# KNOWLEDGE MAPPING OF ARTIFICIAL INTELLIGENCE FOR QUALITY ASSURANCE AND ACCREDITATION IN HIGHER EDUCATION: A BIBLIOMETRIC ANALYSIS (2015–2025)

**Ahmet ADALIER[1], Damla KARAGOZLU[1], Kian JAZAYERI[1], Japheth Ahmed NUHU[2]**
[1] Department of Management Information Systems, Cyprus International University, Nicosia
[2] Department of Business Administration, Cyprus International University, Nicosia
aadalier@ciu.edu.tr, dkaragozlu@ciu.edu.tr, kjazayeri@ciu.edu.tr, jnuhu@ciu.edu.tr

## ABSTRACT

Artificial intelligence (AI), machine learning, natural language processing, and predictive analytics are increasingly used to enhance quality assurance, measurement, assessment, and accreditation processes. Despite this growing adoption, research on AI applications for quality assurance and accreditation remains fragmented across disciplines, including education, information science, and management. A sample of 362 papers from the Scopus database was subjected to bibliometric analysis using the VOSviewer program. Using a dataset of 362 documents, co-authorship and country-level analyses reveal highly interconnected networks, with leading contributors including Al-Ali, Maytha and Almourad, Mohamed Basel, and prominent collaboration hubs in China, the United States, and the United Kingdom. Keyword co-occurrence mapping identifies three major thematic clusters: AI and machine learning technologies, higher education and pedagogy, and quality-focused research, highlighting the interdisciplinary nature of the field. Co-citation and author citation analyses identify foundational sources, such as Assessment and Evaluation in Higher Education, and influential authors, including Apostolou, demonstrating the intellectual structure of the domain. The findings advance theoretical understanding of the integration between technological innovation, pedagogical practices, and institutional quality frameworks. Practically, the study provides guidance for institutions to leverage AI for quality assurance, enhance curriculum design, and foster international research collaborations. Future research should explore emerging AI applications in accreditation, examine evolving collaboration networks, and empirically assess the impact of AI-driven interventions on student outcomes and institutional performance.

**Keywords:** *Accreditation, Artificial intelligence, Bibliometric analysis, Higher Education, Quality Assurance*

## Introduction

The integration of Artificial Intelligence (AI) into higher education has reshaped approaches to teaching, learning, and institutional management (Mariam et al., 2024). AI tools such as machine learning, natural language processing, and predictive analytics are increasingly used to enhance quality measurement, assessment, and accreditation processes (Hutson & Plate, 2023). These technologies facilitate objective evaluation of educational performance, automate quality assurance mechanisms, and support evidence-based decision-making for academic improvement (Chhetri, 2024). Consequently, AI has emerged as a critical enabler of accountability and innovation within global higher education systems (Aithal & Maiya, 2023).

Despite this growing adoption, research on AI applications for quality assurance and accreditation remains fragmented across disciplines, including education, information science, and management (Ugrekhelidze, 2025). While existing studies have examined the pedagogical and technological aspects of AI, there is limited systematic mapping of its contributions to institutional quality frameworks. The lack of a comprehensive overview of research trends, leading authors, and thematic developments in this domain has created a knowledge gap. Moreover, the recent period until 2025 marks a critical phase in higher education's digital transformation, accelerated by the COVID-19 pandemic, necessitating a closer examination of how AI supports post-pandemic quality assurance initiatives (Öziskender & Erdem, 2025).

To address these gaps, this study performs a bibliometric analysis to map and evaluate global research on Artificial Intelligence for quality assurance and accreditation in higher education between 2015 and 2025. Specifically, the study seeks to answer the following research questions:

  

1. What is the publication trend and research productivity in this field during 2015–2025?
2. What are the main research themes and emerging topics based on keyword co-occurrence analysis?
3. Which authors, sources, and documents have most influenced the intellectual structure of this domain?

The study employs three bibliometric techniques: performance analysis, co-word analysis, and co-citation analysis, utilizing tools such as VOSviewer to visualize publication patterns, thematic clusters, and citation networks.

