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Reconceptualizing Educational Agency: A Bibliometric Analysis of Posthumanist Perspectives on Artificial Intelligence and Technology in Educational Research

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Abstract

This research examines publication trends in posthumanism within education through bibliometric analysis of Scopus and Web of Science databases. The findings of 15 relevant articles show increased publication activity since 2021, primarily in Western countries (USA, Australia, UK). Leander and Burriss (2024) and Knox (2016) emerge as influential authors with 67 and 35 citations, respectively. Keyword visualization reveals two distinct clusters—artificial intelligence applications and posthuman theoretical frameworks—with "posthumanist" as a critical bridge between practical and theoretical domains. These themes demonstrate a shift from human-centered educational approaches toward perspectives recognizing the interdependence of human and non-human entities in learning environments. Co-authorship analysis illustrates interconnected research communities across multiple countries, highlighting posthumanism's evolving implications for teaching and learning in technologically mediated educational contexts.

Keywords: Posthumanism, education technology, artificial intelligence, human-technology, bibliometric analysis

Introduction

The education landscape is witnessing a profound transformation as posthumanist philosophies challenge long-held beliefs about teaching, learning, and what it means to be a learner. As artificial intelligence and digital technologies become increasingly woven into educational environments worldwide, posthumanist perspectives offer valuable frameworks for understanding how these technological assemblages reshape our understanding of teaching and learning (Bayne, 2015; Knox, 2016).

Posthumanism marks a significant shift from traditional humanist approaches that have dominated educational philosophy for generations. While humanism places the autonomous human subject at the center of education, posthumanism recognizes education as emerging

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through intricate networks of human and non-human actors, including technologies and material forces (Barad, 2007; Snaza et al., 2014). In educational settings, posthumanist viewpoints challenge conventional ideas of the learner as a self-contained, rational individual who uses technologies as tools, instead viewing learning as emerging through complex socio-material entanglements (Fenwick & Edwards, 2016; Knox, 2016).

The role of technology, including artificial intelligence, in education has evolved beyond simple implementation to become an active agent in educational processes. Researchers have looked at technology and AI in education from different perspectives. AI tools have improved personalized learning, creating customized educational journeys that fit each student's needs and interests (Chen et al., 2020; Tapalova & Zhiyenbayeva, 2022). This personalization happens through smart tutoring systems and adaptive learning tech that use AI to give students immediate feedback and tailored content (Ahmad et al., 2021; Zawacki-Richter et al., 2019). However, Bayne and Jandrić (2017) argue that technology and AI tutoring systems not merely supplement human teachers but transform educational relationships and create new forms of educational subjectivity.

The same argument that education institutions, including schools rushing to use technology and AI in classrooms, face tough questions that we cannot ignore. Who truly benefits when algorithms shape what students learn? Teachers worry about becoming tech support rather than mentors while students navigate a system increasingly designed to measure what machines can track, not what humans need. As these tools become fixtures in our classrooms, we must ask ourselves: Are we letting technology determine our educational values, or are we putting our values first? This is relevant to Bozkurt et al. (2021) and Zawacki-Richter et al. (2019) studies that the adoption of AI in education also raises ethical and social concerns, particularly regarding the potential for AI to influence educational outcomes and the need for critical reflection on its implications. Therefore, integrating technologies, particularly AI into learning environments presents fundamental questions about agency, intelligence, and the boundaries between humans and machines in educational contexts.

The intersection of posthumanist perspective and technology, such as artificial intelligence, creates a rich interdisciplinary field that remains relatively unexplored through systematic analysis. Despite growing scholarship in this area, there has been limited mapping of the intellectual landscape of this emerging field. To address this gap, our study employs bibliometric analysis to systematically investigate global research at the intersection of posthumanism and artificial intelligence in educational contexts.

Through careful quantitative analysis of publication patterns, citation networks, and keyword co-occurrences, we address several key questions:

RQ1: What are the publication trends regarding posthumanist perspectives on AI and technology in education globally?

RQ2: Who are the most influential authors and journals publishing at the intersection of posthumanism and AI technologies in education?

RQ3: What geographical and institutional patterns emerge in research on AI and technology in posthumanist educational contexts, and how do these reflect diverse cultural approaches?

RQ4: How have citation patterns evolved, reflecting the global development of posthumanist approaches to AI in education?

RQ5: What are the main themes and concepts frequently discussed, and how have these evolved in response to technological developments?

By mapping this emerging field through bibliometric methods with attention to diverse cultural contexts, our study contributes to education sciences and posthumanist discourse, offering empirical insights into how these domains inform and transform one another across geographical and cultural boundaries. As Williamson (2017) suggests that the increasing integration of technologies and AI in education represents not merely technical innovation but ontological transformation, reshaping what counts as learning, knowledge, and educational subjectivity. Bibliometric analysis offers a powerful approach to visualize and analyze the intellectual networks and conceptual structures that characterize this emerging interdisciplinary field.

