Entrepreneurship Education, Curriculum Transformation, and Artificial Intelligence: A Bibliometric Analysis from the Global South

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Abstract
This study examines the intersection of Artificial Intelligence (AI), entrepreneurship education, and curriculum transformation in the Global South. Using a systematic bibliometric analysis of 253 publications from 2019–2024 indexed in Scopus, Web of Science, and JSTOR, the study maps publication trends, intellectual structures, and collaborative networks shaping this emerging field. The analysis identifies four key themes: AI-enabled pedagogical innovation, digitalisation and curriculum redesign, entrepreneurship education in developing contexts, and global research collaboration. Guided by Activity Theory, the study conceptualises AI as a mediating artefact shaping interactions between pedagogy, technology, and institutional contexts. The findings highlight the transformative potential of AI in advancing entrepreneurship education while revealing persistent challenges related to infrastructure, policy, and digital inequality. The study contributes theoretical and policy insights for fostering inclusive, contextually responsive, and innovation-driven curriculum transformation in Global South higher education.

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Introduction

The global economy has undergone profound transformation driven by technological advancements, digitalisation, and artificial intelligence (AI), reshaping how knowledge is produced, shared, and applied within higher education. As universities navigate this digital age, entrepreneurship education has become a central mechanism for fostering innovation, resilience, and employability among graduates (Fayolle et al., 2020). Entrepreneurship education is no longer confined to business schools but has evolved into an interdisciplinary field that prepares learners to think creatively, identify opportunities, and generate sustainable solutions to complex socio-economic challenges (Neck et al., 2021). In the Global South, this imperative is even more pronounced, as educational institutions seek to balance access, quality, and relevance in the face of rapid technological change and persistent developmental inequalities (Aparicio et al., 2021).

Despite the growing recognition of the role of entrepreneurship education in addressing socio-economic development, a persistent problem lies in the slow transformation of curricula to reflect the digital realities of the twenty-first century. Many universities in developing contexts continue to deliver entrepreneurship education using outdated pedagogical models that fail to integrate AI and digital competencies (Khoza, 2022; Ratten et al., 2021). Consequently, there is a widening gap between the entrepreneurial skills cultivated in higher education and those demanded by digitally driven economies (Maritz et al., 2022). This disjunction undermines the transformative potential of entrepreneurship education as a tool for inclusive growth, particularly in the Global South where digital adoption and innovation ecosystems are unevenly developed (Nambisan et al., 2019). The first major contribution of this study is its focus on the intersection of entrepreneurship education, curriculum transformation, and AI from a Global South perspective. Existing research on AI in entrepreneurship education is heavily concentrated in the Global North, overlooking context-specific constraints such as limited digital infrastructure, socio-economic disparities, and institutional inertia (Nambisan et al., 2020). By employing bibliometric analysis, this study identifies emerging research trends, key contributors, and thematic clusters, thereby offering a holistic understanding of how AI is shaping entrepreneurship education within developing contexts.

Secondly, this paper contributes to the theoretical discourse on curriculum transformation by examining how AI-driven pedagogical innovations are influencing entrepreneurship education frameworks. Scholars have argued that AI offers opportunities to personalise learning, enhance experiential teaching, and foster digital entrepreneurship mindsets (García-Morales et al., 2021). However, empirical evidence on how these technologies are integrated into entrepreneurship curricula remains limited. Through systematic mapping, this research provides evidence-based insights into the evolution of curriculum design and pedagogical strategies informed by AI in higher education. Thirdly, this study advances policy and practice by highlighting the implications of digital transformation for educators, curriculum designers, and policymakers in the Global South. As AI technologies increasingly mediate learning environments, there is a pressing need to rethink teaching methodologies and assessment frameworks that cultivate entrepreneurial thinking and digital fluency (Maritz et al., 2023). This bibliometric investigation therefore serves as a foundation for future empirical studies and policy interventions aimed at aligning entrepreneurship education with the demands of digital economies.

In summary, this paper addresses the underexplored nexus between entrepreneurship education, curriculum transformation, and artificial intelligence. By adopting a bibliometric lens, it elucidates global research trajectories while situating them within the contextual realities of the Global South. The findings aim to contribute to the reimagining of entrepreneurship education as a dynamic, technology-enabled field capable of driving innovation, inclusion, and sustainable development in emerging economies. This study is guided by the following research questions:

RQ1: What are the publication trends in research on artificial intelligence, entrepreneurship education, and curriculum transformation between 2019 and 2024?
RQ2: Who are the most productive authors, institutions, and countries contributing to this research field?
RQ3: Which journals and publications are the most influential based on citation impact?
RQ4: What thematic clusters emerge from keyword co-occurrence analysis in the literature?
RQ5: How is artificial intelligence transforming entrepreneurship education and curriculum design in higher education institutions within the Global South?

Literature review

Artificial Intelligence in Higher Education

The integration of artificial intelligence (AI) in higher education has transformed the landscape of teaching and learning, offering personalised instruction, intelligent tutoring systems, predictive analytics, and automated assessment (Crompton et al., 2023; Zawacki-Richter et al., 2019). Research shows that AI applications can enhance learning efficiency and improve decision-making in academic management (Wang et al., 2024). However, scholars caution that despite its promise, AI in education remains constrained by ethical, technical, and contextual challenges such as algorithmic bias, data privacy, and unequal access to digital infrastructure (García-Morales et al., 2021; Holmes et al., 2021). Recent systematic reviews reveal that most studies on AI in education originate from developed economies, particularly in North America, Europe, and East Asia, where digital ecosystems are more advanced (Chen et al., 2024). This geographical bias leaves a research gap regarding how AI adoption unfolds in developing regions, especially within the Global South (Mhlanga, 2023). The uneven distribution of digital capacity across universities exacerbates educational inequalities, underscoring the need for context-specific studies that explore how AI can support inclusive and transformative learning in resource-constrained environments (Aparicio et al., 2021).

Entrepreneurship Education and Pedagogical Transformation

Entrepreneurship education has evolved from its traditional focus on venture creation to encompass the cultivation of entrepreneurial mindsets, opportunity recognition, and innovation capabilities (Neck et al., 2021; Fayolle et al., 2020). The pedagogical shift towards experiential and problem-based learning underscores the need for dynamic teaching strategies that reflect the realities of contemporary economies (Ratten et al., 2021). Digitalisation has played a key role in this evolution, with online incubators, simulation-based learning, and collaborative virtual platforms reshaping how entrepreneurship is taught (Maritz et al., 2022). Nonetheless, many entrepreneurship curricula remain outdated and misaligned with the digital competencies required in rapidly evolving markets (Nambisan et al., 2019; Maritz et al., 2023). Research indicates that entrepreneurship education in the Global South often faces structural challenges including limited access to technology, insufficient educator training, and rigid institutional frameworks (Brix et al., 2020; Khoza, 2024). These barriers hinder the integration of AI and digital tools that could otherwise enhance creativity, critical thinking, and innovation among students (García-Morales et al., 2021).

Curriculum Transformation and Digitalisation in Higher Education

Curriculum transformation involves rethinking content, pedagogy, and assessment to align with contemporary economic and technological shifts (Fernández et al., 2023). In higher education, digital transformation has become a strategic priority, particularly in the wake of the COVID-19 pandemic, which accelerated the use of online platforms and learning analytics (Díaz-García et al., 2022). Yet scholars highlight that digitalisation is not merely a technological shift but also an institutional and cultural one that requires leadership, resources, and faculty digital literacy (García-Morales et al., 2021; Nambisan et al., 2020). In entrepreneurship education, curriculum transformation is further complicated by the need to embed AI competencies that foster opportunity recognition, data-driven decision-making, and innovative problem-solving (Vecchiarini et al., 2023). The integration of AI into entrepreneurship curricula can enhance student engagement and entrepreneurial intention through personalised learning pathways and simulation environments (Chen et al., 2024). However, adoption remains uneven, with many institutions in the Global South lacking clear frameworks for embedding AI-driven pedagogies within existing curricula (Matsieli et al., 2024).