By offering a systematic overview of this emerging field, the study contributes to understanding how AI is shaping modern approaches to quality assurance and accreditation in higher education. The findings provide practical implications for researchers, policymakers, and accreditation bodies aiming to leverage AI for institutional excellence and continuous quality improvement.

**Data analysis**

Bibliometric analysis is a well-established approach for evaluating research output in a particular subject area (Zyoud & Zyoud, 2021). It involves mining databases to extract publication-related variables such as authorship, sources, geographical distribution, and various indicators (Zyoud et al., 2024). Bibliometrics is a crucial tool for quantitative analysis in science, used by academics, government agencies, librarians, and researchers to assess the effectiveness of research (Pessin et al., 2022). There is increasing use of bibliometric analysis to identify research trends in specific fields (Hassan & Duarte, 2024). Bibliometrics is the study and measurement of publication patterns across all forms of written communication and their authors (Haba et al., 2023). Through examining citation frequency, keyword frequency, authors, h-index, and publication types, bibliometric analysis offers valuable insights into targeted research fields. This study discusses and concludes and the context of artificial intelligence for quality assurance and accreditation in higher education while providing recommendations for future research directions.

**Method**

**Bibliometric mapping**

Bibliometric mapping facilitates the analysis of a discipline's history and structure, the dissemination of knowledge within the field, the impact of journals, and the citation status of publications over time (Gan et al., 2022). By integrating bibliometric mapping, one can visualize the most prolific authors, institutions, and nations within a specific topic for subsequent analysis, thus revealing trends in literature creation over time. This is essential for delineating and summarizing disciplines. Educational technology, as a dynamic field, requires reflection on its developmental trajectory, assessment of its present condition, and forecasts of forthcoming developments. As a result, bibliometric analysis has emerged as a distinctive analytical approach, garnering considerable interest and frequent use in the domain of educational technology in recent years, thereby becoming a focal point for numerous academics (Chen et al., 2021). Consequently, it serves as a suitable instrument for this analysis as it quantifies scientific activity and its consequences through the measurement of publications and citations attributed to an individual, research group, institution, or country.

**Database**

This study's bibliometric analysis began by identifying the databases utilised to search for research in the fields of Artificial Intelligence for quality assurance and accreditation in higher education. The database chosen for this research was Scopus. Scopus is an abstract and citation database comprising peer-reviewed scientific literature. Upon its inception, it comprised over 27 million publishing records

  

spanning from 1966 to 2004. As of the current writing, the database comprises approximately 76 million entries, encompassing publications from 1788 to 2019, positioning it as one of the largest curated bibliographic abstract and citation databases available today (Baas et al., 2020).

**Keyword identification**

Keyword identification is “a critical phase of bibliometric analysis”. A comprehensive list of keywords will “facilitate comprehensive and integrated queries, guaranteeing that the search exercise encompasses all research articles within the designated knowledge domain” (Kusumawat et al., 2024). In this study, the filters for search date, file type, and terms/keywords have been organized systematically. Research published between 2015 and 2025 on academic platforms in all areas was retrieved. The articles must include the terms ("Artificial Intelligence" OR "Machine Learning" OR "Learning Analytics") AND ("Higher Education" OR "Universities" OR Tertiary Education) AND ("Quality Assurance" OR "Accreditation" OR "Quality Measurement" OR "Quality Evaluation") in the title, abstract, or keywords across all fields. Articles written in languages other than English were excluded from the selection. The article title, abstract, and keywords were selected in the search section. A total of 362 published articles related to the keywords given above were accessed (Access date:11 November 2025). Articles were limited to all subject areas, document type was limited to “articles, conference papers, conference review and book chapters and articles” published only in the English language were retrieved. Subsequently, the complete record and cited references was downloaded in CSV file format for bibliometric mapping.

**Analysis**

This study conducted bibliometric analysis of 362 research publications to assess the scope and nature of contributions in the field.

