyond purely conceptual concerns toward more comprehensive investigations that emphasize implementation and the impacts of digital technology use in educational contexts.

Newer and emerging themes—shown in yellowish-green to yellow hues on the map—include higher education, academic integrity, generative AI, AI literacy, digital ethics, digital literacy, equity and curricula. This shift signals a research transition from general discussions of technology use toward governance of ethical technology use (Akgün & Deniz, 2025) ; (Kayyali, 2025b) ; (Lakshmi et al., 2026), academic integrity (Sanusi et al., 2026) ; (Hakimi et al., 2021) ; (Tantakov et al., 2025), digital equity (Lakshmi et al., 2026) ; (Altamirano et al., 2026) and institutional readiness to integrate AI into curricula (Naomy et al., 2025) ; (Farias-Gaytan et al., 2025). The emergence of generative AI as a recent theme indicates growing researcher concern about ethically salient issues such as plagiarism, transparency in AI use, academic accountability and AI literacy competencies.

These developments demonstrate that digital ethics research is following the acceleration of digital transformation in education. Early studies tended to examine technology's effects on individuals; more recent work focuses on policy development, curricula, digital ethics competencies and governance models for responsible AI use in educational environments.

Taken together, the three visualizations (Figures 2–4) show that the intellectual structure of digital ethics research has progressed from examinations of digital technology use toward more complex issues that integrate digital literacy, AI literacy, generative AI, academic integrity and higher education. This trend suggests future research directions beyond technology adoption alone, emphasizing development of ethical competencies, institutional policy, curriculum design and AI literacy models that support responsible AI use in education. Consequently, themes such as Ethical AI Literacy, AI Governance in Higher

Education, AI Ethics Competency and Responsible Generative AI in Education emerge as promising research gaps and potential sources of novelty for subsequent studies.

CONCLUSION

The VOSviewer bibliometric analysis indicates that research on digital ethics in education exhibits a strong, multidisciplinary intellectual structure, with ethics, education, higher education and female emerging as central keywords. Network visualization revealed clusters on digital ethics in higher education, digital literacy, social media and communication, academic integrity, artificial intelligence and empirical approaches in education and health—signaling a focus that extends beyond technology to pedagogical and social dimensions. Overlay visualization shows a thematic shift from methodology, COVID-19 impacts and user characteristics toward contemporary topics such as digital literacy, AI literacy, generative AI, academic integrity, equity and curricula, reflecting a movement toward ethical governance and AI integration in education. Density visualization identifies high research density around ethics, education and higher education, while AI literacy, generative AI, digital economy, equity and machine learning remain underdeveloped, indicating research opportunities in Ethical AI Literacy, Responsible AI in Education, AI governance and the integration of digital ethics into curricula.

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