AI and Entrepreneurship Education in the Global South

The intersection of AI and entrepreneurship education in developing contexts represents an emerging research frontier (Fossen et al., 2024). While evidence from developed economies demonstrates how AI supports creativity, market analysis, and venture simulation, similar studies from the Global South are scarce (Mhlanga, 2023). Scholars attribute this to infrastructural deficiencies, limited policy support, and insufficient institutional readiness for digital transformation (Aparicio et al., 2021). In African and Latin American universities, initiatives linking entrepreneurship and AI remain fragmented and often externally funded, raising questions about sustainability and contextual adaptation (Rambe, 2023). The lack of localised research has resulted in a narrow understanding of how AI can support entrepreneurial learning in diverse socio-economic environments. Addressing this gap is crucial for designing inclusive and transformative curricula that align with the Fourth Industrial Revolution (4IR) and Sustainable Development Goals (SDGs) (Maritz et al., 2023; Nambisan et al., 2020).

Research Gap and Rationale for the Study

The reviewed literature highlights three critical gaps. First, existing research predominantly focuses on AI in general education rather than in entrepreneurship-specific contexts. Second, studies that explore curriculum transformation often adopt conceptual rather than empirical approaches, limiting the evidence base for actionable policy reform. Third, there is limited understanding of how Global South universities are contextualising AI within entrepreneurship education. Consequently, this study employs a bibliometric approach to map global research patterns, identify key contributors, and highlight emerging themes linking AI, entrepreneurship education, and curriculum transformation. By situating these insights within the Global South, the study contributes to the development of inclusive, innovation-driven education systems that prepare graduates for digitally oriented economies.

Theoretical Framework: Activity Theory

Activity Theory (AT), initially developed by Vygotsky (1978) and later expanded by Engeström (1987), provides a robust lens for understanding the dynamic and socially mediated nature of human activity. The theory views learning and development as culturally and contextually embedded processes, mediated through tools, rules, and social interactions. Within educational settings, AT conceptualises activity systems as networks that include a subject (learner or educator), an object (goal or motive of activity), mediating artefacts (technological or conceptual tools), community (institutional and social environment), rules (norms and regulations), and division of labour (roles and responsibilities) (Kaptelinin & Nardi, 2006). These elements interact dynamically to shape how learning, innovation, and transformation occur.
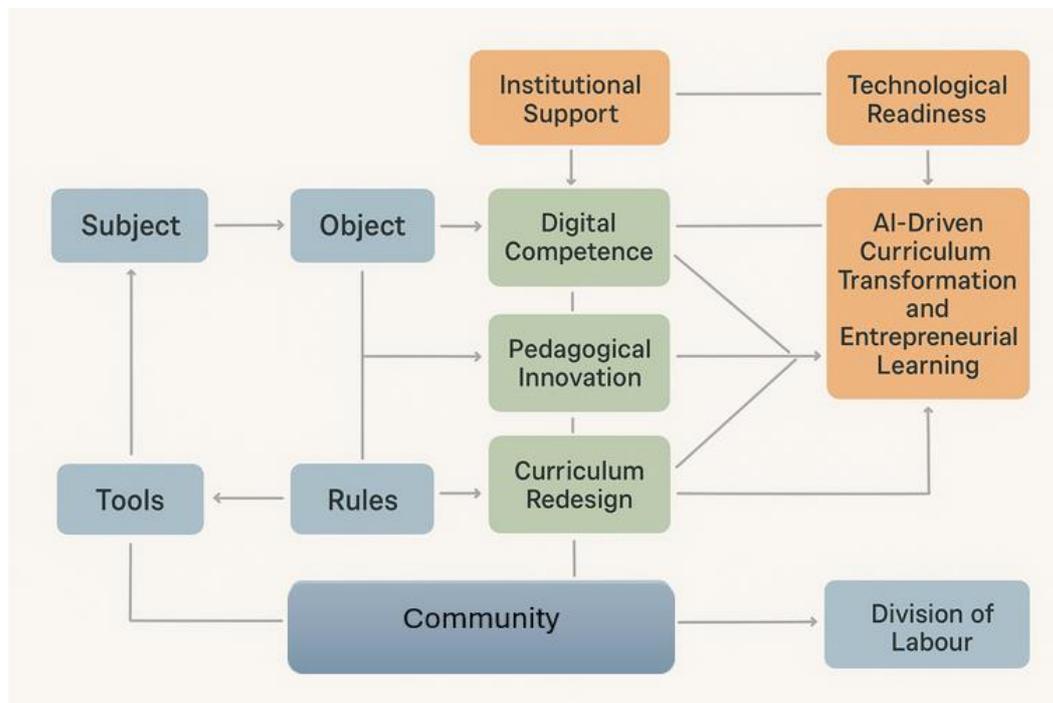
In the context of entrepreneurship education, AT helps to illuminate how educators and students engage with Artificial Intelligence (AI) tools to achieve curriculum transformation and entrepreneurial outcomes (Mwanza-Simwami, 2020). The theory positions AI technologies such as intelligent tutoring systems, data-driven assessments, and generative learning platforms as mediating artefacts that influence both the processes and outcomes of teaching and learning (Mwanza-Simwami, 2020). It also draws attention to the contradictions that emerge within the educational system, such as disparities in access to technology, limited institutional capacity, and varying levels of digital literacy, which often characterise contexts within the Global South (Yamagata-Lynch, 2010). These contradictions are seen not merely as obstacles but as drivers of transformation and innovation within activity systems.

From a bibliometric perspective, Activity Theory offers a conceptual structure for interpreting the knowledge domains, thematic clusters, and co-authorship networks identified in the analysis. Each cluster can be understood as a distinct yet interconnected activity system comprising scholars, research objectives, and methodological tools shaped by socio-cultural and technological contexts. By examining these relationships through the lens of AT, the bibliometric analysis goes beyond descriptive mapping to uncover how research on AI in entrepreneurship education evolves through interactions between subjects (researchers), objects (knowledge production goals), and mediating artefacts (AI, digital pedagogy, and collaborative platforms). This perspective reveals how knowledge is produced, shared, and transformed within the broader educational ecosystem, particularly highlighting the dynamics of curriculum innovation in resource-constrained environments. Overall, adopting Activity Theory allows this study to bridge the macro-level bibliometric insights with micro-level educational practices, offering an integrative understanding of how technological mediation, collaboration, and contextual factors collectively shape entrepreneurship education and curriculum transformation in the Global South.

Conceptual Framework

The framework illustrates the application of Activity Theory in understanding the complex interactions within entrepreneurship education, curriculum transformation, and the integration of Artificial Intelligence (AI) from a Global South perspective. It conceptualises the learning environment as a dynamic system comprising interrelated components including the *subject* (educators and learners), *object* (entrepreneurial competencies and innovation-oriented learning outcomes), and *mediating artefacts* (AI tools, pedagogical strategies, and digital platforms). The *rules* represent institutional policies and ethical norms that guide the incorporation of AI in teaching and learning, while the *community embodies stakeholders* such as higher education institutions, industry partners, and policymakers who contribute to curriculum reform. The *division of labour* captures the distribution of roles, expertise, and responsibilities among participants in the learning ecosystem. Through multi-directional arrows, the framework demonstrates how AI functions as both a mediating tool and a transformative agent, influencing

knowledge construction, curriculum adaptation, and entrepreneurial mindsets. Mediating variables such as digital literacy, institutional readiness, and technological infrastructure shape the effectiveness of AI integration, whereas moderating variables like policy support and socio-economic context determine the extent of impact on curriculum transformation and learner outcomes. Overall, this framework provides a holistic analytical lens to examine how human, technological, and institutional elements interact to foster innovation-driven entrepreneurship education within emerging economies. Figure 1 illustrates this framework:

Figure 1. Conceptual framework based on Activity Theory for AI-Driven Entrepreneurship Education and Curriculum Transformation.

Method

Research Design

This study employed a Systematic Bibliometric Analysis (SBA) to examine and visualise the intellectual, conceptual, and thematic structures of research situated at the intersection of Artificial Intelligence (AI), Entrepreneurship Education, and Curriculum Transformation, with particular attention to the Global South. The SBA approach combines the methodological rigour of a systematic review with the quantitative precision of bibliometric mapping, thereby ensuring comprehensive coverage and analytical depth (Donthu et al., 2021; Zupic & Čater, 2015). The methodological process adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework (Page et al., 2021), which provides a transparent and replicable structure for identifying, screening, and including relevant studies. This design allowed for the integration of descriptive bibliometric indicators with interpretive thematic synthesis, offering a multidimensional understanding of how AI-related scholarship informs entrepreneurship education and curriculum reform (Aria & Cuccurullo, 2017).

