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Mapping Digital Ethics in Higher Education: A Bibliometric Analysis of Performance and Socio-Intellectual Structures

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ABSTRACT

The integration of technology, internet and artificial intelligence in higher education teacher's professional setting raised concerns regarding their digital ethics. This call led to literature explosion in very limited time and highlighted the need to systematically map global trends, analyze socio-intellectual structure and determine future direction of digital ethics literature. This gap was addressed through the bibliometric analysis of digital ethics literature extracted from Web of Science database. The final data-set of 185 entries was then subjected to rigorous analysis using R Studio (4.6.0) and VOS viewer (1.6.20), reproducing performance, social structure, intellectual structure and conceptual structure analysis. The data showed evolution of digital ethics research in higher education with ethical impacts of artificial intelligence, ethical concerns regarding online assessment and academic integrity; role of digital competence and digital citizenship for the development of ethical leadership and sustainable higher education system as dominant themes. The social structure was centric to highly influential institutions both in developed and developing countries. The intellectual structure was rooted in theory and methodology studies following empirical validation models. Conceptually, it was dissected in policy-based, philosophical and pedagogical literature. Thematic evolution analysis suggested rise in competency-based ethical frameworks instead of mere regulatory approaches. The identified clusters and themes may contribute to future research agendas focusing on ethical digital ecosystems, protection of student data, equitable access to educational technologies, promotion of responsible AI use, strengthening ethical digital competencies of teachers by developing ethical guidelines, digital policies and professional development programs in higher education teaching.



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Introduction

The digital landscape of higher education system has been shaped with the advent of digital technology, artificial intelligence, virtual learning platform, cloud computing, learning analytics, big data systems and social media technologies to facilitate learning teaching, assessment, communication and institutional management (Bond et al., 2024). Floridi (2019) defined digital ethics to be a set of principles, values and governance mechanisms guiding human behaviour and technological practices in digital environments.

While navigating through digital education, higher education teacher's perception was shaped around the concerns that who accessed student data online, how grading algorithms were built, what counted as fair use of online content. These issues not only shape trust between students, teachers, and institutions. This way it not only talked about data protection rules but required teachers to weigh the consequences of the technologies they use, to protect student welfare in spaces that are often opaque and constantly changing and to question built-in biases (Floridi, 2018; Mittelstadt et al., 2016).

Higher education teachers usually decide what platforms to adopt, how much student activity to track, and whether to rely on automated assessment or feedback. Their choices influenced both students' understanding of what counts as ethical digital practice and learning outcomes (OECD, 2021). Most of the literature in digital ethics remained fragmented due to the interdisciplinary overlap between computer scientists, education scholars, ethicists and legal researchers. Their works were often in parallel timeline with little synthesis of where the blind spots lied and what was already known (Hakimi et al., 2021).

This literary fragmentation can be best answered by bibliometric research as it offered a way to develop a meaningful structural view by mapping keyword clusters, citation links and patterns of collaboration. It highlighted which topics dominated, which were emerging, and which were largely ignored (Zupic & Čater, 2015; Donthu et al., 2021). This is significant for digital ethics in higher education teachers for two reasons. First reason was that it clarified whether the field was

addressing the responsibilities of teachers themselves, or whether it was still centered on student misconduct and plagiarism. Secondly, it revealed disciplinary and geographic imbalances such as the dominance of North American and European studies and the limited attention to contexts where infrastructure and regulation differ (Czerniewicz (2020); Huang (2024)). Without this overview, there is a policy and faculty development risk being shaped by partial evidence.

The study addressed the following objectives:

1. To explore the performance trends of digital ethics research in higher education through citation analysis, publication trends, and influential scholarly sources.
2. To examine the social and intellectual structure of the field by analyzing co-authorship and co-citation networks among authors, organizations, countries, and references.
3. To analyze the conceptual structure and thematic evolution of digital ethics research using keyword co-occurrence analysis, thematic mapping and thematic evolution analysis to highlight emerging trends, major themes, and future research directions.

2. Research Methodology

Knopf (2006) stated that literature review was foundational to scholar inquiry as it organized existing body of knowledge around the variables, identified research trends and informed future directions. To explore and organize literature review, bibliometric analysis emerged as a rigorous quantitative method to map scientific production and develop intellectual structure within the discipline (Snyder, 2019). Unlike traditional narrative reviews, bibliometric techniques apply statistical and network-based tools to evaluate large-scale publication data, enabling objective and reproducible insights into research evolution (Donthu et al., 2021).

2.1 Bibliometric Analysis

Bibliometric analysis is a computational approach used to examine patterns in scholarly communication by analyzing publication metadata such as citations, authorship, keywords, and co-occurrence relationships. In the context of

this study, bibliometric analysis was employed to explore the intellectual structure and emerging frameworks of digital ethics in higher education, particularly focusing on college and university teachers.

This method enables the identification of research productivity trends, influential authors and publications, collaborative networks, and thematic evolution within a field. Citation analysis was used to determine the most influential publications and sources. Co-authorship analysis was applied to examine collaboration patterns among research authors, their respective institutions and countries. Co-citation analysis was done to explore intellectual foundations and conceptual clusters of the field. Keyword co-occurrence analysis was used to identify emerging themes and research hotspots (Donthu et al., 2021). Other than this, thematic analysis traced the development of digital ethics frameworks over time and to identify future research directions (Leung et al., 2017).

