

Emerging trends in educational research methodology: A bibliometric perspective

Abas Oya¹, Prasetyawan Aji Sugiharto², Abdah³, Defy Gustianing⁴

Abstract

Background/purpose. Educational research methodology has experienced rapid development in response to digital transformation, artificial intelligence (AI), and the increasing demand for evidence-based educational research. Recent educational studies demonstrate a growing tendency toward review-based and technology-supported research approaches. Therefore, this study aims to analyze publication trends, influential publications, thematic structures, and emerging trends in Educational Research Methodology during the period 2020–2026 using a bibliometric perspective.

Materials/methods. This study employed a bibliometric research design using a quantitative descriptive approach. Data were collected from Google Scholar through the Publish or Perish (PoP) application using several methodology-related keywords. A total of 500 publications were initially retrieved, and all publications were analyzed using Microsoft Excel and VOSviewer software for citation analysis, co-occurrence mapping, network visualization, overlay visualization, and density visualization.

Results. The findings indicate a substantial increase in publications related to Educational Research Methodology, with the highest publication frequency recorded in 2025 (170 publications; 34.00%) and the lowest in 2020 (12 publications; 2.40%). Citation and visualization analyses reveal that bibliometric analysis, systematic literature review (SLR), PRISMA, and meta-analysis became the most dominant methodological approaches in recent educational research. Furthermore, terms related to artificial intelligence, STEM education, teaching, and learning emerged as increasingly interconnected research themes within educational methodology studies.

Conclusion. Educational research methodology is evolving toward more systematic, evidence-based, interdisciplinary, and technology-assisted research approaches. The dominance of bibliometric and systematic review methodologies indicates a substantial methodological transformation within educational research in the digital and AI era.

Research Article

Cite this article: Oya, A., & Sugiharto, P.A., Abdah, A., & Gustianing, D. (2026). Emerging trends in educational research methodology: A bibliometric perspective. *EDURE: International Journal of Educational Research And Evaluation*, 1(1), 40–52. <https://doi.org/xx.xxxx/xxxxx>

Received: May 27, 2026

Accepted: May 29, 2026

Published: May 31, 2026

Keywords: educational research methodology, bibliometric analysis, systematic literature review.

Author for correspondence:

Abas Oya

✉ abasoya@habi.ac.id

Authors Affiliation:

¹STKIP Harapan Bima, Indonesia

²Universitas Muhammadiyah Kendal Batang, Indonesia

³Universitas Muhammadiyah Palu, Indonesia

⁴Universitas Aisyah Pringsewu, Indonesia



**OPEN
ACCESS**

© The Author(s), 2026. This is an Open Access article, distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license.

1. Introduction

Educational research methodology plays a fundamental role in generating valid, systematic, and evidence-based knowledge within educational studies. The rapid transformation of education in the digital and artificial intelligence (AI) era has significantly influenced how educational research is designed, conducted, and interpreted. Contemporary educational problems increasingly require adaptive, interdisciplinary, and innovative methodological approaches capable of addressing complex educational phenomena and technological developments (Rahi, 2017; Taherdoost, 2022). In addition, the growing integration of digital technology, online learning systems, artificial intelligence, and data-driven decision-making has encouraged researchers to adopt more flexible and technology-oriented research methodologies in educational research (Javaid et al., 2023; Fitria, 2023). Consequently, educational research methodology is no longer limited to conventional quantitative and qualitative approaches but continues to evolve toward more dynamic, collaborative, and digitally supported research paradigms.

The evolution of educational research methodology can be observed through the increasing diversity of methodological approaches employed in educational studies. Previous studies highlighted that qualitative, quantitative, and mixed methods remain dominant paradigms in educational research, while newer approaches such as bibliometric analysis, systematic literature review, design thinking, engineering design process (EDP), and digital-based research methods are becoming increasingly prominent (Mohajan, 2018; Pregoner, 2024). Furthermore, the development of digital research environments has accelerated the emergence of methodological innovations involving artificial intelligence, augmented reality, virtual reality, learning analytics, and Internet of Things (IoT)-based educational research (Susilawati et al., 2025; Ismail et al., 2024). This transformation demonstrates that educational research methodology continues to adapt to contemporary educational needs and technological advancement, particularly in supporting innovation, problem-solving, and future-oriented educational practices.