Data Sources and Search Strategy

Data for this study were extracted from three multidisciplinary and high-impact academic databases, namely Scopus, Web of Science (WoS), and JSTORE. The inclusion of multiple databases ensured broad coverage across education, management, and technology disciplines (Donthu et al., 2021). The search period extended from January 2019 to December 2024. Although the bibliometric dataset was initially extracted in July 2025, the analysis was restricted to publications indexed up to the end of 2024, which represents the most recent completed publication year. Restricting the dataset to 2024 ensures methodological reliability and avoids the instability of partially indexed records for 2025 in bibliometric databases such as Scopus and Web of Science, to capture the post-Fourth Industrial Revolution and post-COVID-19 surge in AI-related research in higher education (García-Morales et al., 2021). The database extraction was conducted in July 2025, which allowed sufficient time for 2024

publications to be fully indexed across databases. The search strategy combined key terms and Boolean operators as follows: ("Artificial Intelligence" OR "AI") AND ("Entrepreneurship Education" OR "Entrepreneurial Learning") AND ("Curriculum Transformation" OR "Curriculum Development" OR "Pedagogical Innovation") AND ("Higher Education" OR "Universities"). To ensure quality and relevance, filters were applied to include only peer-reviewed journal articles, conference papers, and book chapters published in English. Non-scholarly material such as dissertations, reports, and editorials was excluded. For the purposes of this study, the Global South refers to developing and emerging economies across Africa, Latin America, Asia, and parts of the Middle East. Country classifications were based on commonly used development studies frameworks and international economic groupings. Author affiliations extracted from the bibliographic records were categorised according to Global North and Global South classifications to analyse geographical research contributions.

## Inclusion and Exclusion Criteria

To maintain methodological consistency, studies were included if they examined AI applications or implications for entrepreneurship education or curriculum transformation, focused on higher education or university-level learning, were published between 2019 and 2024, and provided evidence or discussion relevant to the Global South or comparable developing contexts. Studies were excluded if they focused on AI in primary or secondary education, addressed entrepreneurship without reference to educational contexts, or were non-peer-reviewed or lacking analytical substance. Following the PRISMA stages of identification, screening, eligibility, and inclusion, an initial total of 426 records was retrieved (Scopus = 238; WoS = 128; JSTORE = 60). After the removal of duplicates and the application of inclusion criteria, 253 articles were retained for bibliometric and thematic analysis.

Data Extraction and Processing

Bibliographic data such as titles, authors, publication years, journal names, institutional affiliations, keywords, and citation counts were exported in BibTeX and CSV formats. Data cleaning and standardisation were undertaken using EndNote and Microsoft Excel to ensure accuracy and consistency in author names, institutional details, and keyword terminology. Two analytical tools were utilised for data processing and visualisation: the Bibliometrix R-package (version 4.1) for performance and science mapping indicators (Aria & Cuccurullo, 2017), and VOSviewer (version 1.6.20) for the visual representation of co-authorship, co-citation, and keyword co-occurrence networks (Van Eck & Waltman, 2010). Duplicate records were identified through automated matching of titles, author names, and Digital Object Identifiers (DOIs) using reference management software. Following automated filtering, a manual screening process was conducted to verify article relevance and remove remaining duplicates. Two independent reviewers examined titles, abstracts, and keywords to ensure alignment with the inclusion criteria. Any discrepancies were resolved through discussion to ensure consistency and reliability in the dataset.

Bibliometric Analysis Procedures

The bibliometric analysis unfolded across three principal dimensions. The performance analysis quantified the productivity and impact of sources, authors, countries, and institutions, thereby revealing the structural composition of the field (Donthu et al., 2021). The science mapping phase employed co-authorship, co-citation, and bibliographic coupling techniques to identify collaboration patterns and intellectual linkages among scholars (Zupic & Čater, 2015). The thematic evolution analysis examined keyword co-occurrence to trace the emergence and development of research themes, with specific focus on AI-enabled pedagogy, digital transformation, and innovation ecosystems in the Global South. Network visualisations were generated to illustrate the relationships among concepts and thematic clusters. The strength of the linkages between nodes was determined by co-occurrence frequency and normalised total link strength (Van Eck & Waltman, 2010). To ensure transparency and replicability in the network visualisations, specific threshold parameters were applied during the analysis using VOSviewer. In the keyword co-occurrence analysis, a minimum occurrence threshold of five (5) keywords was set, meaning that only keywords appearing at least five times across the dataset were included in the network map. This filtering resulted in the inclusion of the most relevant and frequently occurring terms representing the conceptual structure of the field. For the citation and co-citation analyses, a minimum citation threshold of ten (10) citations per document or source was applied to ensure that only influential publications contributed to the cluster formation. The clustering algorithm implemented in VOSviewer, based on the association strength normalisation method, was used to group related nodes into clusters. These threshold values were selected to balance network clarity with analytical depth, ensuring that the visualised clusters represent meaningful thematic relationships within the bibliometric dataset.
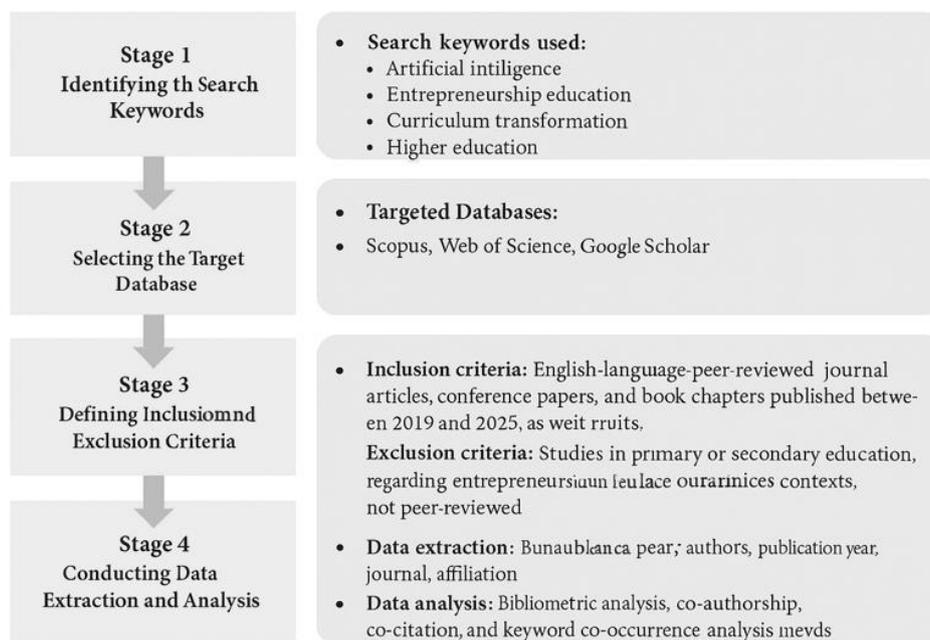
Figure 2. Four-stage Methodological Framework Used for Data Collection and Analysis.

Qualitative Thematic Integration

To complement the quantitative results, a qualitative thematic synthesis was undertaken to interpret the conceptual significance of the identified clusters. Following Braun and Clarke's (2019) thematic analysis framework, the process involved familiarisation with the data, coding, theme generation, refinement, and interpretation. The synthesis revealed three overarching thematic domains, namely AI-driven pedagogical innovation, curriculum transformation and digitalisation, and entrepreneurship education in the Global South. This integrative process ensured that the bibliometric findings were contextualised within broader theoretical and pedagogical debates.

Validity, Reliability, and Ethical Considerations

Methodological validity was maintained through the triangulation of data sources and analytical tools, thereby reducing the likelihood of source bias (Snyder, 2019). Reliability was enhanced through transparent documentation of the search strategy, inclusion criteria, and analytical procedures, consistent with PRISMA guidelines. As the study relied solely on secondary data, no ethical clearance was required. Nonetheless, all research integrity principles, including accurate citation, transparency, and responsible data management, were rigorously observed.

Summary

The Systematic Bibliometric Analysis applied in this study integrates the methodological strength of systematic review with the analytical power of bibliometric mapping. By synthesising publication trends, thematic patterns, and intellectual linkages, the approach provides a comprehensive understanding of how AI is influencing entrepreneurship education and curriculum transformation. It also highlights how research emerging from the Global South contributes to the reconfiguration of higher education towards more inclusive, innovative, and digitally adaptive systems.