**Co-authorship collaboration**

Figure 1 depicts the collaborative partnerships in co-authorship among authors. The initial filtering process involved applying a criterion that required a minimum of 2 documents by an author deemed to be relevant. Strong significant collaboration was observed among the targeted authors in this domain. The top 10 authors are reported in Table 1. The results of the co-authorship analysis show that Al-Ali, Maytha, Almourad, Mohamed Basel, Dawson, Shane P., Gašević, Dragan, Hussain, Mohammed Abdulla, Marks, Adam A., Rietsema, Kees, Rybiński, Krzysztof, and Samuel Mathew, Sujith Samuel were the most productive authors in the field under investigation.

Table 1: Publication trend (Authors Productivity-Co-authorship analysis)

| Author | Documents | Citations | Total Link Strength |
|---|---|---|---|
| Al-Ali, Maytha | 2 | 31 | 4 |
| Almourad, Mohamed Basel | 2 | 25 | 4 |
| Dawson, Shane P. | 2 | 66 | 3 |
| Gašević, Dragan | 2 | 79 | 1 |
| Hussain, Mohammed Abdulla | 2 | 25 | 4 |
| Marks, Adam A. | 2 | 31 | 4 |
| Rietsema, Kees | 2 | 31 | 4 |
| Rybiński, Krzysztof | 2 | 28 | 0 |
| Samuel Mathew, Sujith Samuel | 2 | 25 | 4 |

  

These authors not only contribute significantly in terms of publication volume but also appear prominently within the collaboration network, suggesting that they play influential roles in shaping the research landscape of this topic. Their recurring co-authorship links highlight their involvement in sustained research groups or cross-institutional partnerships.

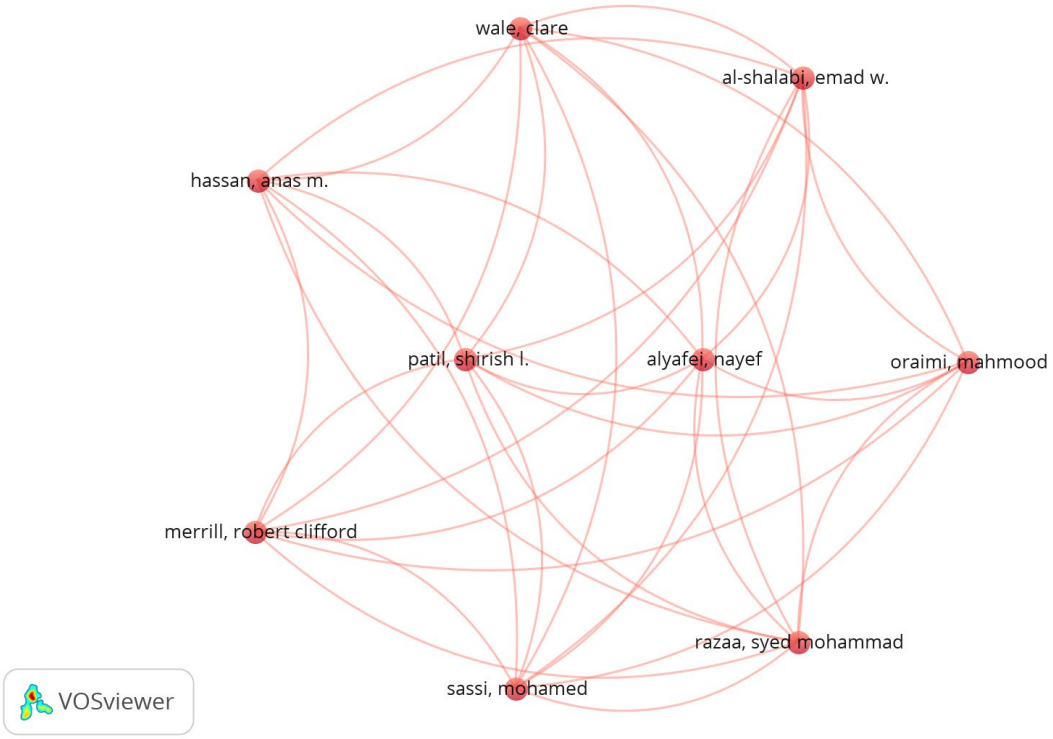


Figure 1: Authors Productivity (Co-authorship analysis)

This network-based analysis offers "an advanced analytical technique, as it visually maps interconnections, identifies key contributors", and reveals regional or cross-national trends in collaborative research. In addition, the analysis reveals collaboration dynamics that may affect both the quality and the heterogeneity of research outcomes.