2.2 Data and Research Design

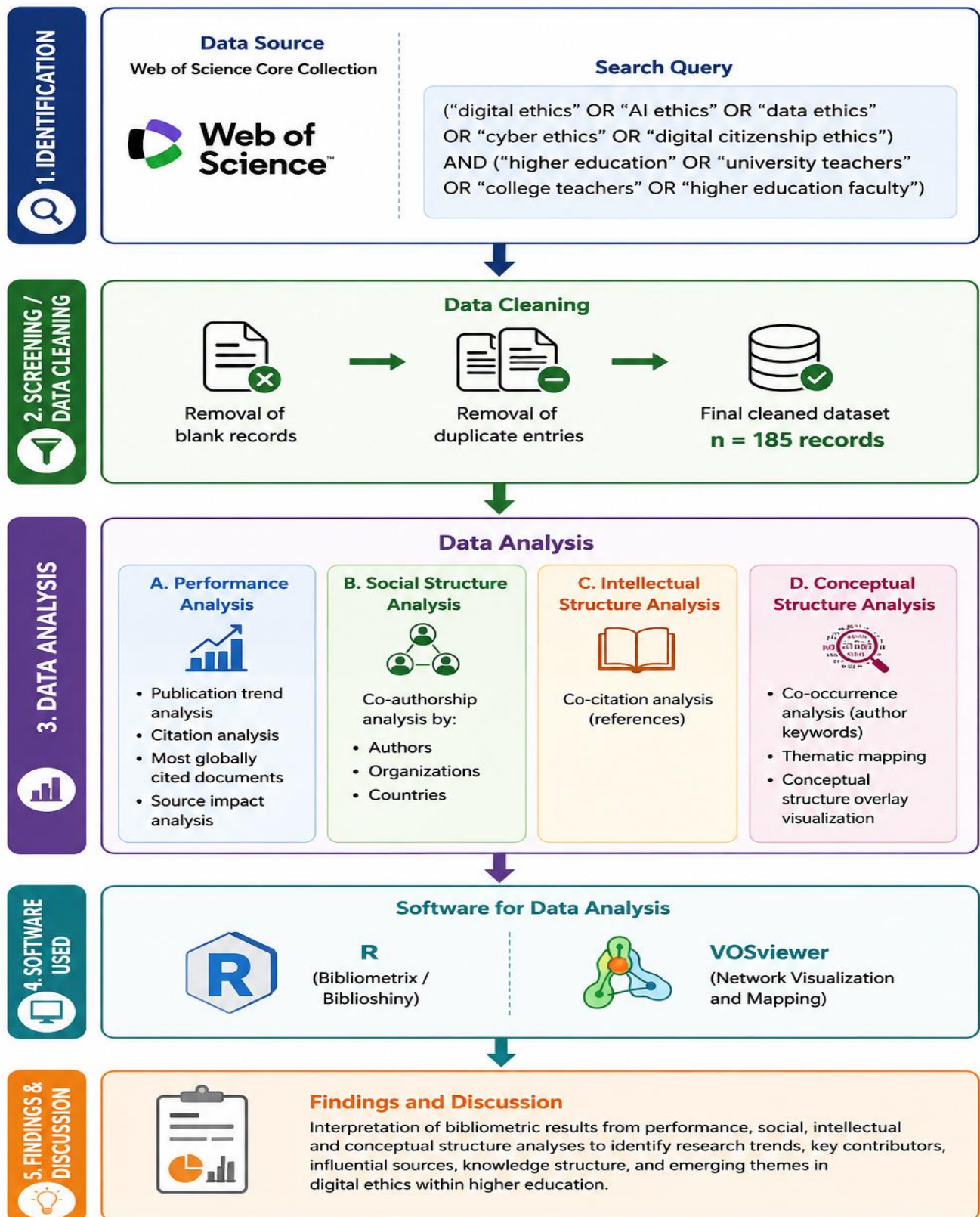
In this study, a systematic bibliometric research design was applied on the data retrieved from the Web of Science (WoS) Core Collection database between 1990-2026 (till April). Web of Science was selected due to its high indexing standards, data reliability, and widespread use in bibliometric researches (Pranckutė, 2021; Zhu & Liu, 2020). The search scope intentionally encompassed literature related to digital ethics, cyber ethics and ai ethics in higher education and higher education teachers' context. The raw string captured a broader data set which was manually scrutinized based on the institutional and teaching frameworks. The data-set was retrieved from Web of Science (WoS) by using advanced research query: TS = (("digital ethics" OR "AI ethics" OR "data ethics" OR "cyber ethics" OR "digital citizenship ethics") AND ("higher education" OR "university teachers" OR "college teachers" OR "higher education faculty")). The research indices

included SCI-EXPANDED, AHCI, SSCI, and ESCI. The filter was restricted to english language article and review papers. After data extraction, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was applied to ensure organization, transparency and rigor during the screening process such that, blank entries and duplication were removed. After full screening based on title, abstract, and full-text analysis, 185 entries retained.

2.3 Data Analysis Tools and Procedure

The study adopted a comprehensive bibliometric framework comprising performance, social, intellectual, and conceptual structure analyses to examine the development of the research field. Performance analysis, including annual scientific production and citation analysis, was conducted using Bibliometrix/Biblioshiny to assess publication growth and identify influential authors, articles, and journals (Donthu et al., 2021; Zupic & Čater, 2015). Social structure was explored through co-authorship network analysis at the author, organizational, and country levels using VOSviewer to examine collaboration patterns (van Eck & Waltman, 2010). Intellectual structure was analyzed through reference co-citation analysis to identify the foundational knowledge base of the field (Small, 1973). Additionally, conceptual structure was examined using keyword co-occurrence analysis, thematic mapping, and thematic evolution analysis to identify major themes, research hotspots, and thematic shifts over time (Cobo et al., 2011; Aria & Cuccurullo, 2017).

To visualize the co-author by organization network, fractional counting method was used. Maximum number of authors/organizations/countries for each documents was 10. Minimum number of documents of authors/organizations/countries was 1 and minimum number of citations of that authors/organizations/countries was also 1.