Methodology

Data Sources

For this study, we gathered primary data from two leading academic databases: Scopus and Web of Science (WoS). We selected these databases for their reliability and comprehensive coverage of academic literature relevant to posthumanism, education, technologies, and artificial intelligence. Scopus, one of the most significant citation databases globally, provides access to high-quality articles from reputable journals across various disciplines, and Web of Science has a strong track record of offering peer-reviewed publications and enables comprehensive citation tracking (Pranckutė, 2021; Bozbay et al., 2024).

We chose these two databases to ensure the completeness and accuracy of the collected data and maximize the breadth of bibliometric analysis. Scopus and Web of Science are known for their robust citation analysis features, which help identify publication trends, influential authors, and leading institutions studying posthumanism in educational contexts.

Inclusion and Exclusion Criteria

Our inclusion and exclusion criteria were carefully designed to ensure a focused and relevant corpus of literature. We excluded duplicate articles, publications irrelevant to our research focus, and those without accessible full-text versions. Our search strategy specifically targeted publications that employ a domain-specific search string to examine the intersection of posthumanist perspectives, technologies, and artificial intelligence within educational contexts. We also applied research boundaries to exclude works discussing posthumanism without educational connections, technologies or AI studies lacking posthumanist perspectives, publications with only superficial mentions of these topics, opinion pieces without substantial content, and duplicate database entries.

To systematically identify the most relevant literature, we implemented a five-step selection process: first identifying potential articles from Scopus and Web of Science databases using our carefully crafted search strings; then removing duplicate entries with the assistance of Rayyan – Intelligent Systematic Review Software; followed by conducting a thorough metadata screening to assess topical relevance; subsequently evaluating the remaining articles based on full-text availability; and finally determining eligibility for inclusion in our bibliometric analysis.

Figure 1 depicts the systematic review process for selecting academic articles based on specific inclusion and exclusion criteria. We structured this data in a format compatible with bibliometric analysis software, with particular attention to standardizing author names, institutional affiliations, and keywords to ensure accurate analysis across diverse cultural contexts.

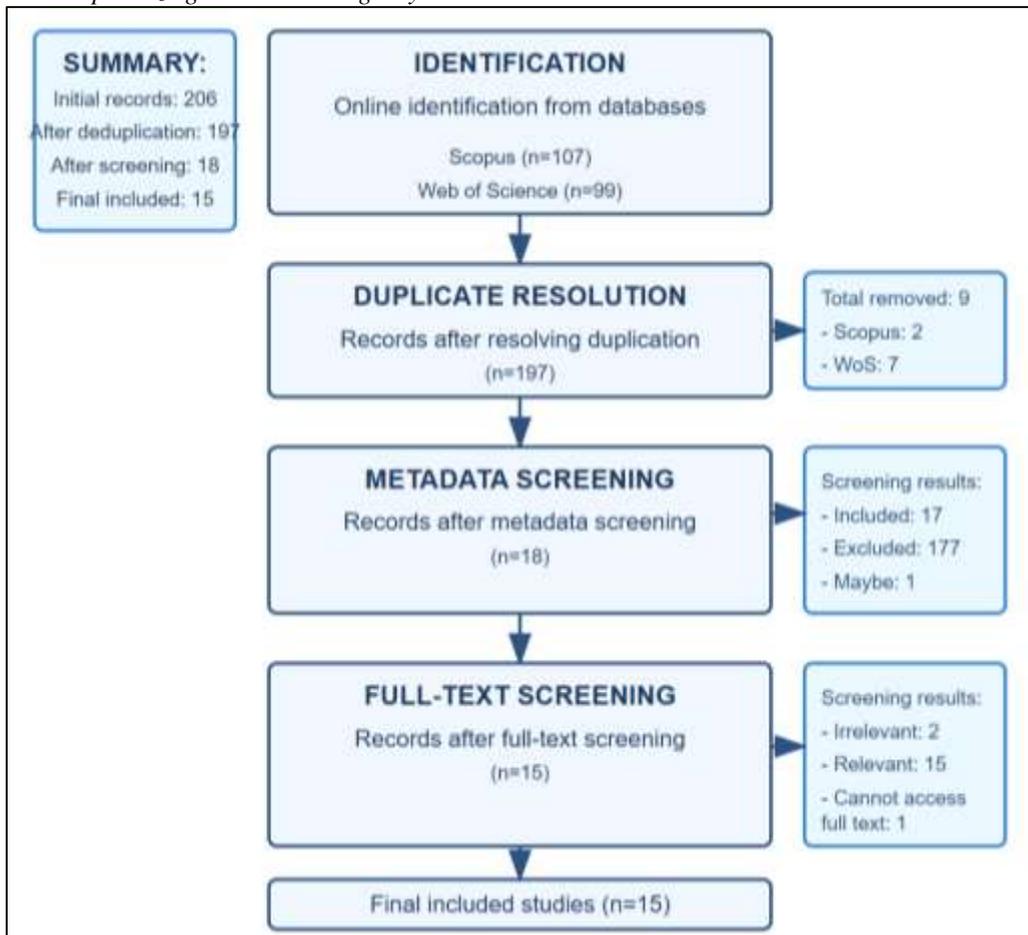


Figure 1. Systematic review flow diagram according to inclusion/exclusion criteria

The process began by identifying articles from two online databases, Scopus and Web of Science (WoS), yielding 206 initial records (107 from Scopus and 99 from WoS). After removing 9 duplicates (2 from Scopus and 7 from Web of Science), 197 unique records remained for further analysis. These 197 records underwent metadata screening based on specific inclusion/exclusion criteria (peer-reviewed articles, English languages, 2015-2025 timeframe, intersection of posthumanist perspectives with AI/technology in educational contexts), which eliminated 177 records, kept 17, and marked 1 as "maybe," leaving 18 records. The remaining 18 records were assessed for full-text availability and relevance, eliminating 3 more records (2 irrelevant and 1 inaccessible) and resulting in 15 final studies.