Data Extraction and Analysis

This section presents the analysis of VOS Viewer and Bibliometric data extracted from Scopus, Web of Science, and JSTORE. It highlights publication trends, influential contributors, thematic patterns, and collaborative networks that define the research landscape on AI, entrepreneurship education, and curriculum transformation.

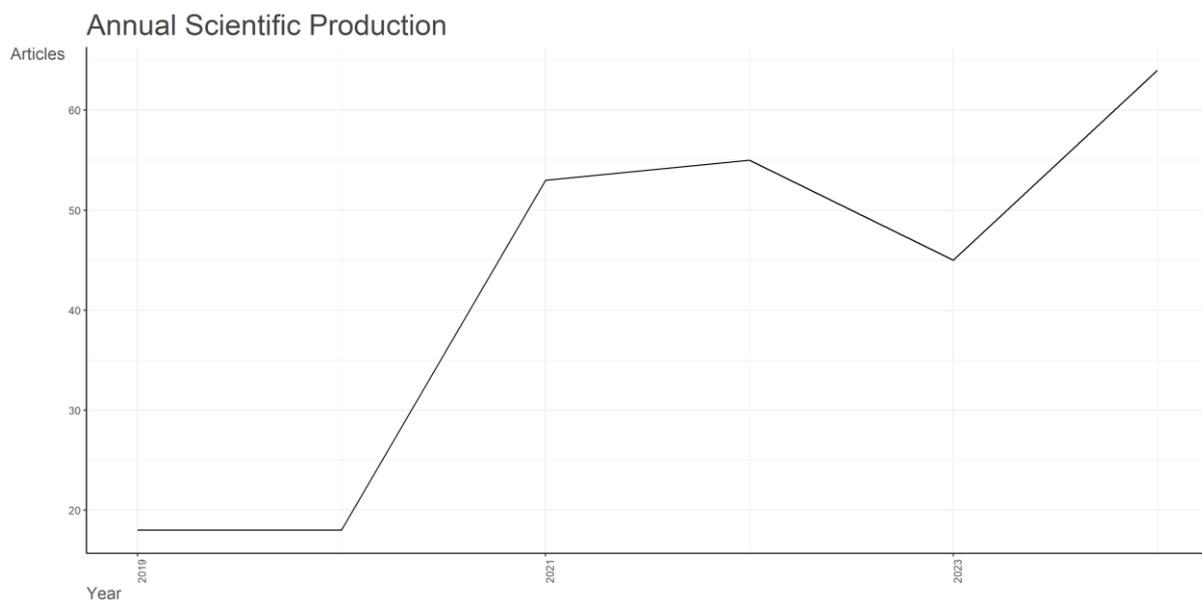### Distribution and Source Analysis

The bibliometric analysis reveals a steady increase in scholarly output examining the intersection of Artificial Intelligence (AI), entrepreneurship education, and curriculum transformation. A total of 253 publications were identified between 2019 and 2024 across Scopus, Web of Science, and JSTOR. As illustrated in Figure 4, the

annual distribution of publications indicates a gradual rise from 2019 to 2021, followed by a more pronounced growth from 2022 onwards. This increase coincides with the acceleration of digital transformation in higher education following the COVID-19 pandemic, which intensified scholarly attention on technology-mediated learning environments. The upward trajectory of publications suggests that the integration of AI into entrepreneurship education has emerged as a rapidly expanding interdisciplinary research domain. Early publications primarily addressed digital learning tools and online entrepreneurship education, whereas more recent studies increasingly explore AI-enabled pedagogical innovation, adaptive learning systems, and data-driven curriculum design. This pattern indicates a transition from exploratory discussions of digitalisation toward more advanced investigations of AI-supported teaching and learning processes in higher education.

Timespan	Sources	Documents	Annual Growth Rate
2019:2024	82	253	28.88 %
Authors	**Authors of single-authored docs**	**International Co-Authorship**	**Co-Authors per Doc**
498	79	7.905 %	2.09
Author's Keywords (DE)	**References**	**Document Average Age**	**Average citations per doc**
935	10345	3.88	4.775

Figure 3. Main Information.

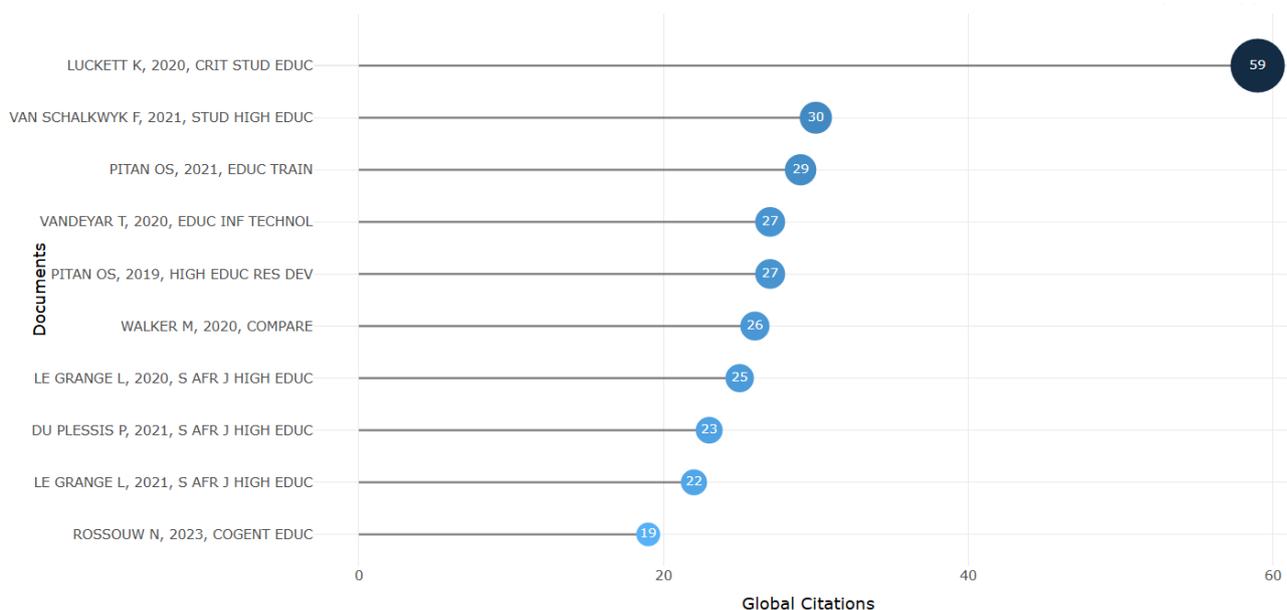**Figure 4.** Annual distribution of publications on AI, entrepreneurship education, and curriculum transformation.
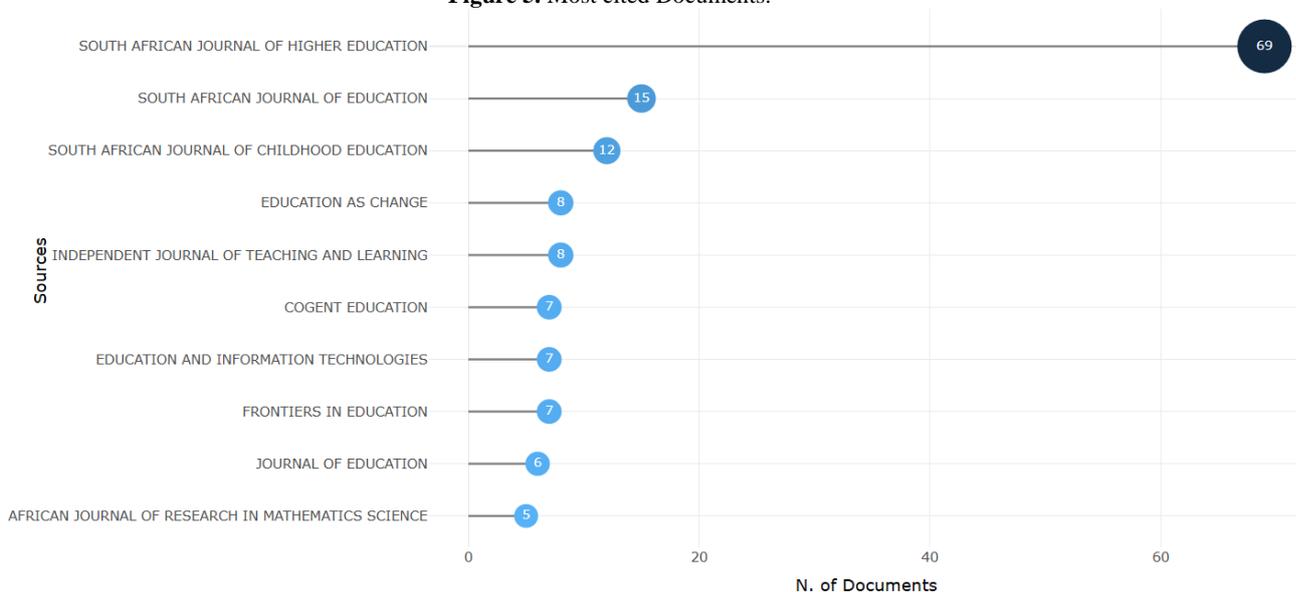
Figure 5. Most cited Documents.