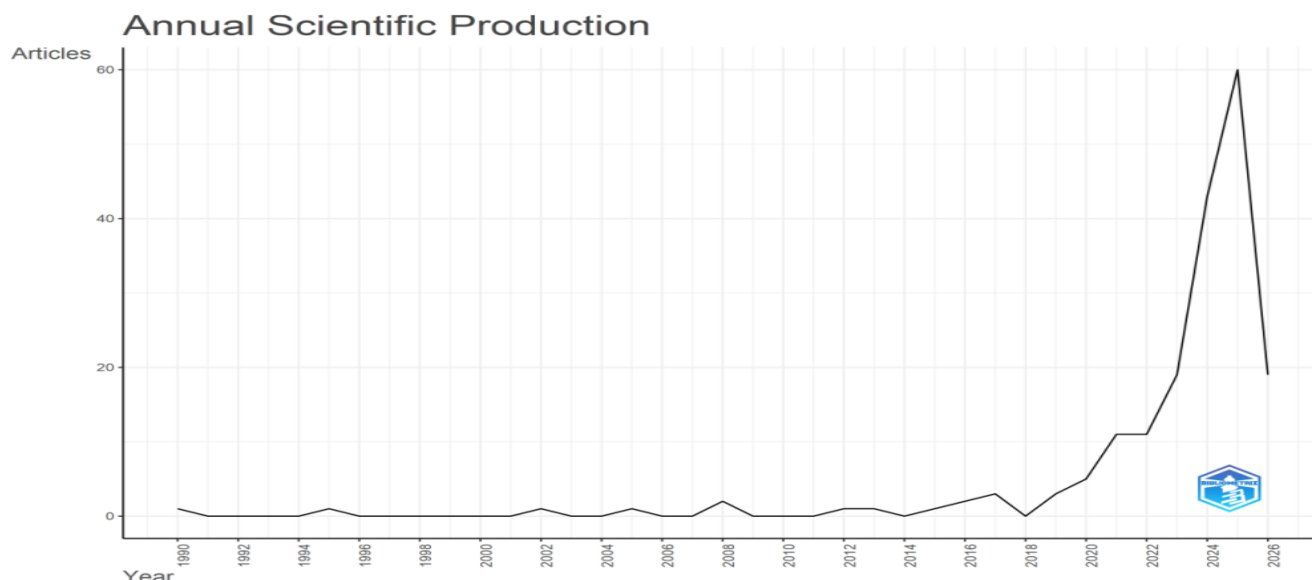


3. Results

3.1 Performance analysis

3.1.1 Annual scientific production

Performance analysis was done through R (Bibliometrix/Biblioshiny) to measure annual scientific production. It Examines annual growth and productivity of the field (Donthu et al., 2021). The data was retrieved from 1990-2026 (till april).



The annual scientific production trend showed that research output remained very low and almost stagnant from 1990 to around 2017, with occasional publications (mostly 0–2 articles per year). However, this trend shifted after 2018 with a steady inclination in publications indicating growing academic interest in the topic due to technological advances and ethics debates associated to it. A major surge came after 2020 during COVID-19 era, with a sharp upward trajectory reaching a peaking around 2025

(approximately 60 articles). The slight decline in 2026 (around 20 articles) indicated the data extraction during April.

3.1.2 Citation analysis

Other than this citation analysis was done by analyzing Documents, authors and Source performance and their Impact. It helped in Identification of influential articles, authors, and journals (Zupic & Čater, 2015).

A) Most Global Cited Documents

Citation	Summary of the article	Normalized TC	Total Citations	TC per Year
Wang, 2025	Work in human–computer interaction ethics reflecting current frontier of AI-driven digital ethics frameworks in higher education and strongly influences recent research directions.	24.00	200	100
Fiesler, 2019	Worked on integrating ethics into computer education by highlighting curriculum-level embedding of ethical awareness in higher education computing programs.	4.15	177	25.3
Saltz, 2019	Focusing ethical computing education frameworks and how it contributed to pedagogical development of responsible digital practice in higher education.	2.64	117	14.6
Burton, 2017	Foundational level theoretical work on AI ethics by establishing early conceptual grounding for ethical AI governance and responsibility in digital systems.	2.81	106	10.6
Al-Zahrani, 2024 a	Examined applied digital ethics in modern digital environments by reflecting on growing relevance of AI ethics in educational and social contexts.	8.85	100	33.3

Jang, 2022	Focus on digital learning technologies and ethical implications in education while highlighting applied framework development in higher education settings.	5.66	87	17.4
Stahl, 2016	Early foundational contribution to information systems ethics by establishing theoretical base for digital and AI ethics discourse.	1.80	73	6.6
Zembyla, 2023	Introduced critical and socio-cultural perspectives on digital ethics by addressing power, pedagogy, and ethical responsibility in education.	3.81	65	16.2
Al-Zahrani, 2024 b	Studied contemporary applied ethical challenges in digital environments; highlights growing importance of AI governance and educational ethics frameworks.	5.75	65	21.7

The most influential papers highlighted a clear shift from early theoretical foundations to highly applied and education-centered digital ethics research. Citation performance showed that Wang (2025) authored high impact and most cited study (TC=200; TC/year=100; highest normalized impact), indicating that AI-driven ethics in human-computer interaction became a dominant frontier. Earlier works of Stahl (2016) and Burton (2017) provided conceptual basis for AI and digital ethics. Fiesler (2019) and Saltz (2019) like

studies stated that the citation momentum favored studies focusing digital ethics integration in higher education curricula. Recent publications such as Jang (2022) and Al-Zahrani (2024) demonstrated the emerging trend of digital learning technologies, practical governance, and applied ethical challenges. Zembylas (2023) added a new perspective using critical socio-cultural lens by emphasizing power and responsibility in digital educational settings.

B) Author Performance and Citation Impact (Grouped Analysis)

Research Phase	Author & PY-Start	Publications (NP)	g-index	h-index	m-index	Total Citations (TC)	Local Citations
Foundational Phase (2019–2020)	Fiesler, 2019	3	3	3	0.375	325	19
	Beard, 2019	2	2	2	0.250	294	19
	Dewar, 2019	1	1	1	0.125	117	6
	Gorelli, 2019	1	1	1	0.125	117	6
	Heckman, 2019	1	1	1	0.125	117	6
	Garrett, 2020	1	1	1	0.143	177	13
Expansion Phase (2022–2024)	Choi, 2022	1	1	1	0.200	87	6
	Jang, 2022	1	1	1	0.200	87	6
	Al-Zahrani, 2024	2	2	2	0.667	165	7
Emerging AI Ethics Phase (2025)	Dai, 2025	1	1	1	0.500	200	2
	Gu, 2025	1	1	1	0.500	200	2

Li, 2025	1	1	1	0.500	200	2
Wang, 2025	1	1	1	0.500	200	2

To understand the performance of authors, publication and of top 10 authors were analysed. This author performance analyses showcased a three phased evolutionary structure. The first phase was considered as foundational phase (2019–2020), with dominance of authors such as Fiesler and Beard, who established the intellectual base with work in computational ethics and AI responsibility. They had highest citation impact and local citation strength. The second author

performance phase (2022–2024) with works of authors like Choi, Jang and Al-Zaharani, shifted the literature towards applied ethical frameworks in educational technology and higher education. The third phase of author performance, dominating Dai, Gu, etc studied AI ethics (2025). This area had high citation intensity but low publication volume due to emergence of AI-driven digital technologies and ai-ethics literature. The low local citation values states that the field is still developing.