The network map displayed distinct clusters, each represented by a certain colour. While the strength of collaborative ties was reported to be higher within the clusters, researchers from other clusters collaborated to publish research material in this field (see Table 2).

The country-level co-authorship analysis shows that research on AI-driven quality assurance in higher education is highly internationalized, with notable differences in productivity and collaboration. China leads in research output with 106 documents and 693 citations, although its collaboration intensity is moderate (total link strength 18). The United States and the United Kingdom, despite having fewer publications than China, demonstrate the strongest international connections, with total link strengths of 25 and 20, respectively, underscoring their central roles in global knowledge exchange.

Saudi Arabia, India, Spain, Germany, and the United Arab Emirates also exhibit substantial involvement, characterized by a moderate publication volume and strong collaborative ties. Countries such as Australia and Indonesia contribute to the field but exhibit lower levels of collaboration. Overall, the results indicate that North America, Europe, and parts of Asia serve as key hubs in the global collaboration network, driving cross-border partnerships and advancing research in this domain (see Figure 2).

  

Table 2: Co-authorship of countries

| Country | Documents | Citations | Total Link Strength |
|---|---|---|---|
| Australia | 10 | 139 | 3 |
| China | 106 | 693 | 18 |
| Germany | 12 | 90 | 10 |
| India | 25 | 115 | 12 |
| Indonesia | 12 | 79 | 2 |
| Saudi Arabia | 19 | 196 | 19 |
| Spain | 15 | 51 | 13 |
| United Arab Emirates | 10 | 107 | 13 |
| United Kingdom | 22 | 207 | 20 |
| United States | 37 | 269 | 25 |