Analysis Procedure

The analysis procedure in this study followed a systematic bibliometric approach to examine posthumanism in educational research with a focus on technology, including AI. The steps involved in the bibliometric analysis included data collection, cleaning, and the subsequent analysis of publication trends, citation patterns, geographical distribution, and keyword co-occurrences.

After obtaining the final dataset, the bibliometric analysis was conducted using VOSviewer software (version 1.6.18) to generate and visualize co-authorship networks, citation networks, and keyword co-occurrence maps. VOSviewer was chosen for its ability to efficiently handle large-scale bibliometric data and create visualizations that help uncover the underlying structure of the research field (van Eck & Waltman, 2010). Additionally, Microsoft Excel and the power bin were used to organize the raw data, perform descriptive statistical analyses, and create graphs visualizing trends in publication counts, citations, and the geographic distribution of research on posthumanism and technology in educational contexts.

Results

The bibliometric analysis conducted in this study provides a detailed overview of the research landscape on posthumanism, technology, and AI in educational contexts. This section presents the findings, including publication trends over time, the geographical distribution of research outputs, citation patterns, and keyword co-occurrence networks. These results are illustrated in the following sub-sections.

Publication Trends and Temporal Evolution

The figure charts the progression of posthumanist scholarship in educational technology from 2016 to 2024, showing a consistent baseline of approximately one publication annually from 2016 to 2020, followed by rapid growth peaking at four publications in 2023, before declining to about two publications by 2024. This trajectory (see Table 1) reflects the field's evolution from foundational works by Knox (2016) and Bayne and Jandrić (2017) to the acceleration marked by Valentine and Jensen's (2021) and Kumar and Tissenbaum's (2022) contributions, culminating in 2023's peak with publications from Murray-Rust et al. (2023), Vartiainen et al. (2023), and Nyikaa and Motalenyane (2023).

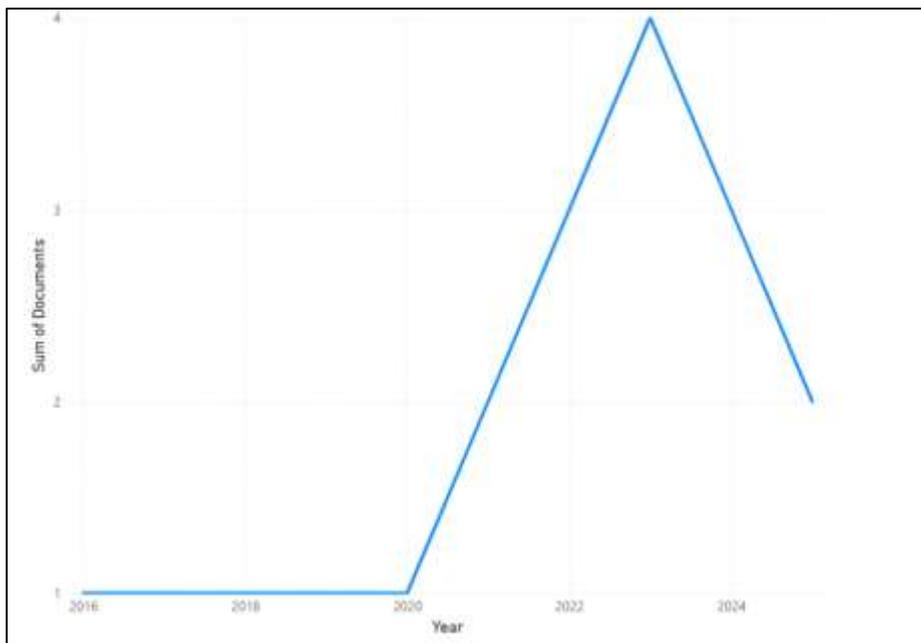


Figure 2. Trends in the Development of Research on AI using Posthumanism in Education perspectives

By 2024, the publication pattern suggests a maturation of the field, with works by Tang and Cooper (2024), Matthews (2024), and Jukes et al. (2024) demonstrating more focused applications of posthumanist frameworks to specific educational contexts and technologies. Though fewer in number, these recent publications reveal a deeper engagement with posthumanist theory as applied to generative AI, language learning, and outdoor pedagogy, suggesting a shift from theoretical foundations toward practical educational implementations.