C) Sources local impact

Journals	h-index	g-index	m-index	Total Citations (TC)	Publications (NP)	PY Start	Articles
Education and Information Technologies (Educ. Inf. Technol.)	4	4	0.80	125	4	2022	153
Humanities & Social Sciences Communications (Humanit. Soc. Sci. Commun.)	3	3	0.75	137	3	2023	30
International Journal of Educational Technology in Higher Education (Int. J. Educ. Technol. High. Educ.)	3	3	0.75	68	3	2023	145
Journal of Academic Ethics (J. Acad. Ethics)	3	5	1.00	60	5	2024	8
Proceedings of the 54th ACM Technical Symposium on Computer Science Education (SIGCSE 2023, Vol. 1) (Symposium on Computer Science Education (SIGCSE 2023, Vol. 1) (Proc. ACM Tech. Symp. Comput. Sci. Educ.)	3	3	0.75	46	3	2023	14
ACM Transactions on Computing Education (ACM Trans. Comput. Educ.)	2	2	0.25	133	2	2019	14
BMJ Open	2	3	0.33	11	3	2021	2
Computers and Education: Artificial Intelligence (Intelligence Comput. Educ. Artif. Intell.)	2	4	1.00	30	4	2025	163
International Journal of Artificial Intelligence in Education (Int. J. Artif. Intell. Educ)	2	2	0.40	35	2	2022	1
International Journal of Ethics Education (Int. J. Ethics Educ.)	2	2	0.33	25	2	2021	5

The pattern of journal's citation and impact patterns revealed a structural hierarchy in the domains of educational technology, artificial intelligence in education, and ethics research. The top-tier journals had overall high influence, citation count and balanced scholarly impact. Mid-tier influencing journals involved lower output and strong citation performance, suggesting high-quality methodologically rigorous contributions. Lower tier Journals exhibited low output within this data-set but remained theoretically significant. Overall, the field is characterized by a core-periphery structure where a few high-output journals dominate visibility, while specialized journals contribute focused but lower-volume, high-value research.

3.2 Social Structure

The social structure was examined through co-authorship analysis. Co-authorship Network visualization examined collaboration patterns among authors, institutions, and countries using

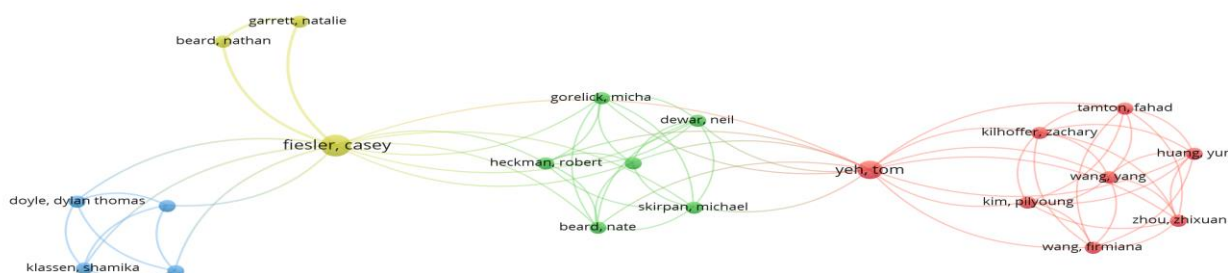
Vos viewer (van Eck & Waltman, 2010). The network visual metrics involved four distinct visuals I.e., nodes (foundational unit of analysis for individual authors, organizations, countries or keywords), physical diameter of node (relative publication output or total citation weight), links (cooperative interactions such as co-authorship or keyword co-occurrence, where connected line calculated normalized link strength) and distinct colour signifying modularity clusters (highly interconnected research communities within digital landscape).

A) Co-author-Visualization

Author

Network

To visualize the co-author-author network, fractional counting method was used. Maximum number of author for each documents was 10. Minimum number of documents of an author was 1 and minimum number of citations of that author was also 1. Out of 443 items, the largest set of connected authors consisted of 21 items.



The co-authorship map revealed a structured collaboration pattern among influential scholars in the domain of digital ethics and related educational technology research. The network is divided into four distinct clusters, reflecting separate but interconnected research communities. The size of nodes indicated author influence I.e. productivity/impact depending on VOS settings, while the connecting lines indicated the strength of co-authorship relationships. **Cluster 1 (red cluster)** indicated Asian led-

collaborative research group including key authors like Yeh, Tom, Wang, Yang, Zhou, Zhixuan, Kim, Pilyoung, Huang, Yun, Kilhoffer, Zachary, Tamton, Fahad, and Wang, Firmiana. The clustered had strong linkages around the themes of technology ethics, AI-driven digital systems, Privacy and digital citizenship. The literature of Yeh, Tom held the bridging capacity between red and green cluster, indicating a strong role in connecting research agendas across networks. **Cluster 2 (green cluster)** the human-centered

computing network literature to ethics literature (Beard, Nate, Saltz, Jeffrey, Gorelick, Micha, Dewar, Neil, and others). The cluster density highlighted the co-authorship around institutional ethics, digital governance, ethical frameworks, and applied ethics in digital systems. Green cluster bridged the co-authorship between red and yellow through its conceptual and methodological role between applied technology ethics and digital responsibility research. **Cluster 3 (yellow cluster)** was based on Fiesler, Casey, Beard and Nathan's co-authorship, with Fiesler appearing as a major node. This cluster connected social and platform

related to platform governance, online communities, digital policy ethics, and user-centered ethical decision-making. **Cluster 4 (blue cluster)** depicted authors such as Klasser, Shamika and Doyle, Dylan Thomas with small collaboration group on a specialized research niche focusing on ethics education, digital identity, or socio-technical implications.