Figure 6. Most relevant sources.

Geographical, Institutional, and Author Collaboration Patterns

The performance analysis highlights a concentration of scholarly contributions within a relatively small group of authors, institutions, and countries. The analysis of institutional affiliations (Figure 8) identifies several universities as key contributors to research on AI-driven entrepreneurship education. These institutions often demonstrate strong interdisciplinary collaboration between education, management, and information technology departments. Country-level analysis (Figures 7, 9, and 10) reveals significant geographical disparities in research output and influence. South Africa emerges as the most influential country within the Global South, recording the highest citation count in the dataset with 1,147 citations. Other countries such as Nigeria, Ghana, Ethiopia, Namibia, and Kenya contribute to the field but with considerably lower citation impact. The collaboration network visualisation (Figure 9) indicates increasing international research partnerships, particularly between scholars in the Global South and institutions in the Global North. These collaborations facilitate knowledge exchange and methodological innovation, reflecting the growing globalisation of research on digital entrepreneurship education.

Longitude

Latitude
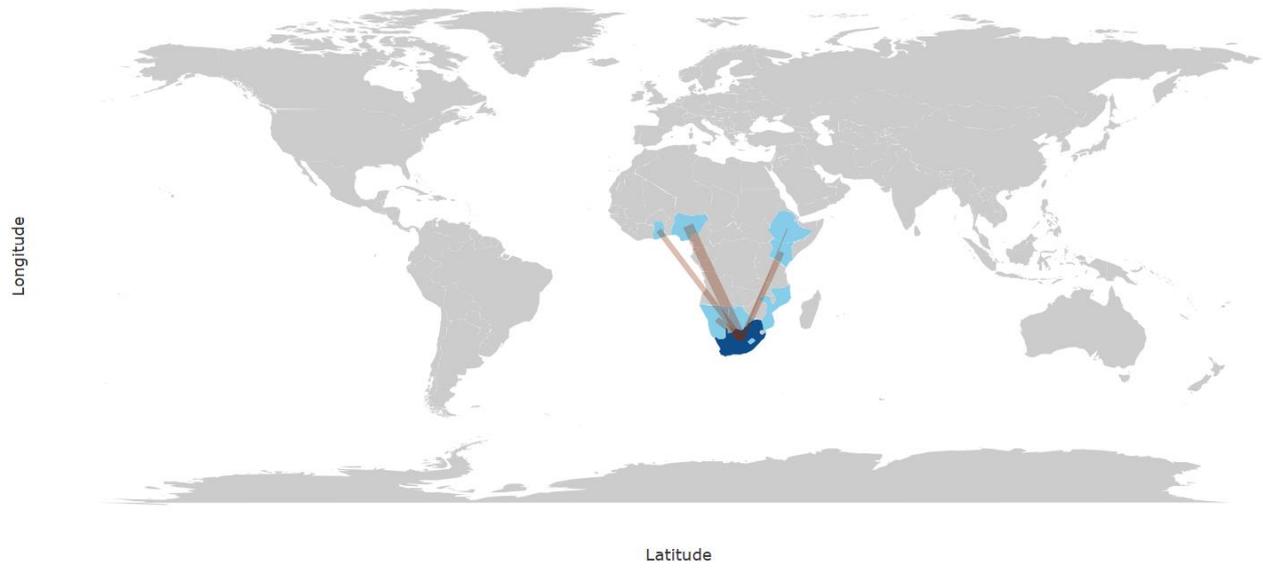
Figure 7. Countries' Collaboration World Map.
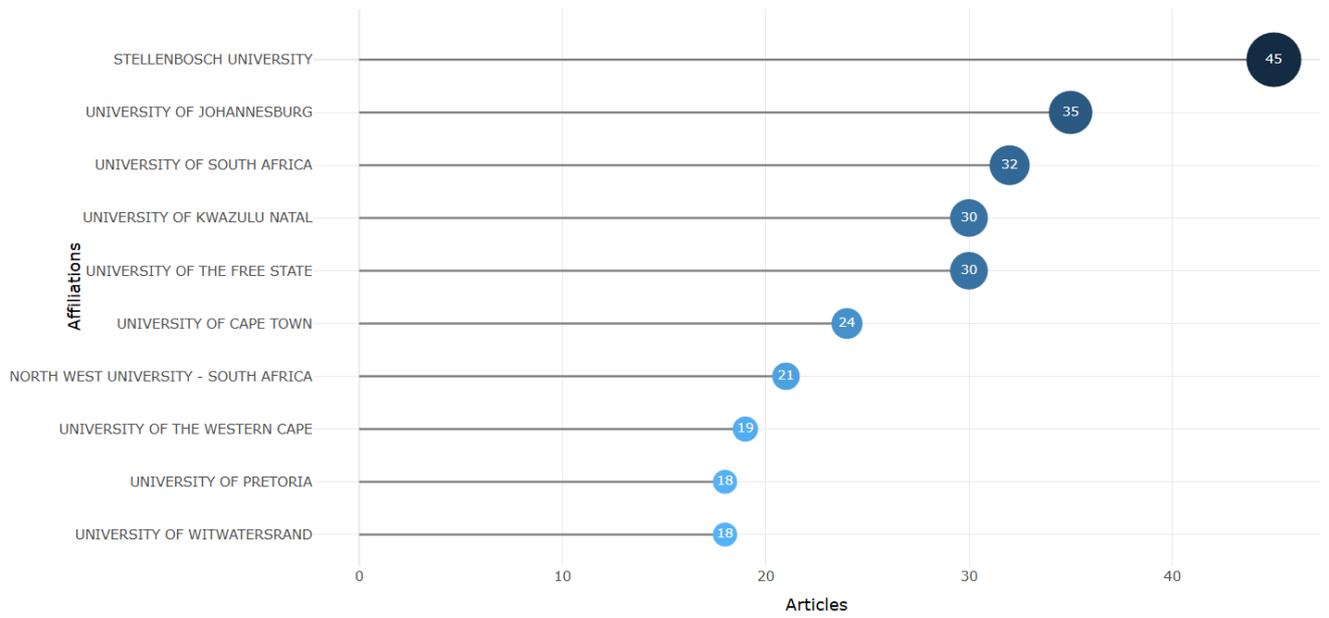
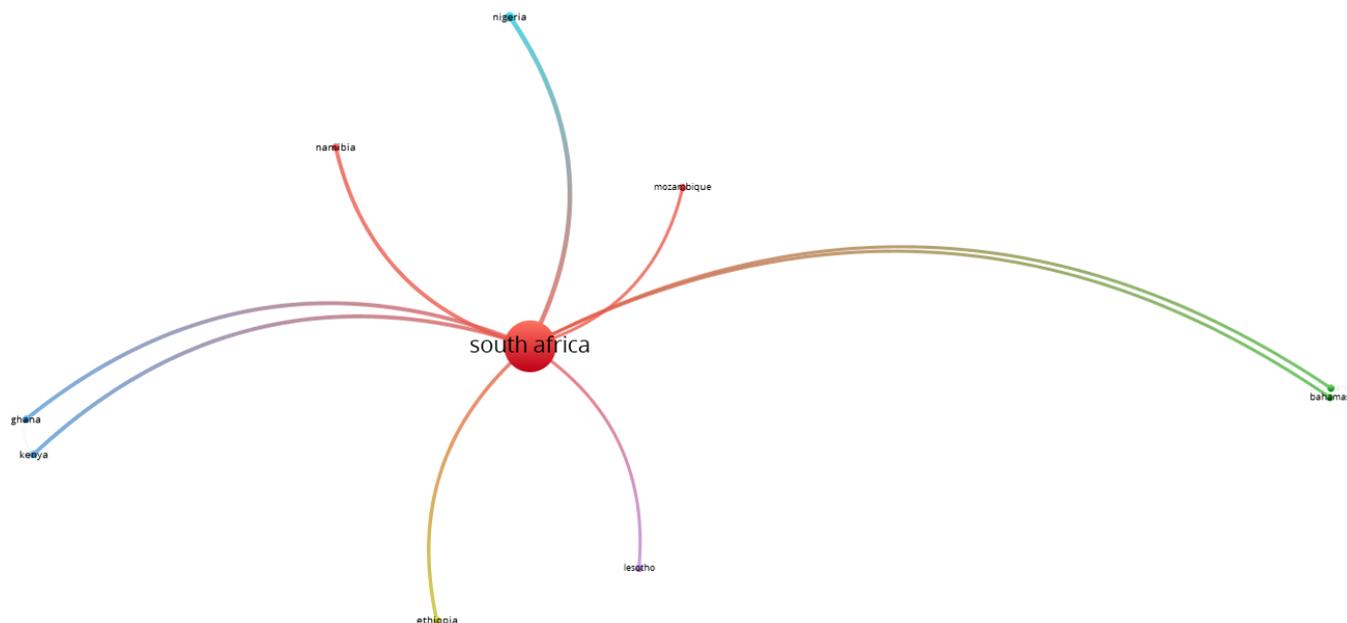**Figure 8.** Most relevant affiliations.
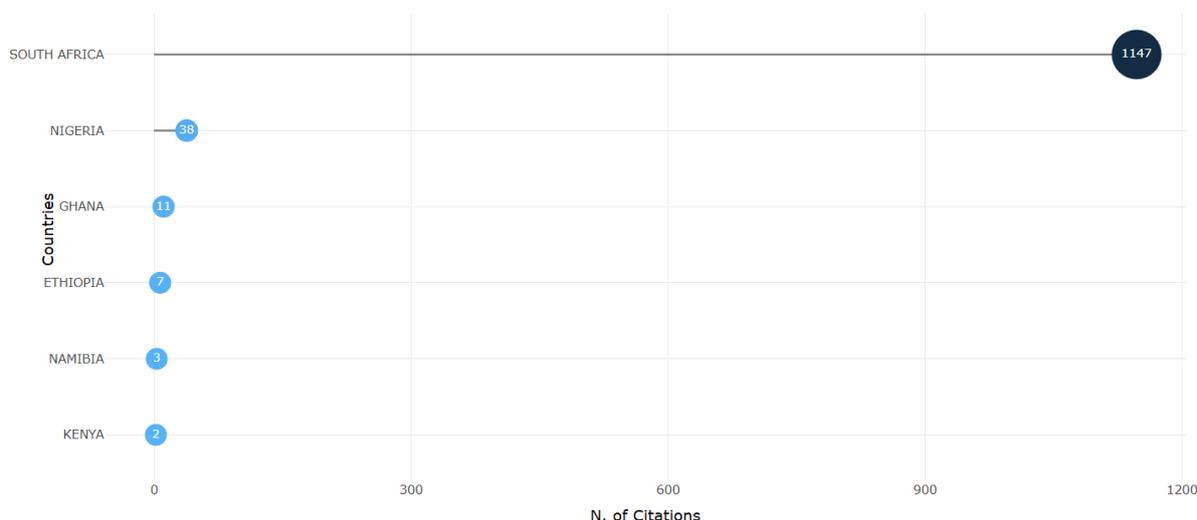
Figure 9. Co-Authorship by country.