Several previous studies have discussed educational research methodology from conceptual, practical, and instructional perspectives. For example, Tomaszewski et al. (2020) emphasized the importance of research planning and decision-making in qualitative studies, while Rahi (2017) focused on research paradigms, sampling techniques, and instrument development within educational research. Similarly, Susilawati et al. (2025) introduced methodological stages and practical research procedures in science and engineering education through the PHMEEDERID framework. Although these studies contributed significantly to understanding educational research methodology, most previous research primarily focused on explanatory or procedural discussions rather than systematically mapping the intellectual structure, thematic evolution, and emerging trends of educational research methodology studies. Moreover, limited studies have specifically examined how methodological approaches in educational research evolve alongside digital transformation and AI integration.

Bibliometric analysis provides a systematic approach for identifying publication trends, influential studies, thematic development, and intellectual structures within a particular research field (Al Husaeni & Nandiyanto, 2022). Through bibliometric mapping and visualization analysis, researchers can identify dominant methodologies, emerging themes, and future research directions within educational research methodology studies. Therefore, this study aims to analyze the publication trends, influential publications, thematic structures, and emerging trends in educational research methodology studies using a bibliometric perspective. This study is expected to contribute theoretically by providing a comprehensive mapping of educational research methodology development and practically by identifying future methodological opportunities in educational research within the digital and AI era.

2. Literature Review

Educational research methodology refers to systematic approaches, procedures, and strategies used to investigate educational phenomena and generate scientific knowledge within educational contexts. Traditionally, educational research has been dominated by qualitative and quantitative

paradigms, both of which provide different perspectives in understanding educational problems and learning processes (Mohajan, 2018; Taherdoost, 2022). Over time, educational research methodology has evolved toward more integrative and flexible approaches, including mixed methods, systematic literature review, bibliometric analysis, design thinking, and engineering design process (EDP)-based research (Rahi, 2017; Susilawati et al., 2025). Furthermore, technological advancement and digital transformation have significantly influenced methodological innovation in educational research, particularly through the integration of artificial intelligence, virtual reality, augmented reality, learning analytics, and Internet of Things (IoT)-based research approaches (Fitria, 2023; Ismail et al., 2024). This evolution demonstrates that educational research methodology continuously adapts to the growing complexity of educational challenges and future learning environments.

In recent years, bibliometric analysis has increasingly been utilized to map publication trends, intellectual structures, research collaboration, and thematic evolution across various educational research fields. Previous studies employed bibliometric approaches to analyze trends in STEM education, engineering education, biotechnology education, Internet of Things (IoT)-based learning, and educational technology integration (Riandi et al., 2022; Susilawati et al., 2023). Similarly, Al Husaeni & Nandiyanto (2022) emphasized that bibliometric visualization analysis provides comprehensive insights into dominant research themes, emerging topics, and future research opportunities within educational studies. Despite the increasing use of bibliometric analysis in educational research, limited studies specifically focus on mapping the development and emerging trends of educational research methodology itself. Most previous studies tend to discuss research methods from conceptual or instructional perspectives without comprehensively analyzing the evolution of methodological paradigms, thematic relationships, and future methodological directions within educational research.

Table 1 presents several previous studies related to educational research methodology and methodological development in educational studies. The reviewed studies generally focus on research paradigms, qualitative and quantitative approaches, practical methodological procedures, and design-based educational research. However, previous studies have not comprehensively explored the intellectual structure and thematic evolution of educational research methodology using bibliometric visualization analysis, particularly within the context of digital transformation and artificial intelligence integration in education. Therefore, this study offers novelty by providing a bibliometric perspective on emerging trends in educational research methodology and identifying future methodological opportunities in the digital and AI era.

Table 1. Research on educational research methodology.