B) Co-Authorship by Organization (Institutional Collaboration Network)

During this analysis, 443 items fitted the set threshold and the largest set of connected

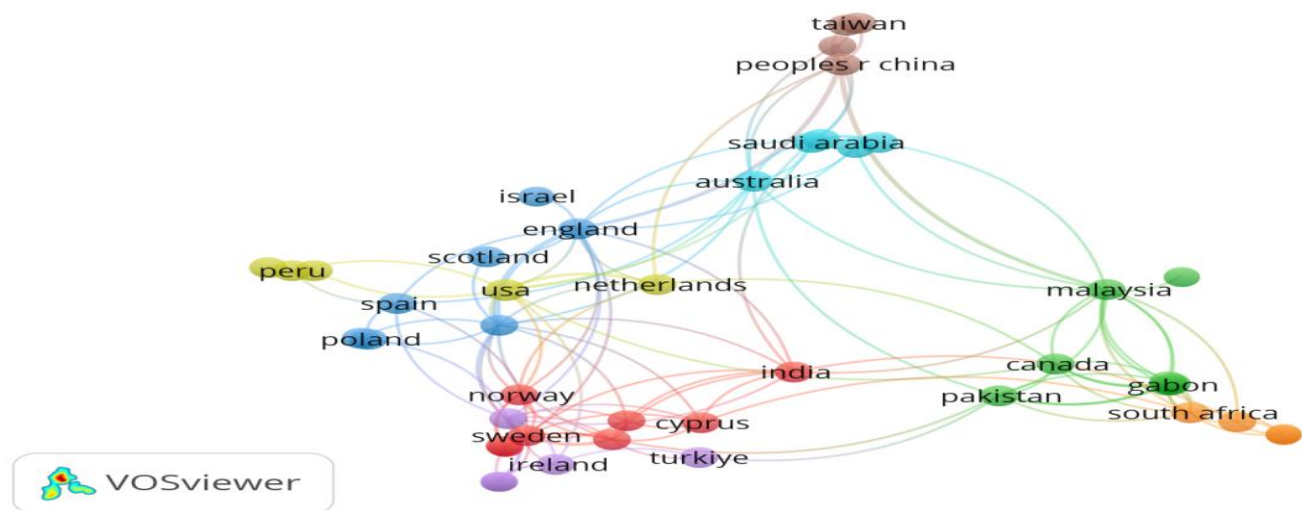


governance scholars representing their research. The institutional collaboration network shows that co-authorship by organization is centric in a small set of highly influential institutions. These institutions acted as central nodes in the scholarly network. The although linear but a well-connected

organizations consisted of 21 items.

map suggest a structure where a few universities served as strong collaboration bridges by contributing to foundational conceptual work, governance frameworks, including ethical theory and policy-related discussions.

C) Co-Authorship by Countries (Collaboration Network)



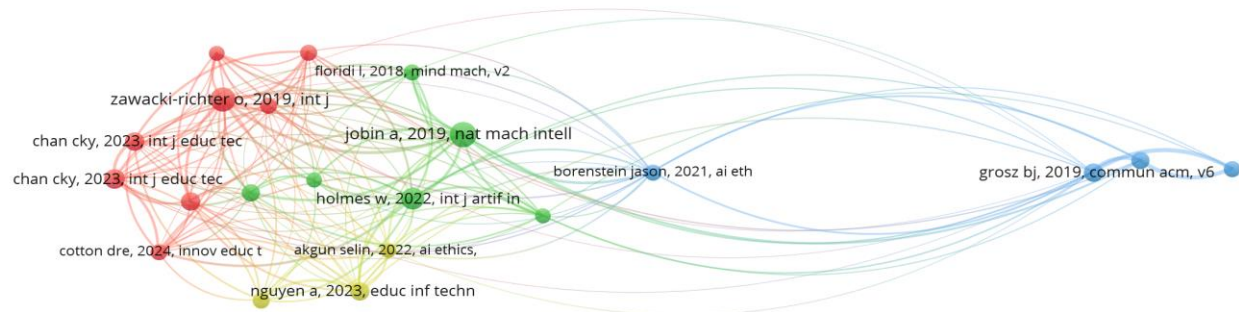
The co-authorship network based on countries visualized 21 connected items out of 226 items. This visualization displayed although global but actually densely structured distribution with only a few collaboration hub type countries. Most of the cooperation occurred in regional and thematic groupings rather than as a single unified global network. Based on the citation number, USA topped with 766 publications followed by China, UK and Saudia Arabia. The United States of America also appeared as an America-European bridge. It strengthens that North America–Europe collaboration is a major driving force against issues such as ethical governance, privacy, digital responsibility and AI ethics,

The second collaboration network aligns Malaysia, Canada, Pakistan, Gabon, and South Africa, reflecting emerging research activity in developing and transitional contexts. While the

third cluster involved China, Taiwan, Saudi Arabia, and Australia, showing cross-regional cooperation between Asia and the Middle East, with Australia acting as a bridge country indicating expansion of digital ethics research in Asia-Pacific and Gulf countries due to adoption of AI and digital learning technologies.

3.3 Intellectual Structure

The intellectual structure was studied through Co-citation-reference analysis in Vos viewer. It identified the intellectual foundations underpinning digital ethics frameworks in higher education teaching. The network structure revealed intellectual foundations and knowledge structure of the field (Small, 1973). For this, following fractional counting, minimum number of citations of a cited reference was set to be 10 to avoid noise. Of the 8573 documents, 21 met the threshold.



The reference co-citation map reflected the intellectual structure of digital ethics research by identifying the most frequently co-cited studies. The undermentioned clusters indicated that digital ethics literature was diversely grounded in theory and methodology. The **green cluster** referenced Jobin et al. (2019) and Fornell (1981) suggesting the reliance of digital ethics on both AI ethics guidelines and empirical measurement/validation models. This highlighted the increasing empirical validation trend in ethical frameworks. The **red cluster** depicted strong connections in Zawacki-Richter (2019), Nguyen (2023), and publications in IEEE Access focusing on AI integration in education, digital learning governance, and emerging ethical issues in higher education environments suggesting that educational technology ethics is becoming one of the most influential directions within digital ethics research. The blue cluster highlighted intersection of computer science with philosophical discussions of AI responsibility as represented by Grosz (2019). It provided the normative and