Geographical Distribution of Research

Based on Figure 3, which illustrates the "Distribution of Research on Posthumanism in Education Across Several Countries," the United States demonstrates the highest scholarly productivity with 4 publications examining the intersection of artificial intelligence and posthumanist educational theory (Burriss & Leander, 2024; Kumar & Tissenbaum, 2022; Rowe, 2019; Valentine & Jensen, 2021), followed by Australia (Creely & Blannin, 2025; Jukes et al., 2024; Tang & Cooper, 2024), and the United Kingdom (Bayne & Jandrić, 2017; Knox, 2016; Matthews, 2024) with 3 documents each. The Netherlands contributes 2 publications (Fassbender, 2025; Murray-Rust et al., 2023), while Finland (Vartiainen et al., 2023), Norway (Bokedal et al., 2022), and South Africa (Nyikaa & Motalenyane, 2023) each provides 1 document.

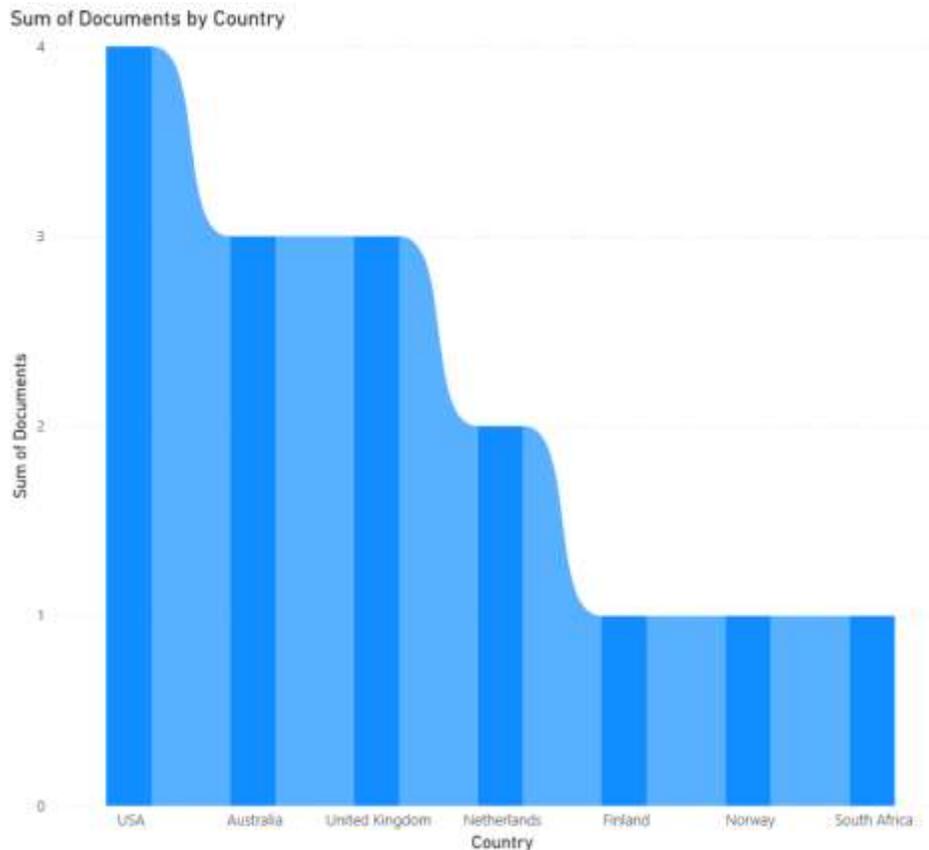


Figure 3. Cross-Country Distribution of AI in Posthumanist Educational Research

This geographical distribution reveals that research on AI through posthumanist educational

frameworks is predominantly concentrated in Western nations with established research infrastructures, while the emerging presence of diverse countries suggests a growing international engagement with these theoretical perspectives. The participation of countries across multiple continents indicates the global relevance of posthumanist approaches to understanding the integration of technologies, including artificial intelligence, in educational contexts. However, Western academic institutions dominate the scholarly conversation in this emerging field.

Citation Analysis

Table 1 highlights several key contributions to the field, with notable variations in citation impact across studies.

Table 1. Research on Posthumanism on Technology and AI in Education cited in databases

Authors	Title	Source Title	Citation	References
Kumar V.; Tissenbaum M.	Supporting collaborative classroom networks through technology: An actor network theory approach to understanding social behaviours and design	British Journal of Educational Technology	8	(Kumar & Tissenbaum, 2022)
Tang K.-S.; Cooper G.	The Role of Materiality in an Era of Generative Artificial Intelligence	Science and Education	14	(Tang & Cooper, 2024)
Bayne S.; Jandrić P.	From anthropocentric humanism to critical posthumanism in digital education	Knowledge Cultures	28	(Bayne & Jandrić, 2017)
Bokedal T.; Reindal S.M.; Rise S.; Wivestad S.M.	'Someone' versus 'something': A reflection on transhumanist values in light of education	Journal of Philosophy of Education	3	(Bokedal et al., 2022)
Matthews B.	Finding the Human in an Era of Machine Intelligence: A Flat Ontological Analysis of Generative AI and Language Learning	Technology in Language Teaching and Learning	0	(Matthews, 2024)
Murray-Rust D.; Lupetti M.L.; Nicenboim I.; Hoog	Grasping AI: experiential exercises for designers	AI and Society	8	(Murray-Rust et al., 2023)