No	Title	Reference
1	Research Design and Methods: A Systematic Review of Research Paradigms, Sampling Issues, and Instruments Development	Rahi (2017)
2	Planning Qualitative Research: Design and Decision Making for New Researchers	Tomaszewski et al. (2020)
3	Research Approaches in Education: A Comparison of Quantitative, Qualitative and Mixed Methods	Pregoner (2024)
4	How to Do Research Methodology: From Literature Review, Bibliometric, Step-by-step Research Stages, to Practical Examples in Science and Engineering Education	Susilawati et al. (2025)

3. Methodology

3.1 Research Design

This study employed a bibliometric research design using a quantitative descriptive approach to analyze the development and emerging trends of educational research methodology studies. Bibliometric analysis was utilized to identify publication growth, influential publications, thematic structures, keyword relationships, and research trends related to educational research methodology in

the digital and artificial intelligence (AI) era. The bibliometric approach was selected because it enables systematic mapping and visualization of scientific publications within a specific research field through citation and co-occurrence analysis (Li et al., 2023; Al Husaeni & Nandiyanto, 2022).

3.2 Data Source

The data for this study were collected from Google Scholar using the Publish or Perish (PoP) application as the primary data retrieval tool. The publication search covered studies published from 2020 to 2026 using several keywords, including “educational research methodology,” “research methods in education,” “qualitative research,” “quantitative research,” “mixed methods,” and “bibliometric analysis in education.” A total of 500 publications were initially retrieved during the data collection process. After conducting screening and relevance filtering procedures, 148 relevant publications were selected and exported in RIS and CSV formats to support bibliometric and descriptive analyses.

3.3 Data Collection Procedure

The data collection procedure was conducted through several stages. First, publication searches were performed using the predefined keywords in the Publish or Perish (PoP) application connected to Google Scholar. Second, the retrieved publications were screened based on relevance, publication type, duplication, language consistency, and thematic suitability with educational research methodology studies. Third, irrelevant and duplicated publications were excluded from the dataset. Finally, the selected publications were exported into RIS and CSV formats for further bibliometric mapping and visualization analysis using VOSviewer and Microsoft Excel software.

3.4 Data Analysis

The collected data were analyzed using descriptive and bibliometric analysis techniques. Microsoft Excel was utilized to analyze annual publication trends, citation frequencies, and descriptive publication data. Meanwhile, VOSviewer software was employed to generate bibliometric visualization networks, including network visualization, overlay visualization, and density visualization based on keyword co-occurrence analysis. The visualization analysis aimed to identify dominant methodological themes, thematic relationships, emerging research trends, and the intellectual structure of educational research methodology studies in the digital and AI era.

4. Results

4.1. Educational Research Methodology Trend 2020–2026

Table 1 and Figure 1 present the annual distribution of publications related to Educational Research Methodology indexed through Google Scholar and retrieved using the Publish or Perish application during the period 2020–2026. The results indicate a substantial increase in the number of publications across the observed years, reflecting the growing academic interest in educational research methodology and methodological innovation in the digital and artificial intelligence (AI) era. A total of 500 publications were identified and analyzed in this study.

Based on Table 1, the number of publications gradually increased from 12 documents (2.40%) in 2020 to 27 documents (5.40%) in 2021 and 35 documents (7.00%) in 2022. A more significant increase began to emerge in 2023 with 72 publications (14.40%), followed by 106 publications (21.20%) in 2024. The highest publication growth was recorded in 2025 with 170 publications (34.00%), indicating that educational research methodology has become an increasingly prominent research topic in recent years. Meanwhile, publications in 2026 accounted for 78 documents (15.60%), although the publication year was still ongoing during the data collection process.

The increasing trend of publications demonstrates that educational research methodology continues to evolve alongside rapid technological advancement, digital transformation, and the growing integration of evidence-based research approaches within educational studies. In particular, the dominance of recent publications suggests that methodologies such as bibliometric analysis, systematic literature review (SLR), PRISMA-based review, and digital research approaches are becoming increasingly popular among educational researchers. Furthermore, this publication growth

also reflects the increasing demand for innovative, efficient, and technology-supported research methodologies capable of addressing complex educational challenges and contemporary learning environments.

Table 1. Annual report research on educational research methodology.