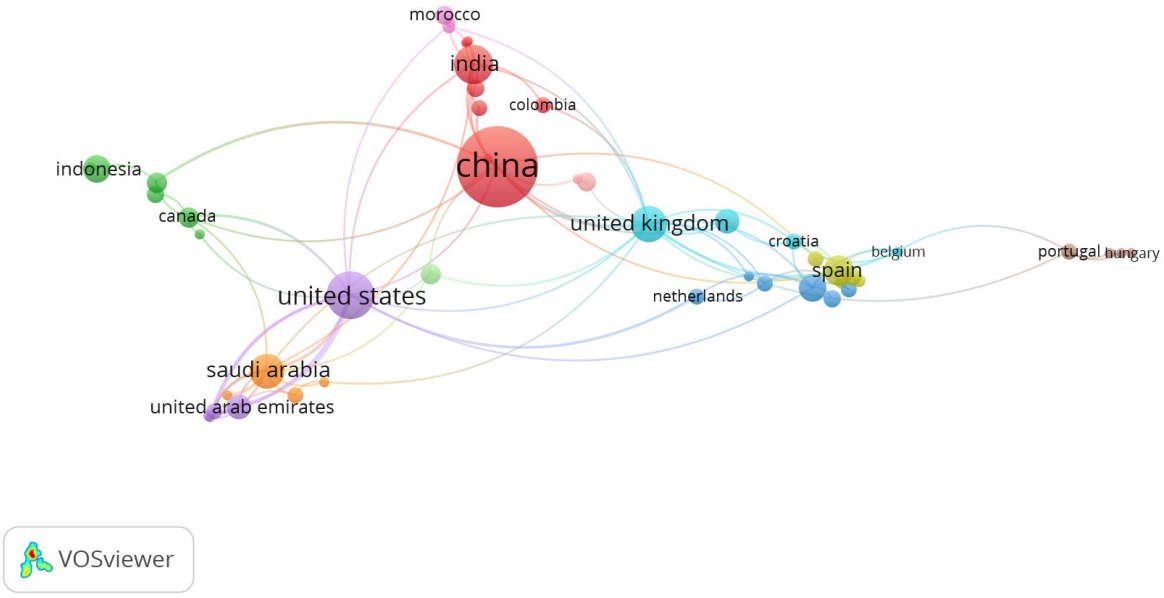


Figure 2: Countries' Contribution

**Co-occurrence network of all keywords**

The primary objective of examining keyword co-occurrence using network visualization is to explore the interconnectedness of terms scholars use in a specific research field. This study seeks to understand the whole knowledge framework of this topic. Accordingly, VOSviewer was utilized to produce a network graph that facilitates a visual analysis of term co-occurrence.

Co-occurrence analysis of all keywords was applied to conceptualize the development and growth of selected keywords as indicated in the "Keyword Identification" section of this manuscript. Following

  

Anas et al. (2023), a minimum threshold of 10 for the co-occurrence of a particular keyword was required and filtered to arrive at a meaningful analysis. 42 keywords met the requirement.

The keyword co-occurrence analysis reveals the thematic structure of research linking artificial intelligence and quality assurance in higher education. Artificial Intelligence is the most dominant term, appearing 130 times with the highest total link strength (511), indicating its central role in connecting all other concepts. Closely related terms such as Machine Learning (74 occurrences; TLS 277) and Engineering Education (51 occurrences; TLS 244) highlight the strong technological and applied education focus within the field (see Table 3).

Keywords related to the educational context; Higher Education (61 occurrences; TLS 263), High Educations (46; TLS 262), Students (89; TLS 485), and Teaching (68; TLS 375) form another major cluster, reflecting the consistent emphasis on learner-centered and pedagogical applications of AI. Meanwhile, quality-related terms such as Quality Assurance (81 occurrences; TLS 359), Quality Control (84; TLS 449), and Quality Evaluation (46; TLS 251) represent a strong cluster, showing the field's focus on institutional quality processes (see Figure 3).

The network suggests that research in this area is organized around three interconnected themes: AI/ML technologies, educational practices, and quality assurance mechanisms. The strong link strengths across these clusters indicate a highly integrated and evolving research landscape. Figure 4 illustrates research themes and emerging topics over the years.

Table 3: main research themes and emerging topics (Co-occurrences Analysis)

| Keyword | Occurrences | Total Link Strength |
|---|---|---|
| Artificial Intelligence | 130 | 511 |
| Engineering Education | 51 | 244 |
| High Educations | 46 | 262 |
| Higher Education | 61 | 263 |
| Machine Learning | 74 | 277 |
| Quality Assurance | 81 | 359 |
| Quality Control | 84 | 449 |
| Quality Evaluation | 46 | 251 |
| Students | 89 | 485 |
| Teaching | 68 | 375 |

  