Figure 10. Most cited countries.

Citation, Co-occurrence, and Thematic Analysis

Citation analysis provides insights into the intellectual influence of journals and publications within the research field. Figure 5 identifies the most cited documents, while Figure 12 illustrates the journals that exert the greatest citation impact. The findings indicate that journals specialising in educational technology, innovation studies, and entrepreneurship research dominate the citation landscape. Highly cited publications typically focus on the transformative potential of AI in teaching and learning, digital entrepreneurship education models, and curriculum redesign in response to technological change. The prominence of these journals reflects the interdisciplinary nature of the field, where contributions span multiple academic domains including education, management, digital innovation, and technology studies. This interdisciplinary orientation highlights the complex and multifaceted nature of curriculum transformation in the digital era. The keyword co-occurrence network generated using VOSviewer reveals several interconnected thematic clusters that shape the research landscape. The largest cluster centres on education and higher education, linking key concepts such as students, teachers, institutions, and knowledge, which indicates that the literature is strongly grounded in higher education systems and pedagogical contexts. A second cluster focuses on student experiences and perceptions, including themes such as graduate employability, learning outcomes, and the impact of educational practices, suggesting an emphasis on how students engage with evolving educational environments. A third cluster highlights policy and socio-institutional dynamics, incorporating keywords such as policy, justice, capabilities, and coloniality, reflecting growing scholarly interest in issues of educational equity, governance, and transformation within higher education. Finally,

a smaller but interconnected cluster relates to student wellbeing and performance, linking terms such as stress, emotions, resilience, and academic performance. Together, these clusters illustrate that the literature is characterised by an interdisciplinary focus on higher education transformation, student development, institutional policy, and socio-cultural dynamics shaping contemporary educational systems.

Figure 11. Thematic Evolution.

Figure 12. Citation by sources.

Figure 13. Keywords occurrences.

Analysis summary

The diagram titled *"Bibliometric Analysis"* provides an overview of the methodological framework used in bibliometric research. It integrates four key components: methods, analysis design, software, and outcomes. The methods section distinguishes between *backward* and *forward* analysis and includes techniques such as citation, co-citation, bibliographic coupling, and co-authorship. These are complemented by content analysis approaches conventional, directed, and summative which add qualitative interpretation. The analysis design centres on *bibliometric analysis* leading to *visualisation* and *content analysis*, showing how quantitative data can be translated into conceptual insights. The software tools listed such as Excel, BibExcel, Sitkis, HistCite, VOSviewer, CiteSpace, Gephi, UCINET, and iGraph support different stages of analysis and visualisation. Finally, the outcomes illustrate what each approach yields: identifying top articles and journals, mapping intellectual structures, tracking knowledge diffusion and development over time, detecting emerging literature, analysing collaboration impact, and revealing conceptual dynamics. Overall, the figure demonstrates how bibliometric analysis combines methodological rigour with data visualisation and software tools to produce a holistic understanding of research landscapes and scholarly influence.
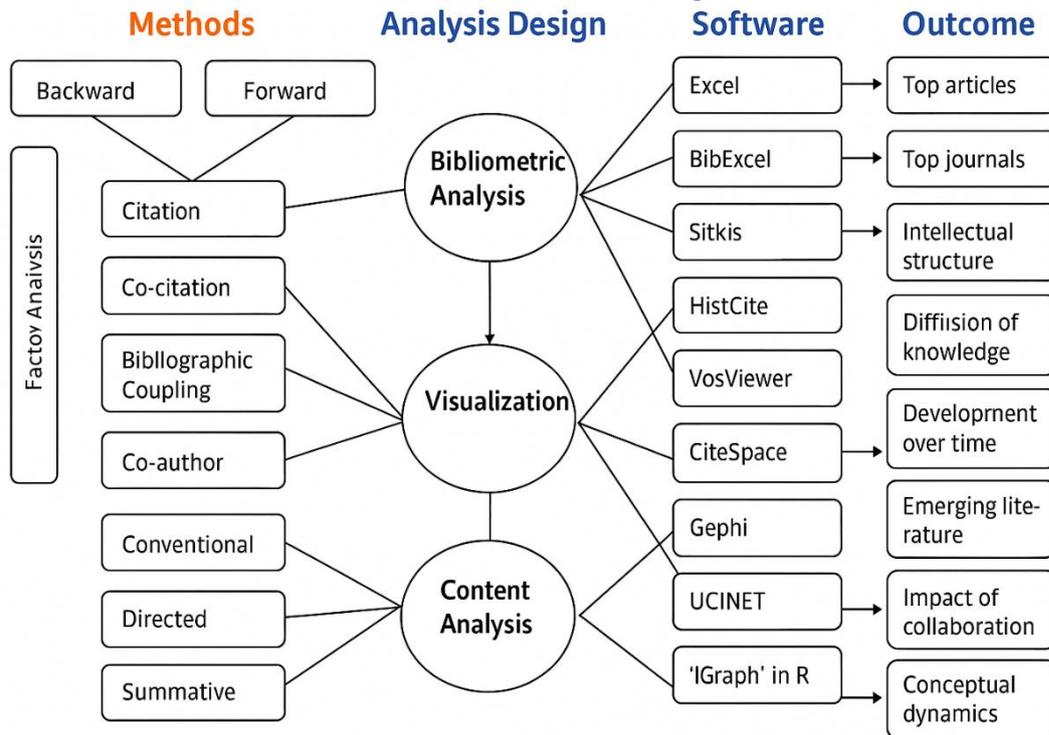
Bibliometric Analysis

Figure 14. Bibliometrics summary.