No	Years	Documents	Percentages
1	2020	12	2,40%
2	2021	27	5,40%
3	2022	35	7,00%
4	2023	72	14,40%
5	2024	106	21,20%
6	2025	170	34,00%
7	2026	78	15,60%
Total		500	100%

Source: Research Data (2026)

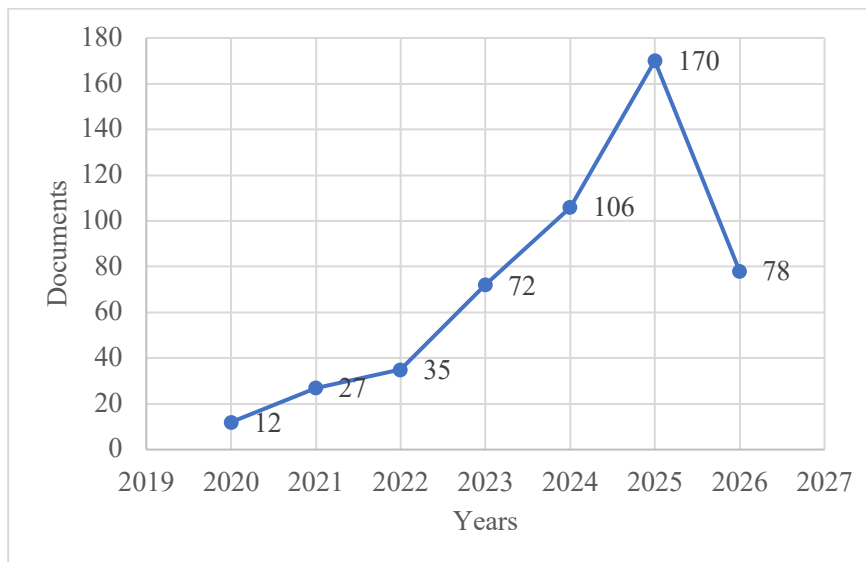


Figure 1. Annual report of publications

4.2. Most Influential and Highly Cited Publications

Table 2 presents the most influential and highly cited publications related to Educational Research Methodology indexed in Google Scholar during the period 2020–2026. The citation analysis reveals that review-based and evidence synthesis methodologies, particularly systematic literature reviews (SLR) and bibliometric studies, dominate highly cited publications in recent years. This finding indicates that contemporary educational and interdisciplinary research increasingly emphasizes research synthesis, scientific mapping, and evidence-based approaches to understand complex educational and technological issues.

Based on Table 2, the article entitled *Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR)* by [Paul et al. \(2021\)](#) became the most influential publication with 2,675 citations and 535 citations per year. This finding demonstrates the significant role of systematic review methodology in supporting rigorous and structured research synthesis across academic disciplines. Furthermore, several highly cited publications also focused on systematic literature review approaches, including transformative learning, blockchain auditing, work–life balance, blended learning, inquiry-based learning, and Islamic social finance studies. The dominance of SLR-based publications suggests that researchers increasingly rely on evidence synthesis methodologies to analyze broad and rapidly evolving research topics.

In addition to systematic literature reviews, bibliometric analysis also emerged as one of the most prominent methodological approaches within recent educational and interdisciplinary research. Publications such as *Bibliometric Analysis for Medical Research* by [Kumar et al. \(2023\)](#), *Virtual Reality Aided Therapy Towards Health 4.0: A Two-Decade Bibliometric Analysis* by [Liu et al. \(2022\)](#), and *Scientific Mapping of Social Media in Education* by [Barrot \(2021\)](#) indicate the growing utilization of bibliometric mapping techniques to identify research trends, thematic structures, and intellectual development within various scientific fields. The increasing popularity of bibliometric analysis is strongly associated with the rapid growth of scientific publications, digital databases, and visualization software such as VOSviewer, which enable researchers to conduct large-scale research mapping more efficiently and systematically.

Moreover, several highly cited studies were closely associated with digital transformation, artificial intelligence, online learning, and technology integration in education. Publications discussing ChatGPT in K-12 education, virtual reality, STEM education, game-based learning, and post-COVID-19 learning modes demonstrate that educational research methodology is increasingly influenced by technological advancement and digital educational environments. These findings indicate that contemporary educational research is moving toward interdisciplinary, technology-supported, and evidence-based methodological approaches capable of addressing emerging educational challenges in the digital and AI era.