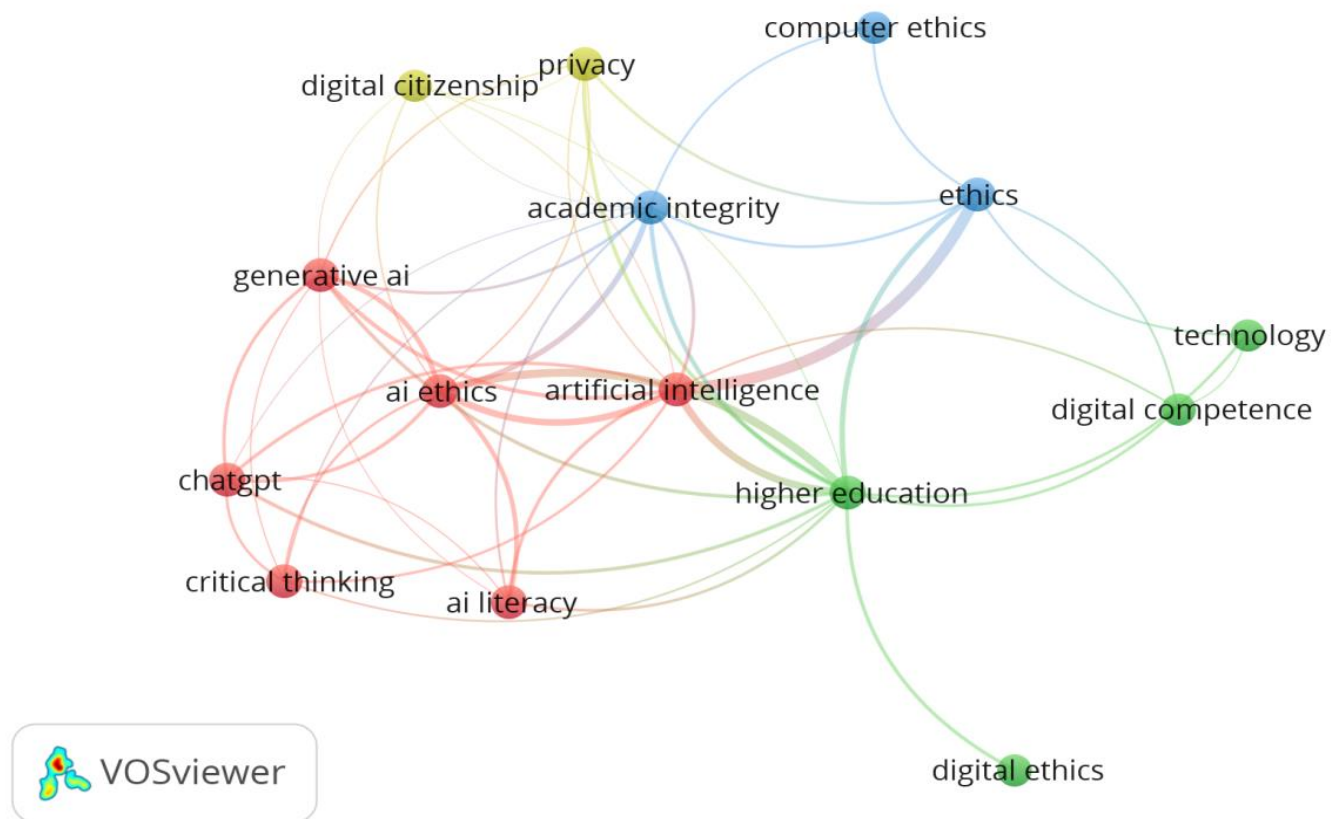
conceptual base of digital ethics scholarship by focusing on core principles such as fairness, accountability, human-centered AI and transparency.

3.4 Conceptual Structure (Keyword Analysis)

Conceptual structure of digital ethics in higher education teachers' frameworks was assessed by keyword co-occurrence analysis, thematic mapping and thematic evolution analysis.

A) Keyword Co-occurrence Analysis

In keyword Co-occurrence Analysis, Co-occurrence Network Visualization was studied in context to author keywords because it identified dominant themes and research hot-spots used as keyword by authors in literature (Cobo et al., 2011). The minimum number of co-occurrence set as 5. Out of 563 words, 21 met the threshold, yet on further analyzing the chart repetitive words like artificial intelligence and ai etc were unmarked.

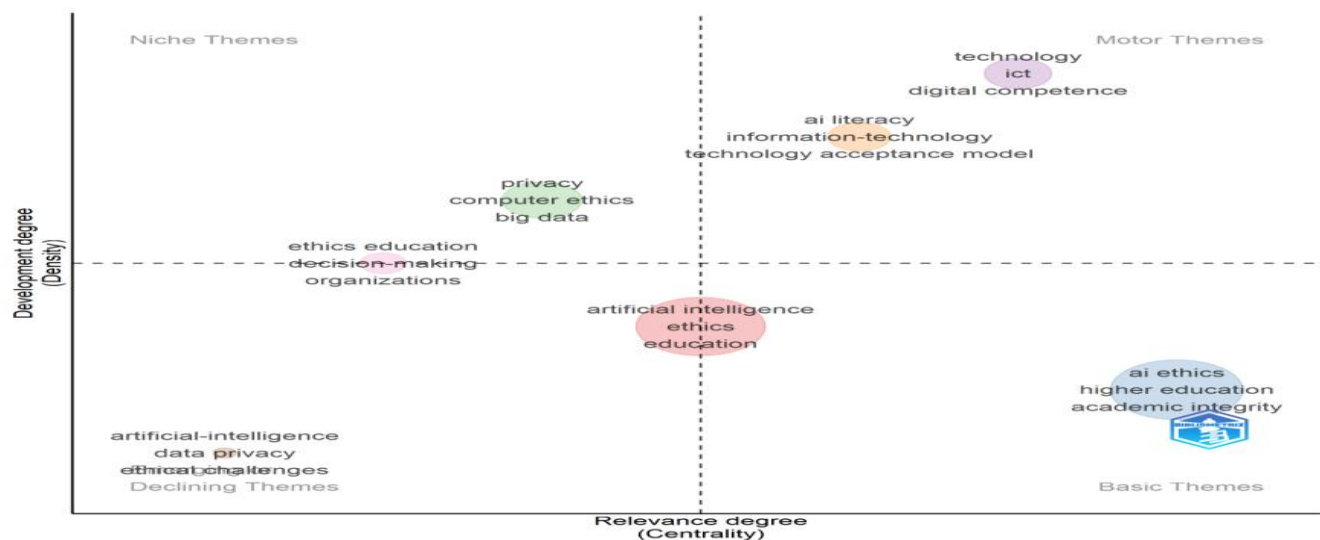


The authors keywords are how authors use to conceptualize digital ethics. **Red cluster** authors (Chen, Celik, Ng, Chan, and UNESCO) conceptualized digital ethics around educational transformation, AI governance and policy-oriented perspectives. The **blue cluster**, including Holmes, Hagendorff, Miao, and Selwyn, reflected critical scholarship surrounding ethical implications of artificial intelligence in education, and socio-technical concerns. The **green cluster**, represented by Floridi, Stahl, and Fiesler, constituted the philosophical and normative ethics

dimension of the field. The **yellow cluster**, involving authors such as Braun and Chiu, focused on methodological and pedagogical dimensions, particularly thematic analysis, digital competence, digital citizenship and educational adaptation to AI-driven environments.