W.V.D.				
Jukes S.; Stewart A.; Morse M.	Learning landscapes through technology and movement: blurring boundaries for a more-than-human pedagogy	Journal of Adventure Education and Outdoor Learning	7	(Jukes et al., 2024)
Valentine K.D.; Jensen L.J.	Mobile entanglements and communitas: the embodied nature of play in Pokémon Go	Educational Technology Research and Development	7	(Valentine & Jensen, 2021)
Fassbender W.J.	Of teachers and centaurs: Exploring the interactions and intra-actions of educators on AI education platforms	Learning, Media and Technology	0	(Fassbender, 2025)
Vartiainen H.; Tedre M.; Jormanainen I.	Co-creating digital art with generative AI in K-9 education: Socio-material insights	International Journal of Education Through Art	12	(Vartiainen et al., 2023)
Nyikaa R.; Motalenyane A.M.	A Reflection on Implementation of Posthumanist Pedagogy in Polytechnics in Zimbabwe during COVID-19 Era	Journal of Curriculum Studies Research	8	(Nyikaa & Motalenyane, 2023)
Rowe E.	Capitalism without capital: the intangible economy of education reform	Discourse	17	(Rowe, 2019)
Creely E.; Blannin J.	Creative partnerships with generative AI. Possibilities for education and beyond	Thinking Skills and Creativity	0	(Creely & Blannin, 2025)
Leander K.M.; Burriss S.K.	Critical literacy for a posthuman world: When people read, and become, with machines	British Journal of Educational Technology	67	(Burriss & Leander, 2024)
Knox J.	Posthumanism and the MOOC: opening the subject of digital education	Studies in Philosophy and Education	35	(Knox, 2016)

The most highly cited works include Leander and Burriss's (2024) "Critical Literacy for a Posthuman World" (67 citations) and Knox's (2016) "Posthumanism and the MOOC" (35 citations), which appear to establish foundational frameworks connecting posthumanist theory with digital education practices. Bayne and Jandrić's (2017) work on transitioning from

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anthropocentric humanism to critical posthumanism (28 citations) and Rowe's (2019) analysis of capitalism in education reform (17 citations) also demonstrate significant impact, suggesting that theoretical works examining paradigm shifts in educational philosophy have gained substantial traction.

Recent contributions, such as Tang and Cooper's (2024) examination of materiality in the era of generative AI (14 citations) and Vartiainen et al. (2023) study on co-creating digital art with generative AI (12 citations), have fewer citations but demonstrate growing scholarly attention to the practical applications of AI in educational contexts and creative processes. Meanwhile, newer research, including publications by Creely and Blannin (2025) on creative partnerships with generative AI, Matthews' flat ontological analysis of generative AI in language learning, and Fassbender's (2025) exploration of educator interactions on AI platforms (all with 0 citations), has only begun to gain traction, reflecting the nascent but expanding interest in generative AI's specific role in education. Overall, the citation trends reveal that foundational studies in posthumanist educational theory continue to shape the discourse while emerging research focused specifically on generative AI applications is gradually building its impact.

Co-Authorship Networks

The visualization in Figure 4 offers a fascinating glimpse into the scholarly community exploring how technology is reshaping our understanding of human subjectivity in educational contexts. Analyzed using VOSviewer, this heat map reveals a vibrant constellation of researchers whose work challenges traditional boundaries between humans and technology in learning environments.