The diagram illustrates how VOSviewer functions in bibliometric analysis (see Figure 15 below). It connects various methods such as citation, co-authorship, and co-citation with the software's analytical role. Within the analysis design, VOSviewer facilitates network visualisation and mapping. The resulting outcomes include cluster analysis, mapping of research networks, heatmaps, and temporal analysis, which together reveal collaboration intensity, thematic structures, and the evolution of research over time.
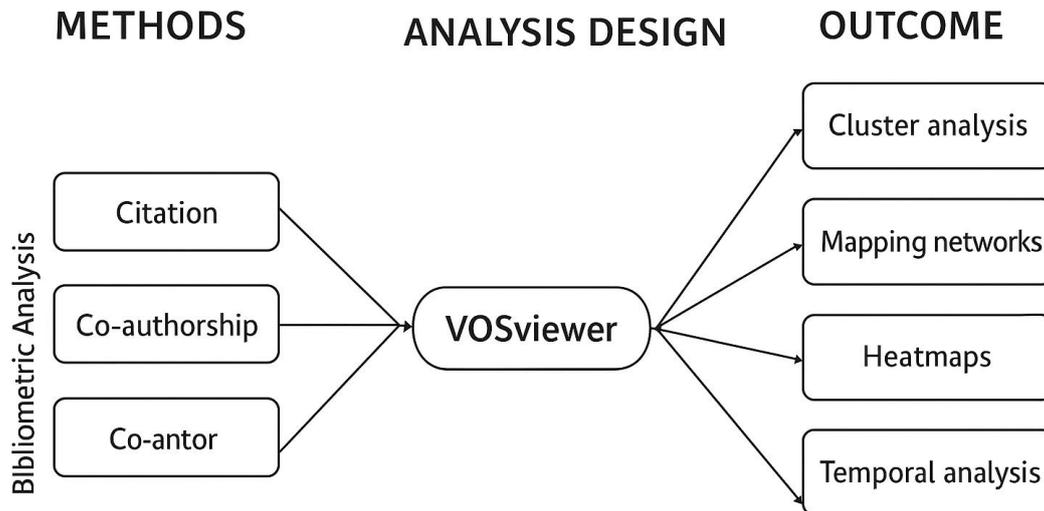
Figure 15. VOS summary.

Results

The qualitative thematic synthesis conducted on the bibliometric dataset identified four dominant thematic domains describing how artificial intelligence is being incorporated into entrepreneurship education and curriculum design in higher education institutions within the Global South. These themes emerged from the analysis of keyword co-occurrence patterns, publication content, and cluster relationships identified through the bibliometric mapping process.

AI-Driven Pedagogical Innovation

The first theme identified in the dataset relates to the use of artificial intelligence technologies to support pedagogical innovation in entrepreneurship education. The analysed studies report the increasing use of AI-enabled educational technologies such as intelligent tutoring systems, adaptive learning platforms, machine learning analytics, and generative AI tools to support teaching and learning processes (Scholtz, 2020). Several publications describe the integration of personalised learning environments that allow course content and learning activities to be adjusted according to individual student performance and engagement patterns (Matiki et al., 2023; Dlamini, Bayaga & Moyo, 2021). These AI-supported systems are used to generate automated feedback, monitor learner progress, and provide customised learning pathways within entrepreneurship programmes. The literature also reports the use of AI-based analytics to track student participation, evaluate learning behaviour, and support real-time instructional adjustments by educators (Mkhwanazi et al., 2021; Govender, 2022). In addition, a number of studies highlight the use of digital simulation environments, virtual entrepreneurship labs, and AI-supported case analysis tools that allow students to experiment with entrepreneurial decision-making in controlled digital environments. These platforms are used to simulate market scenarios, financial modelling, and venture development processes within entrepreneurship curricula.

Curriculum Transformation and Digitalisation

The second theme emerging from the analysis concerns curriculum transformation and the digitalisation of entrepreneurship education programmes. Publications within this cluster report the restructuring of course content, programme design, and assessment methods to incorporate artificial intelligence competencies and digital entrepreneurship skills (Rambe, 2023; Simba et al., 2024). The literature indicates that several higher education institutions have introduced new curriculum components focusing on AI literacy, data-driven decision-making, algorithmic thinking, and digital innovation (Mpungose, 2020). In many cases, these curriculum changes involve the integration of interdisciplinary modules combining entrepreneurship, information technology, and digital innovation studies. The analysed studies also report the use of digital platforms for course delivery, including learning management systems, virtual incubators, and online innovation labs that support collaborative project development (Pitan & Muller, 2019; Mukwambo, 2021;). Assessment practices reported in the literature include digital portfolios, AI-assisted feedback systems, and project-based entrepreneurial assignments conducted through online collaboration platforms (Dzamesi & van Heerden, 2020; Dubay & Richards, 2024). In addition, Dubay & Richards (2024) describe the redesign of entrepreneurship curricula to incorporate experiential learning activities supported by digital technologies, including virtual business simulations, digital venture creation projects, and online innovation challenges.

Entrepreneurship Education in the Global South

A third thematic domain emerging from the analysis relates to the contextual implementation of AI-supported entrepreneurship education within Global South higher education systems. Publications within this cluster document the institutional, infrastructural, and policy environments influencing the adoption of digital and AI-enabled educational practices (Nongqwenga & Funda, 2024). The literature reports variations in digital infrastructure availability across institutions, including differences in internet connectivity, access to digital learning platforms, and availability of AI-enabled educational technologies (Pika, 2024). Several studies identify disparities between urban and rural institutions with respect to technological resources and institutional readiness for digital transformation (Lynn et al., 2020; Omweri, 2024). Other publications describe institutional initiatives aimed at introducing digital entrepreneurship training programmes and technology-supported innovation ecosystems within universities (Şahin & Ozturk, 2019; Hanumantharaju & Sivakumar, 2024). These initiatives include partnerships with technology companies, innovation hubs, and entrepreneurship incubators designed to support digital venture development among students (Banele, Gomera & Kabelele, 2023). The studies also document the introduction of national and institutional strategies aimed at strengthening digital capacity in higher

education systems, including initiatives to expand digital infrastructure, develop technology-enabled teaching practices, and integrate emerging technologies into academic programmes (Aleryani, 2024).

Innovation Ecosystems and Research Collaboration Networks

The fourth theme emerging from the dataset concerns the development of innovation ecosystems and collaborative research networks associated with digital entrepreneurship education. Bibliometric mapping of co-authorship and institutional collaborations reveals increasing levels of international research cooperation within this field. The collaboration networks indicate partnerships between universities, research centres, and technology institutions across multiple regions. Several publications report joint research initiatives, collaborative curriculum development projects, and cross-institutional entrepreneurship education programmes supported through international partnerships (Christiansen, Juebei & Xiangyun, 2023). In addition, the literature describes the development of university-based innovation ecosystems that connect entrepreneurship education programmes with technology incubators, start-up accelerators, and industry partners (Maritz, Nguyen & Ivanov, 2022; Rambe & Hinson, 2024). These ecosystems are used to support student innovation projects, technology transfer activities, and digital venture creation initiatives (Aleryani, 2024). Network analysis also identifies a number of institutional clusters engaged in collaborative research related to artificial intelligence in higher education, entrepreneurship education, and digital innovation. These collaborations frequently involve partnerships between institutions in the Global South and Global North.