Table 3. Most cited articles on educational research methodology.

No	Cites	Title	Year	Cites Per Year	Ref.
1	2675	Scientific procedures and rationales for systematic literature reviews (SPAR-4-SLR)	2021	535.00.00	Paul et al. (2021)
2	825	Digital competences for teacher professional development. Systematic review	2022	206.25.00	Fernández-Batanero (2022)
3	608	Forms of implementation and challenges of PBL in engineering education: a review of literature	2021	121.60	Chen et al. (2021)
4	403	A systematic review of ChatGPT use in K-12 education	2024	201.50.00	Zhang & Tur (2024)
5	385	Transformative learning in the field of sustainability: a systematic literature review (1999-2019)	2020	64.17.00	Aboytes & Barth (2020)
6	375	Bibliometric analysis for medical research	2023	125.00.00	Kumar et al. (2023)
7	274	Work–life balance: a systematic literature review and bibliometric analysis	2022	68.50.00	Rashmi & Kataria (2022)
8	270	Teaching and learning delivery modes in higher education: Looking back to move forward post-COVID-19 era	2023	90.00.00	Imran et al. (2023)
9	248	The disruption of blockchain in auditing—a systematic literature review and an agenda for future research	2022	62.00.00	Lombardi et al. (2022)
10	228	Islamic social finance for achieving sustainable development goals: a systematic literature review and future research agenda	2024	114.00.00	Dirie et al. (2024)

No	Cites	Title	Year	Cites Per Year	Ref.
11	223	Psychological interventions of virtual gamification within academic intrinsic motivation: A systematic review	2021	44.60	Xu et al. (2021)
12	218	Sustainable construction management: A systematic review of the literature with meta-analysis	2020	36.33.00	Araújo et al. (2020)
13	212	Virtual reality aided therapy towards health 4.0: A two-decade bibliometric analysis	2022	53.00.00	Liu et al. (2022)
14	190	Artificial intelligence in science education (2013–2023): Research trends in ten years	2024	95.00.00	Jia et al. (2024)
15	185	Mapping the first decade of circular economy research: a bibliometric network analysis	2021	37.00.00	Alnajem & Mostafa (2021)
16	168	Three decades of game-based learning in science and mathematics education: an integrated bibliometric analysis and systematic review	2022	42.00.00	Chen et al. (2022)
17	159	Scientific mapping of social media in education: A decade of exponential growth	2021	31.80	Barrot (2021)
18	154	The role of STEM Education in improving the quality of education: a bibliometric study	2023	51.33.00	Jamali et al. (2023)
19	149	The effect of inquiry-based learning on students' critical thinking skills in science education: A systematic review and meta-analysis	2025	149.00.00	Arifin et al. (2025)
20	142	A retro perspective on blended/hybrid learning: Systematic review, mapping and visualization of the scholarly landscape	2022	35.50.00	Bozkurt (2022)

4.3. Visualization of Research Data Mapping of Educational Research Methodology

Educational Research Methodology using VOSviewer. The minimum occurrence threshold was set at 10 occurrences. From a total of 2285 identified terms, 56 terms met the minimum threshold requirement. Subsequently, VOSviewer automatically calculated the relevance score and selected the most relevant terms, resulting in 34 interconnected terms included in the final visualization network.

As illustrated in Figure 2, the term bibliometric analysis appears as the largest and most dominant node within the visualization network, indicating that bibliometric-based studies have become one of the most prominent methodological approaches in recent educational research. The dominance of this term also demonstrates the increasing utilization of scientific mapping, citation analysis, and publication trend analysis in exploring educational phenomena and research development. Furthermore, strong interconnections among terms suggest that educational research methodology is increasingly characterized by interdisciplinary, evidence-based, and technology-supported research approaches.