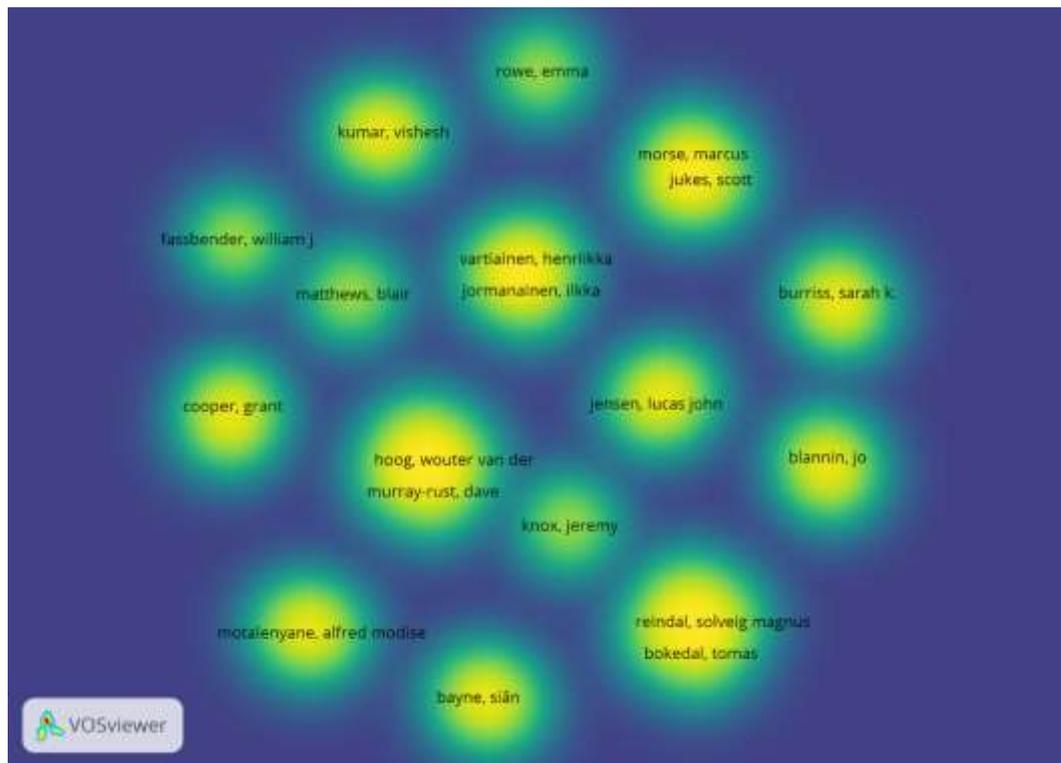


Figure 4. Density Visualization of Co-Authorship of Research on Posthumanism in Education

At the center of this intellectual landscape, researchers like Vartiainen et al. (2023) shines brightly, surrounded by scholars such as Kumar and Tissenbaum (2022), Jukes et al. (2023), and Murray-Rust et al. (2023), who each contribute unique perspectives on how educational technologies are transforming what it means to be human. The intensity of yellow nodes highlights researchers whose work has resonated particularly strongly within this community, forming connection points between diverse theoretical approaches to posthumanism in education.

What emerges from this visualization is not just a map of individual scholars but a portrait of a deeply collaborative field where researchers from Nordic countries work alongside colleagues from the UK, USA, and beyond. Their collective efforts reflect a growing recognition that as AI and other technologies become increasingly integrated into educational spaces, we need new frameworks to understand the complex entanglements between humans, machines, and learning processes. This density visualization captures a moment in the evolution of educational research where traditional notions of the human subject are being thoughtfully reconsidered in light of our technological present and future.

Conceptual Mapping and Thematic Clusters

Figure 5 presents a network visualization of keywords from research on posthumanism in education, comprising nodes grouped into 2 distinct clusters, with "posthumanist" as a central connecting node. Each cluster highlights specific themes within this area of study.

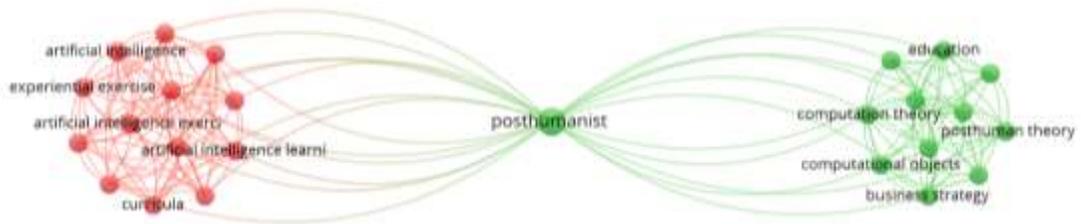


Figure 5. Keyword Network Visualization on Technology in Posthumanist Educational Research

The left cluster (red) centers around "artificial intelligence," "experiential exercise," "artificial intelligence exercise," "artificial intelligence learning," and "curricula," revealing how AI technologies are being integrated into educational practices and reshaping learning experiences through posthumanist frameworks. Furthermore, the right cluster (green) includes "education," "computation theory," "posthuman theory," "computational objects," and "business strategy," showcasing how scholars are developing theoretical frameworks that blur traditional boundaries between human and technological agency in educational contexts.

The central node, "posthumanist," is the critical bridge between these clusters, demonstrating how posthumanist perspectives facilitate dialogue between practical technologies and AI applications in education and broader theoretical reconceptualizations of human-technology relationships. This visualization captures how researchers navigate the complex terrain where

educational practices meet emerging philosophical questions about what it means to be human in increasingly technological learning environments.

When we look closely at this network, we see more than just academic keywords—we see the outline of an ongoing conversation about how technologies, including AI, transform not just what we teach but how we understand ourselves as teachers and learners. The connections between practical applications and theoretical frameworks, on the other hand, reflect education's unique position at the intersection of philosophical inquiry and everyday classroom practice.

Discussion

The bibliometric analysis presented in this study offers valuable insights into the evolving research landscape at the intersection of educational technologies and posthumanist perspectives. Our keyword network visualization revealed distinct conceptual clusters that form the intellectual architecture of this emerging field. By examining these thematic clusters concerning publication trends, citation patterns, geographical distribution, and collaborative networks, we can comprehensively understand how posthumanist approaches are reshaping educational technology research. The keyword network visualization identified two primary thematic clusters with "posthumanist" as the central bridging concept. This bifurcation illustrates the field's dual intellectual orientation, spanning both practical implementation and theoretical innovation.

Technologies Applications and Educational Practice in Posthumanism

The emergence of posthumanist approaches in educational contexts represents a significant shift in how researchers conceptualize human-technology relationships in learning environments. Analysis reveals a thematic cluster centered on practical applications, with keywords like "artificial intelligence," "experiential exercises," and "curriculum" highlighting scholarly attention to concrete educational practices. This trend shows a marked surge beginning in 2021, peaking in 2023 following ChatGPT's release. Key studies illustrate this development: Vartiainen et al. (2023) demonstrated how middle schoolers externalized AI relationships through digital artifacts and collaborative discussions, finding that peer collaboration facilitated new human-technology relationships while dialogic teaching created space for critical reflection.