Discussion

The discussion reveals a dynamic intersection between Artificial Intelligence (AI), curriculum transformation, and entrepreneurial pedagogy in South African higher education. The literature underscores a growing institutional awareness of how AI-driven pedagogical innovation redefines traditional teaching frameworks while fostering creativity and problem-solving in entrepreneurship education (Bayaga, 2025). Within this context, AI tools function not merely as instructional aids but as catalysts for rethinking the epistemic and structural foundations of curricula. This shift supports the view that teaching and learning are evolving into more adaptive, data-driven, and learner-centred processes that align with the demands of the Fourth Industrial Revolution (Walwyn & Combrinck, 2025). However, as Luckett (2025) cautions, the integration of technology within curriculum reform must be situated within a decolonial framework that resists reproducing Eurocentric epistemologies. Studies on decoloniality and curriculum reform demonstrate that the historical residues of colonial education policy continue to influence knowledge hierarchies, thereby constraining efforts toward epistemic justice. This is consistent with Walker (2024), who calls for a capabilitarian approach that foregrounds equity, justice, and social inclusion as the foundation for curriculum innovation. Similarly, Koopman and Koopman (2025) identify the neoliberal technological epoch as a double-edged force expanding access to digital education while reinforcing market-oriented logics that often overlook contextual needs in the Global South.

Curriculum transformation efforts are particularly salient in the South African context, where educators and policymakers grapple with aligning pedagogical innovation with social justice imperatives. Erasmus and Bloem (2025) highlight how transformative developmental curricula, particularly in social work education, can promote equity and justice in highly unequal societies. Their findings resonate with Senekal's (2025) notion of "curriculum-in-motion," which advocates for learning grounded in community-based participatory research and lived experience. Both studies emphasise that meaningful curriculum reform must extend beyond policy rhetoric to embrace experiential, community-engaged pedagogies that reflect local realities. The role of technology and digitalisation in teacher education emerges as a critical enabler of transformation. Jita and Dhliwayo (2025) demonstrate how the use of tablets and design-based research frameworks fosters professional growth among teacher educators through communities of practice. This aligns with Bayaga (2025), who advocates for AI-enhanced pedagogical innovations that personalise learning experiences and support continuous professional development. Yet, the digital divide persists as a major constraint. Studies such as Mdodana-Zide and Chimbi (2025) and Govender (2025) show that rural and under-resourced ecosystems face persistent infrastructural barriers that hinder sustainable technology integration.

Institutional readiness and professional development remain recurrent challenges in the literature. Mkhwanazi et al. (2025) and Pillay (2025) both examine the Jika iMfundo initiative, revealing that while curriculum tracking and structured professional development programmes are designed to improve learning outcomes, their effectiveness is often limited by superficial compliance rather than genuine pedagogical engagement. Teachers frequently perceive such interventions as administrative exercises rather than opportunities for reflective practice and growth.

Similarly, Moyo, McKenna, and Ndebele (2025) observe that many university teaching grants are spent on projects grounded in common-sense assumptions rather than robust pedagogical theory, limiting their transformative potential. In the field of entrepreneurship education, collaborative ecosystems and international partnerships are emerging as crucial drivers of innovation. America and Neethling (2025) illustrate how activity theory-informed collaborations between South African and Dutch students enhance entrepreneurial awareness through experiential, cross-cultural engagement. This form of digital collaboration not only bridges the theory-practice divide but also strengthens global learning networks an observation echoed in the bibliometric mapping of growing North-South research partnerships. Such initiatives underscore that collaboration, when rooted in mutual learning and contextual sensitivity, can significantly enrich entrepreneurial education.

Bouwer (2025) and Pitan and Muller (2025) further contextualise these dynamics within broader higher education reform. Bouwer's study on decolonising tourism curricula highlights the necessity of stakeholder engagement, contextualisation, and multilingualism in shaping inclusive and responsive programmes. Similarly, Pitan and Muller (2025) underscore the importance of aligning employability development with curriculum design, ensuring that higher education responds effectively to evolving labour market demands. Together, these perspectives reveal that curriculum transformation in South Africa must be multi-layered integrating AI-driven innovation, decolonial reorientation, and contextually grounded employability strategies. Finally, the management of student success within restructured curricula also warrants attention. Ogude et al. (2025) illustrate how Extended Curriculum Programmes (ECPs) can promote access and equity through structured student support systems such as the Mamelodi Referral System. These models highlight that pedagogical innovation, and digital transformation must operate in tandem with student-centred management systems to ensure sustainable impact. Collectively, the reviewed studies reaffirm that AI and digitalisation hold transformative potential for South African higher education. However, their success depends on the coalescence of technological capacity, decolonial intent, institutional readiness, and inclusive collaboration across all levels of the educational ecosystem. The bibliometric findings reveal three major research trajectories in the field. First, scholarship increasingly focuses on the integration of artificial intelligence within entrepreneurship education as a driver of pedagogical innovation. Second, a growing body of literature addresses curriculum transformation and digitalisation within higher education institutions. Third, research emerging from Global South contexts highlights structural challenges such as digital infrastructure limitations, policy gaps, and unequal access to technological resources. These trends suggest that the intersection of AI and entrepreneurship education is evolving as a multidisciplinary field shaped by technological, institutional, and socio-economic factors.

Implications

Theoretical Implications

The findings reinforce the need to advance theoretical frameworks that integrate AI-enhanced pedagogy with decolonial and context-sensitive approaches to curriculum design. The studies reviewed highlight gaps in conventional pedagogical theories, which often fail to account for socio-economic, infrastructural, and epistemic inequities prevalent in Global South contexts (Luckett, 2025; Walker, 2024). Incorporating activity theory, design-based research, and critical pedagogy provides a nuanced lens to understand how AI and collaborative learning ecosystems mediate knowledge production, learner engagement, and entrepreneurial thinking (America & Neethling, 2025; Jita & Dhliwayo, 2025). Consequently, this body of work encourages scholars to develop hybrid theoretical models that simultaneously address technological affordances, social justice, and culturally responsive pedagogy.

Practical Implications

For practitioners, the findings highlight the critical need for structured, contextually relevant professional development that goes beyond superficial compliance and tick-box exercises. Teacher educators and higher education faculty require practical training in AI-driven pedagogy, collaborative learning platforms, and curriculum design frameworks to translate theoretical insights into classroom impact (Bayaga, 2025; Jita & Dhliwayo, 2025). The research also points to the value of leveraging international collaborations and experiential learning initiatives to cultivate entrepreneurial competencies, while simultaneously embedding local knowledge and sustainability practices (America & Neethling, 2025; Bouwer, 2025). Institutions should adopt adaptive and learner-centred management systems to monitor student progress and support successful implementation of digital and inclusive curricula (Ogude et al., 2025).

Policy Implications

The evidence underscores the importance of aligning national and institutional education policies with local realities to support effective curriculum transformation. Programmes such as Jika iMfundo and Extended Curriculum Programmes demonstrate that well-intentioned policy interventions may be undermined by misalignment between top-down mandates and teachers' classroom practices (Mkhwanazi et al., 2025; Pillay, 2025; Ogude et al., 2025). Policymakers should therefore prioritise consultative approaches that include educators and community stakeholders in designing and implementing curriculum innovations. Additionally, policies must facilitate equitable access to digital infrastructure, professional development resources, and AI-enabled tools to ensure that technology-driven initiatives do not exacerbate existing inequalities (Mdodana-Zide & Chimbi, 2025; Govender, 2025).

Limitations

While this study synthesises contemporary scholarship on AI-enhanced pedagogy and curriculum transformation, several limitations must be acknowledged. First, the focus on South African and select Global South contexts may limit the generalisability of findings to other regions with differing socio-political and infrastructural conditions. Second, the reliance on published studies from 2024 may exclude emerging interventions or informal practices that have not yet been captured in academic literature. Third, variations in research design, sample sizes, and methodological rigour across studies make it challenging to draw definitive causal conclusions. Finally, the review primarily considers English-language sources, potentially overlooking relevant research published in other languages or regional outlets.

Conclusion

This synthesis demonstrates that AI-driven pedagogical innovation, curriculum digitalisation, and collaborative learning ecosystems hold significant potential to transform higher education in the Global South. Successful implementation, however, requires integration of decolonial and context-sensitive approaches, robust policy alignment, and sustained professional development for educators. While challenges such as infrastructural inequities, superficial adoption of tools, and misalignment between policy and practice persist, evidence suggests that carefully designed interventions can enhance learner engagement, foster entrepreneurial competencies, and promote social justice. Ultimately, advancing higher education requires a multi-dimensional approach that simultaneously addresses technological, pedagogical, and socio-cultural factors, ensuring that innovation serves both learning outcomes and broader societal development goals.

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