B) Thematic Mapping

In thematic mapping, thematic map was made by using R (Bibliometrix/Biblioshiny) as it further classified themes into motor, basic, niche, and emerging themes (Cobo et al., 2011).



The thematic map categorized research themes according to their centrality (relevance) and density (development), thereby identifying mature, emerging, basic, and declining themes within the field. The structural quadrants are undermentioned

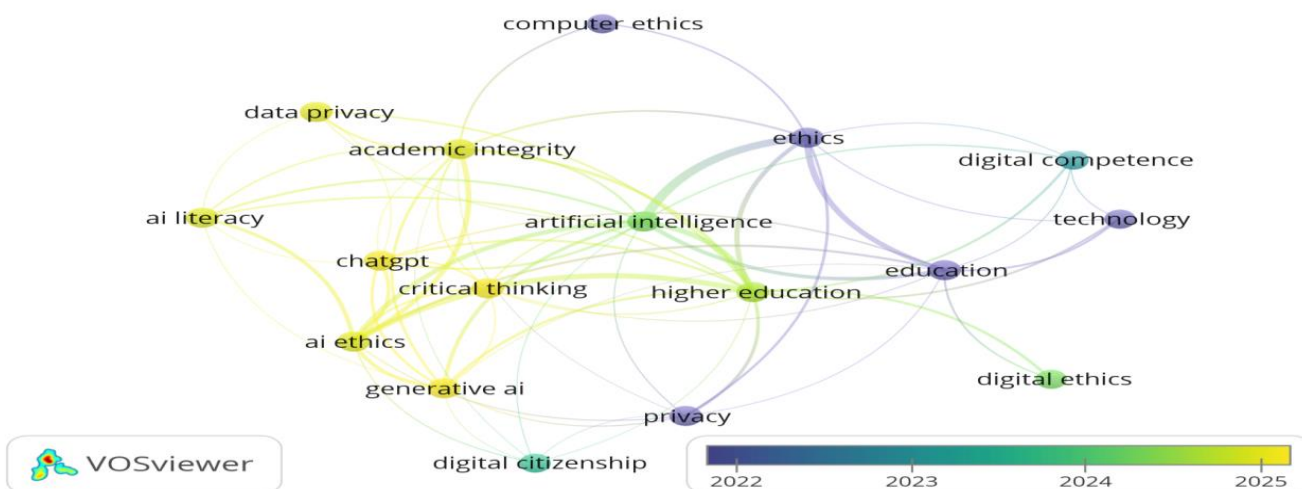
1. The upper-right quadrant contained **motor themes** i.e. technology, ICT, digital competence, AI literacy, information technology and Technology acceptance model (TAM) which were highly developed and influential themes drive the field forward.
2. The lower-right quadrant depicts **basic themes** with high centrality and low density involving AI ethics, Higher education and Academic integrity. These themes were foundational and universally relevant.
3. The upper-left quadrant suggested **niche themes**. It contained low centrality but high

density themes on topics like privacy, computer ethics and big data. These themes contained highly specialized and internally developed academic sub-domains within the digital ethics.

4. The lower-left quadrant encompassed **emerging and declining themes**. These themes had low centrality and low density indicating a current transition towards emerging themes like artificial intelligence, data privacy and ethical challenges.

C) Thematic Evolution Analysis

Thematic evolution analysis studies thematic development and shifts over time (Aria & Cuccurullo, 2017) but due to small time slices in the development of digital ethics conceptual structural overlay visualization was studied.



The above mentioned figure represent the overlay

visualization of keyword illustrating the

conceptual evolution and emerging research trends within the domain between 2022 and 2025. The color gradient differentiated the temporal development with purple/blue representing earlier themes and yellow representing the most recent and emerging themes within the field. Earlier researches studied computer ethics, privacy, technology, education and digital competence. In contrast, the most recent researches examined AI ethics, generative AI, AI-literacy, academic integrity, critical thinking and digital citizenship. The highly connected network is of AI keywords representing a major shift in research priorities by following the widespread adoption of generative AI technologies in education. The increasing prominence of *academic integrity* within the overlay reflected growing concerns and issues regarding ethical use of AI-generated content, assessment authenticity, and plagiarism in higher educational institutions. The strong link between *AI literacy*, *critical thinking*, and *digital citizenship* showed development of competency-based ethical frameworks rather than mere regulatory or prescriptive frameworks and approaches, highlighting a transition from reactive ethical concerns towards proactive digital ethics education and responsible AI engagement.

Discussion

The results of the bibliometric analysis addressed the intellectual fragmentation of digital ethics literature in higher education by mapping networks across from 2000 to 2026-year timeline. The historical baseline from 2000-to 2007 showed relative stagnation due to its separation from educational theory. The literature experienced surge in post 2018 era, due to pandemic induced corporate shift I.e., deployment of remote learning infrastructures and learning management systems (Hakimi et al., 2021) and the decentralization of generative AI in post 2022 I.e., disruption of traditional education delivery systems by advanced language models, shifting the academic discourse from surveillance debates to concerns regarding cognitive offloading and erosion of human agency.

During these years, the citation networks experienced a three phased intellectual evolution with foundational phase established in curriculum level integration of computing ethics, then mid-tier expansion phase outgrowing pure philosophy

and embedding mainstream education platform and then the emerging AI phase heavily citing AI driven frameworks. Currently, the interdisciplinary education networks haven't had sufficient time to absorb or replicate these frameworks. The source hierarchy, represented a structural friction and between technological and educational research. Intellectual structure through author collaboration pathways clustered around four themes, I.e., platform policy, human-centered computing bridges, asian-led practical ai and privacy systems and specialized ethics education niche further solidifying that policy designers and technical systems developers often operate without direct interaction. The citation structure revealed where the field's intellectual weight lied now. Highly cited works increasingly addressed applied problems such as ethics integration into curricula, AI governance, and responsible design of educational technologies. This focus aligned with Jobin et al.'s (2019) global mapping of AI ethics, which identified fairness, accountability, transparency, and governance as dominant themes. Zawacki-Richter et al.'s (2019) reported that ethical and governance challenges were the main barriers to responsible Artificial Intelligence adoption in education while, Saltz (2019) and Fiesler (2020) suggested that computing education research was embedding ethical literacy into professional preparation of educators by treating it as a core competence. This shift re-positioned digital ethics from technological constraint to digital education precursor.