Moreover, Murray-Rust et al. (2023) developed experiential 'AI exercises' for interaction design students, making abstract technology and AI concepts more tangible through metaphors and enactments, helping students become more reflective about designing with AI. Tang and Cooper (2024) emphasized materiality's importance in science education with GenAI, highlighting concerns about AI's disconnection from physical reality and providing recommendations for incorporating materiality in learning with GenAI. Their work's significant citation count, despite its recency, confirms the growing interest in practical applications of posthumanist perspectives in AI-enhanced educational settings as researchers move beyond abstract philosophy to create frameworks addressing the complexities of human-technology collaboration while maintaining critical perspectives on technology's role and limitations.

Theoretical Frameworks and Philosophical Foundations

The second thematic cluster (represented in green in our visualization) focuses on theoretical constructs and philosophical foundations. Keywords in this cluster—including "posthuman theory," "computational theory," and "education"—demonstrate how posthumanist educational technology research contributes to broader theoretical developments. The studies in this cluster

establish the conceptual frameworks that inform empirical research and practical applications.

Leander and Burriss's (2024) highly cited work (67 citations), "Critical literacy for a posthuman world: When people read, and become, with machines," exemplifies this theoretical orientation by proposing that posthumanism fundamentally challenges traditional views of technology as an external tool controlled by humans. Their work outlines a theory of critical posthumanist literacy that re-imagines literacy concerning concepts of ontology, agency, ethics, and pedagogy, viewing literacy as an accomplishment among human and non-human actors. Similarly, Knox's (2016) analysis (35 citations) provides a comprehensive framework for understanding how digital technologies influence the application of posthumanism in education, critiquing how MOOCs maintain problematic humanist assumptions and suggesting critical posthumanism as an alternative framework for understanding human-technology intermingling in educational contexts.

Moreover, Bayne and Jandrić's (2017) influential work (28 citations), "From anthropocentric humanism to critical posthumanism in digital education," further demonstrates the theoretical depth of this cluster. Their research argues that AI systems do not merely supplement human teachers but fundamentally transform educational relationships and create new forms of educational subjectivity. Their conversation introduces concepts like cyborg learners and the uncanny perspective for discussing digital learning experiences, advocating for approaching education beyond humanism's embodied legacy. This theoretical perspective has proven influential in shaping how researchers conceptualize human-technology relationships in educational contexts.

The inclusion of "business strategy" in this theoretical cluster is illuminated by Rowe's (2019) research on "Capitalism without capital: the intangible economy of education reform." Her work connects posthumanist theoretical perspectives to strategic considerations in educational administration by examining how education reform is shaped by intangibles like big data, AI, and algorithms, creating what she terms an "intangible economy" in education. This demonstrates how philosophical frameworks can inform institutional responses to technological transformation in educational settings.

Posthumanism as a Conceptual Bridge

The central position of "posthumanism" between these two clusters highlights its function as an intellectual nexus connecting practical educational concerns with broader philosophical questions about human-technology relationships. This bridging role is evident in studies integrating theoretical perspectives with practical applications. For example, Kumar and Tissenbaum's (2022) work on "Supporting collaborative classroom networks through technology" demonstrates how posthumanist conceptual frameworks can inform the development of collaborative educational approaches. Their study implements "Connected Spaces (CxS)," an ambient help-seeking interface in a project-based computing classroom, using actor-network theory (ANT) to understand collaborative connections. They argue that posthumanism offers "an emerging and critical extension to sociocultural perspectives on understanding learning" by decentering the human and considering the active roles both human and non-human entities play in learning environments.

Similarly, Jukes et al. (2024) research on "Learning landscapes through technology and movement" shows how theoretical posthumanist perspectives can be translated into practical educational strategies that recognize the complex interplay between human and non-human

actors. Their study explores learning landscapes through non-digital technology and movement in canoe journeys, utilizing "posthumanist and process-relational theories for exploring epistemological dimensions of outdoor learning." They demonstrate how technology and movement help shape learning orientations and highlight that these elements "help constitute how we come to know places.

Both studies represent the bridging function between theoretical posthumanist frameworks and their practical implementation in educational settings, demonstrating how posthumanism is an intellectual nexus in educational technology research. This integration allows researchers to develop practical applications informed by sophisticated theoretical understandings of human-technology relationships, creating more nuanced and effective educational approaches in increasingly technology-mediated learning environments.

Conceptual Gaps and Future Directions

Our keyword analysis reveals notable conceptual gaps that represent opportunities for future research development. Terms related to ethics, policy, and governance are not prominently featured in either cluster despite their importance in educational technology research. This gap is highlighted by Zawacki-Richter et al.'s (2019) work on the ethical implications of AI in education raises critical questions about algorithmic bias, privacy, and decision-making authority that have not yet been fully integrated into posthumanist educational technology research.