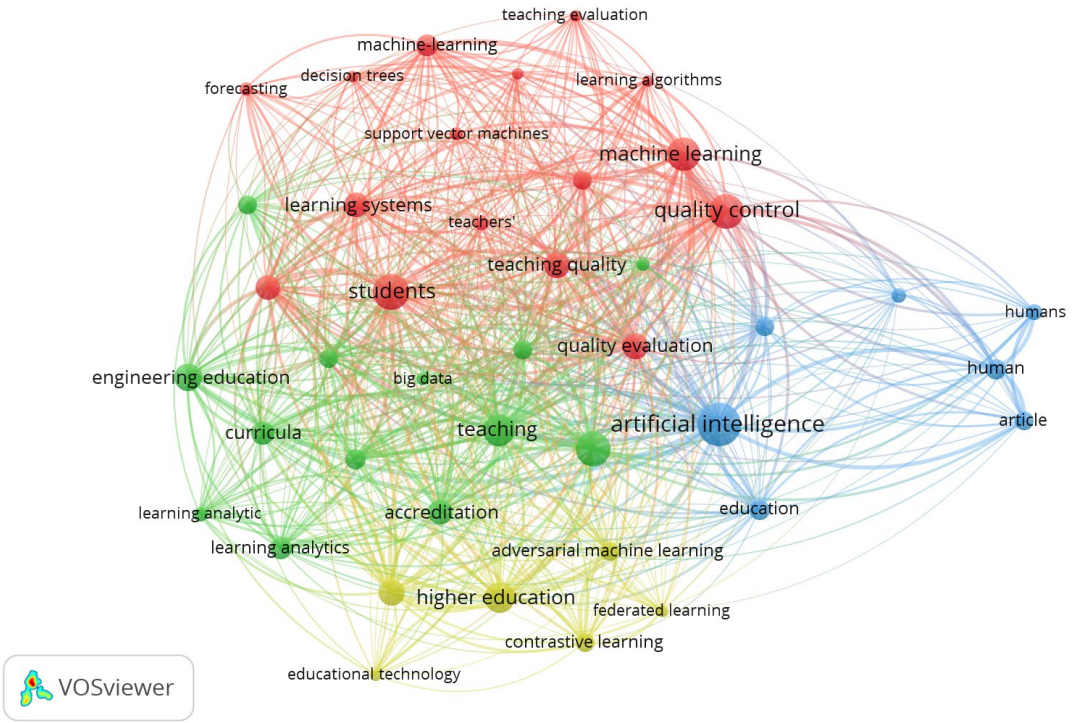


Figure 3: Research themes and emerging topics (Co-occurrences Analysis)

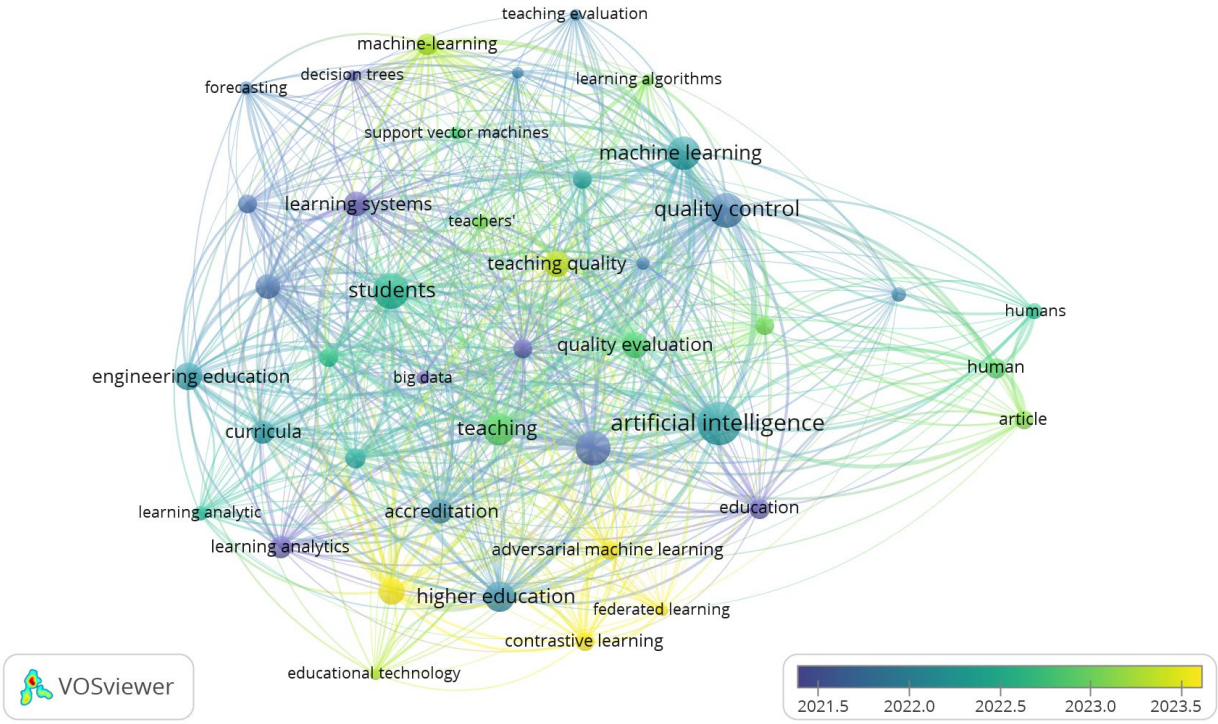


Figure 4: Themes and emerging topics over the years

  