Intellectually, reference co-citation analysis showed a literary triad of global ethical guidelines, quantitative measurement models, and applied educational overviews. The conceptual structure based on author keywords highlighted four keys concepts: Policy and Transformation, Critical Socio-Technical, Philosophical, and Pedagogical Competency. There was also a sharp increase in academic integrity keyword, suggesting that the researchers changed their focus from plagiarism concerns to the validity of traditional student assessment design due to widely accessible automated tools. Furthermore, there was a clear inclination towards digital citizenship, critical thinking and digital competency based frameworks revealing that the higher education institution needed to look beyond top-down

policies and must proactively design teacher professional development programs to equip teachers with automated data handling and tracking, balancing data collection limits, and foster student autonomy (OECD, 2021). There was a persistent bias on the use of technology appliance model (TAM) to make teachers adopt digital systems instead of actual evaluation of the ethical consequences of deploying them. Methodologically the publications depicted the integration of normative theory with empirical validation, ultimately building a research base capable of informing policy, teacher training programs and accreditation standards.

The social networks of collaboration highlighted a structure of geopolitical imbalance. The USA established its literary hegemony, while also acting as Euro-American bridge rooting in data privacy and digital responsibility literature, validating concerns relating western-bias (Czerniewicz, 2020). Two other networks I.e., Asia-Pacific-Gulf network (China, Saudi Arabia, Australia) contextualizing ai-driven learning tools and transnational network (Malaysia, Pakistan, South Africa, Gabon) establishing localized digital ethics research in regions with disparate or uneven infrastructure and regulatory structure remained prominent. While the emergence of active clusters in developing countries like Pakistan, Malaysia, South Africa, and the Middle East signaled a meaningful geographic expansion due to two regions. The expansion was not merely quantitative, instead it showed late emergence of digital education in higher education institutions and presence of regulatory, infrastructural, and cultural conditions in the respective countries. This highlighted the issues of digital equity, context-specific ethical norms and the need to bridge these emerging networks with established western hubs to avoid the North-centric bias.

Beyond the network trends, the socio-intellectual structural dynamics within the literature revealed profound institutional, policy, and instructional implications for higher education. The sharp shift in the themes away from the concepts of traditional surveillance toward 'academic integrity', 'generative AI', and 'critical thinking' proves that in digital landscape higher education has shifted from defensive, restriction-based plagiarism detection frameworks, reactive, top-

down regulatory policies to more proactive, and competence-driven teacher education and preparation models. Consequently, the institutional policies may intentionally have inculcated algorithmic bias assessment, automated data tracking and real-time student data privacy parameters in core digital ethics and digital competence frameworks to train future educators.

Policy Recommendations

Based on the performance, intellectual, social and conceptual analysis, the following policy recommendations are formulated to address the challenges of professional development, fragmentation, western hegemony, student assessment and reactive policy models:

- 1) In the literature, there was a shift from computational ethics to proactive digital citizenship, AI literacy and competence based frameworks urging the faculty development models to formulate competence driven ethical frameworks. The training should teach beyond technical navigation and must focus on automated data handling and tracking, algorithmic bias assessment, ethical and limited data collection, and real-time student data privacy regulation.
- 2) The higher education system should shift from technology acceptance models assessing mere ease and adoption rate of digital technology to mandatory ethical impact assessments during the procurement and deployment of learning management system, automated assessment system, remote proctoring system and digital education networking platforms for online education.
- 3) The dramatic clustering of generative AI, academic integrity, critical thinking called for restructuring of digital assessment system from defensive and surveillance based plagiarism detection models to widely accessible automated tools evaluating student's critical cognitive process and ethical engagement with generative AI rather than final output. For this purpose, universities may establish AI acceptable boundaries for ultimate production of digital citizenship in professional preparation.
- 4) The bibliometric analysis highlighted the

independent and isolated pathways of computer scientists, educationists, philosophers and policy makers creating fragmented literature and raising issues during implication of digital ethics. For this purpose, interdisciplinary research centers and cross-departmental governance committees including a balanced mix of above mentioned stakeholder can operate to prevent technical deployment choices out-spacing pedagogical and ethical measures.

- 5) To de-center western hegemony, mitigate North-centric bias, address unique transnational challenges and develop context specific policies, there is a need to establish cross-regional collaboration and funding networks where established authors actively build research based alliances in global south and emerging clusters. This will diversify global digital ethics frameworks reflecting on their diverse cultural, institutional, infrastructural and legal need to ensure transferability and endorse representation of the marginalized.

Limitations and Future directions

Despite a comprehensive overview of the field, there were a few methodological limitations. Firstly, data was limited to Web of Science Core Collection database only due to its elite indexing standards and high data reliability. However, integrating dimensions from Scopus or Google Scholar can broaden the literary coverage for future studies. Secondly, the publications were restricted to English-language only to meet researchers' linguistic capacity and data screening process but it ultimately created geographic and linguistic bias and potentially under-represented localized, non-English digital ethics frameworks.

Thirdly, citation metrics during the analysis naturally favoured older and well established authors and papers and toned down the citation velocity of recent literature on emerging trends like generative AI ethics. Future researcher may utilize mixed method systematic review to both qualitatively and quantitatively analyse the structural trends.

Conclusion

Th digital ethics literature in higher education has expanded and conceptually consolidated in a very short time due to its digital education integration and Artificial intelligence emergence. The performance trends showed an evolutionary shift from computational ethics to digital education ethics and then generative AI-related ethical researches. Author collaboration clustered around platform policy, human-centered computing bridges, practical Artificial Intelligence and privacy systems and specialized ethics education. The conceptual structure based on author keywords highlighted four keys concepts: Policy and Transformation, Critical Socio-Technical, Philosophical, and Pedagogical Competency. The social network highlighted USA's hegemony and its role as euro-american bridge rooting in data privacy and digital responsibility literature. The Asia-Pacific-Gulf network contextualized ai-driven learning tools. The transnational network established localized digital ethics research in regions with disparate or uneven infrastructure and regulatory structure. This highlighted the issues of digital equity, context-specific ethical norms. Moreover, the focus on new variables like ethical competence, digital citizenship and AI literacy offered a practical road-map for professional development of higher education faculty and curriculum reform.

Conflict of Interest

The authors showed no conflict of interest.

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