The absence of prominent keywords related to student experiences and perspectives in our visualization indicates a significant gap. This limitation resonates with the questions raised in our literature review about who truly benefits when algorithms shape what students learn and whether we allow technology to determine our educational values rather than putting our values first. Bozkurt et al.'s (2021) research on digital learning during the COVID-19 pandemic emphasizes the importance of centering student experiences on technological transformations. However, posthumanist educational technology research has not fully embraced this student-centered perspective.

The geographical analysis of our corpus reveals another conceptual limitation: despite posthumanism's challenge to Western humanist traditions, research remains predominantly within Western academic contexts. As Fenwick and Edwards (2016) argue, posthumanist perspectives should recognize diverse cultural understandings of human-technology relationships, yet our findings indicate limited contributions from Asian, African, and Latin American scholars. This geographical concentration suggests that posthumanist educational technology research would benefit from more diverse cultural perspectives.

Integration of Conceptual Clusters with Research Patterns

Several important patterns emerge when integrating our conceptual mapping with other bibliometric findings. First, the temporal evolution from theoretical to more applied research approaches parallels the dual clustering of keywords. During the 2016-2020 period, studies like Knox (2016) and Bayne and Jandrić (2017) established theoretical foundations, while more recent works like Vartiainen et al. (2023) and Murray-Rust et al. (2023) demonstrate the field's shift toward practical applications.

Second, citation patterns reveal that while theoretical works have established foundational concepts, publications focused on specific AI applications represent the field's cutting edge. This

trend is exemplified by the growing citation impact of Tang and Cooper's (2024) work on materiality in the era of generative AI, which builds bridges between philosophical posthumanism and educational practice.

Third, our co-authorship visualization reveals collaborative networks that align with these conceptual clusters. Researchers focused on practical applications, such as Vartiainen and Jormanainen, demonstrate strong collaborative ties within specific institutional contexts, while theoretically oriented scholars like Kumar and Jukes often bridge different research communities. This pattern suggests that conceptual development in posthumanist educational technology research benefits from both specialized expertise and cross-disciplinary collaboration.

Conclusion

This bibliometric analysis maps the emerging intellectual landscape of posthumanist perspectives on technology and AI in educational contexts, revealing distinct yet interconnected conceptual domains bridged by posthumanism. Our findings trace the field's evolution from theoretical foundations laid by scholars like Knox (2016) and Bayne and Jandrić (2017) to practical implementations exemplified in works by Vartiainen et al. (2023) and Murray-Rust et al. (2023), with a notable publication surge following ChatGPT's release. While research demonstrates global relevance, Western academic institutions dominate the conversation, suggesting opportunities for more diverse cultural perspectives. Keyword co-occurrence networks reveal posthumanism's crucial role in connecting practical educational concerns (artificial intelligence, experiential exercises) with broader theoretical questions (posthuman theory, computational theory), creating a rich intellectual space where human-nonhuman agency boundaries can be productively reimagined. As education navigates technological transformation, these posthumanist frameworks offer valuable alternatives to simplistic implementation narratives, providing more nuanced understandings of how technologies actively reshape educational experiences, relationships, and fundamental conceptions of knowledge and subjectivity in learning environments.

Implication

This bibliometric analysis of posthumanist perspectives on AI and technology in education reveals significant implications for educational theory, practice, and policy. Our findings highlight the importance of bridging theoretical and practical domains for researchers, suggesting that meaningful advances in understanding educational technology require both philosophical depth and concrete classroom applications. For educators, the emergence of posthumanist frameworks offers alternative approaches to technology integration that move beyond viewing AI as mere tools and instead recognize technologies as active participants in reshaping educational relationships and knowledge construction. Moreover, our analysis suggests that educational institutions need organizational structures and curricula to accommodate more fluid boundaries between human and technological agencies. For policymakers, the growing influence of posthumanist perspectives challenges conventional regulatory approaches based on humanist assumptions, indicating the need for more nuanced governance frameworks that recognize the distributed nature of agency in AI-enhanced educational environments. Collectively, these implications point toward a fundamental reconceptualization of education that acknowledges the inseparability of human learning from the technological systems with which we are increasingly entangled, requiring new theoretical models, pedagogical approaches, and institutional frameworks adapted to this posthuman

educational reality.

Limitations and Future Research Directions

While providing valuable insights into posthumanist perspectives on AI in education, this study has several limitations, including reliance on Western-dominated databases potentially excluding regional or non-English publications, a relatively small sample size (15 publications) limiting statistical robustness, inconsistencies in author-provided keywords affecting thematic precision, and focus on formal academic literature potentially missing practitioner contributions. Future research should address these limitations through expanded empirical investigations of posthumanist frameworks concerning rapidly evolving AI technologies, greater incorporation of Global South perspectives to balance geographical representation, increased attention to student experiences and perspectives within posthumanist educational environments, deeper engagement with ethical, policy, and governance implications of AI in education, and longitudinal studies tracking how posthumanist educational frameworks evolve in response to technological developments. By addressing these gaps, research at this intersection can develop more robust theoretical frameworks and practical applications that better recognize the complex entanglements of humans and technologies in contemporary learning environments.

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Conflicts of Interest

We want to confirm that we have no financial interests or affiliations with any organization that may have a direct or indirect interest in the subject matter discussed in the manuscript.

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