**Most cited sources**

The co-citation analysis indicates that the field is strongly shaped by higher education and technology-focused journals. Assessment and Evaluation in Higher Education is the most influential source, with 7 citations and the highest link strength (9), followed by Higher Education, which has 7 citations (TLS 4). Technology-related journals such as Computers and Education (6 citations, TLS 4) and Education Sciences (4 citations, TLS 4) also play key roles, reflecting the integration of AI and digital learning research (see Table 4).

Discipline-specific sources such as Journal of Chemical Education (5 citations, TLS 5) and Journal of Engineering Education (7 citations, TLS 3) offer additional but more specialized contributions. Other journals, including ACM International Conference Proceedings Series and Sustainability (Switzerland) (each 5 citations), serve supporting roles, while sources with low link strength remain peripheral. The citation pattern underscores the dominance of quality assurance and technology-enhanced learning literature in shaping this research area (see Figure 5).

Table 4: Productivity trend- Most cited sources (Co-citation)

| Source | Citations | Total Link Strength |
|---|---|---|
| Acm International Conference Proceeding Series | 5 | 2 |
| Assessment And Evaluation In Higher Education | 7 | 9 |
| Computers And Education | 6 | 4 |
| Education Sciences | 4 | 4 |
| Higher Education | 7 | 4 |
| International Journal Of Radiation Oncology Biology Physics | 5 | 0 |
| Journal Of Accounting Education | 5 | 0 |
| Journal Of Chemical Education | 5 | 5 |
| Journal Of Engineering Education | 7 | 3 |
| Sustainability (Switzerland) | 5 | 4 |

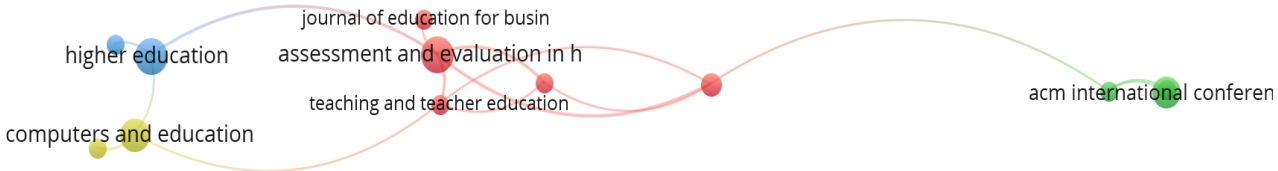


Figure 5: Productivity trend (Most cited sources-Co-citation Analysis)

**Most cited authors**

Co-citation analysis of most influential authors was performed. The minimum document of an author was determined to be 3, 25 authors met the requirement. The analysis of the most cited authors shows that influence within this research domain is concentrated among a few key contributors. Apostolou and Barbara A. stand out with 5 citations each and the highest total link strength (25), indicating that their work is not only frequently cited but also strongly connected to other influential studies. Authors such

  

as Cojocaru A. and Dorian (both 4 citations, TLS 16) also play significant roles, reflecting solid integration within the broader scholarly network.

Other authors, including Fie (6 citations, TLS 9) and Romero (4 citations, TLS 9), contribute a moderate influence with notable connections across related publications. In contrast, authors like John T. (4 citations, TLS 0) and M. (3 citations, TLS 3) appear more peripheral, showing fewer co-citation linkages despite being cited. Overall, the pattern suggests a core group of highly interconnected scholars driving the intellectual structure of the field (see Table 5). Figure 6 present a graphical representation of most influential authors.

Table 5: Citation analysis of influential authors

| Author | Citations | Total Link Strength |
|---|---|---|
| Apostolou | 5 | 25 |
| Barbara A. | 5 | 25 |
| Brown | 5 | 5 |
| Cojocaru A. | 4 | 16 |
| Dorian | 4 | 16 |
| Educon | 4 | 7 |
| Fie | 6 | 9 |
| John T. | 4 | 0 |
| M. | 3 | 3 |
| Romero | 4 | 9 |

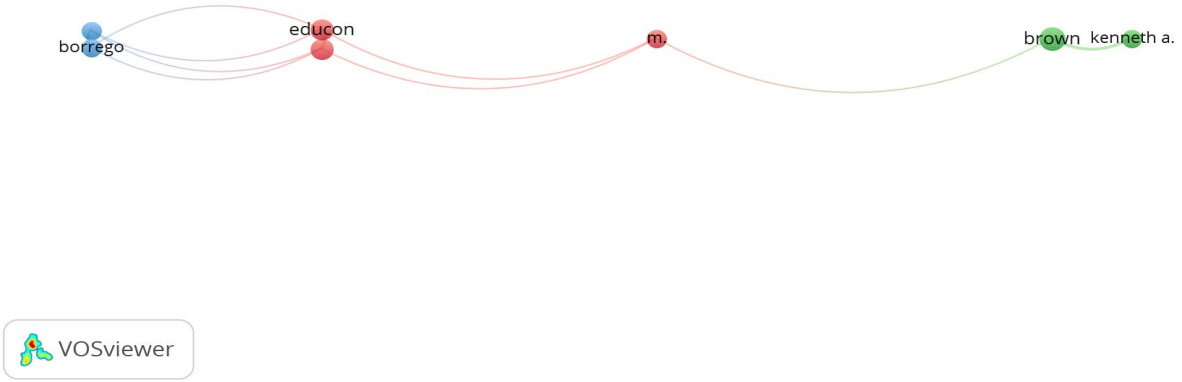


Figure 6: Influential authors (Co-citation of authors)

  

## Discussion

The bibliometric analysis reveals a highly interconnected and interdisciplinary research landscape on AI, machine learning, and learning analytics in higher education quality assurance. Co-authorship analysis highlights strong collaboration among scholars, with leading contributors such as Al-Ali, Maytha and Almourad, Mohamed Basel driving research development. At the country level, China leads in publication volume (106 documents, 693 citations), while the United States (37 documents, TLS 25) and the United Kingdom (22 documents, TLS 20) demonstrate the strongest international collaboration, indicating the presence of global knowledge hubs.

Keyword co-occurrence mapping identifies three major thematic clusters: AI and machine learning technologies (Artificial Intelligence, Machine Learning), higher education and pedagogy (Higher Education, Students, Teaching), and quality-focused research (Quality Assurance, Quality Control, Quality Evaluation). Co-citation and author citation analyses reveal the foundational literature and influential authors shaping the field, including Assessment and Evaluation in Higher Education (7 citations, TLS 9) and Apostolou (5 citations, TLS 25). Overall, research in this area demonstrates a synergistic integration of technology, pedagogy, and institutional quality management.

## Theoretical Implications

The findings advance theoretical understanding by highlighting the integration of technological and quality frameworks, the role of collaborative networks in knowledge creation, and the value of interdisciplinary approaches. These insights suggest that AI-driven interventions in higher education can be conceptualized through combined models of technological innovation, pedagogical improvement, and institutional quality assurance.

## Practical Contributions

For practitioners, the study offers several actionable insights. Institutions can leverage global collaboration networks and influential research to guide AI adoption for quality assurance and accreditation. The prominence of student- and teaching-related keywords underscores the potential for integrating AI and learning analytics into curricula to enhance learning outcomes. Additionally, identifying productive countries and authors supports international partnerships and collaborative research initiatives.

## Future Research Directions

Future studies should examine emerging AI applications in quality measurement and accreditation, explore the evolution of co-authorship and country networks over time, and develop interdisciplinary theoretical models combining AI, pedagogy, and quality assurance. Empirical research linking AI-driven interventions to student outcomes and institutional accreditation will further validate and extend the insights from this bibliometric mapping.

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