The visualization network is divided into five interconnected clusters representing thematic relationships within educational research methodology studies. The first cluster (red), consisting of 9 items, includes academic literature, bibliometric, comprehensive bibliometric, content analysis,

direction, and meta-analysis. This pattern indicates that contemporary educational research methodology is gradually shifting toward evidence synthesis methodologies, AI-assisted research approaches, and future-oriented educational research trends.

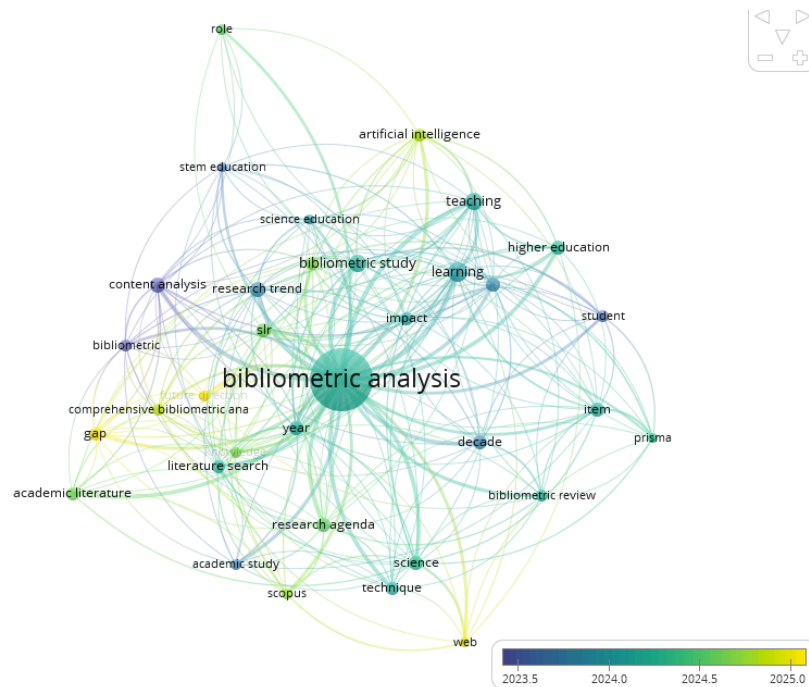


Figure 3. Overlay visualization based on co-occurrence of terms.

Furthermore, the density visualization shown in Figure 4 demonstrates the intensity and concentration of frequently occurring terms within the research network. The term bibliometric analysis appears as the most prominent and dense area within the visualization, confirming its dominant role in recent educational research methodology studies. Other highly visible terms include learning, teaching, bibliometric study, literature search, and artificial intelligence, indicating that contemporary methodological research is increasingly concentrated on digital research practices, evidence synthesis approaches, and technology-integrated educational studies. These findings suggest that educational research methodology is evolving toward more systematic, data-driven, and interdisciplinary research paradigms in the digital and AI era.

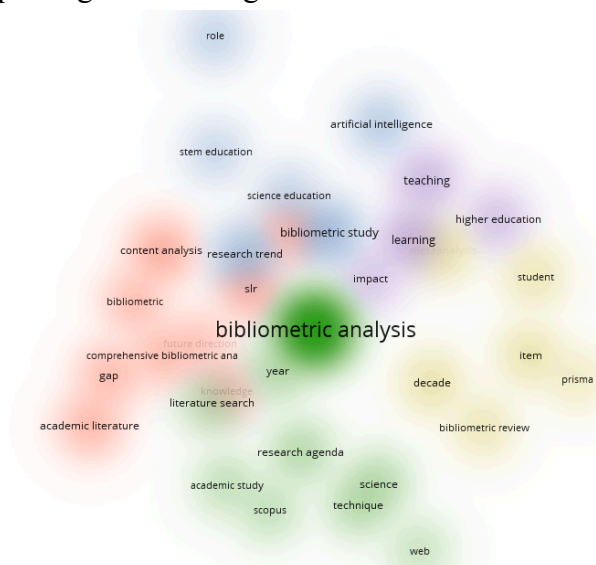


Figure 4. Density visualization based on the co-occurrence of terms.

5. Discussion

The findings reveal a significant increase in publications related to Educational Research Methodology during 2020–2026, particularly after 2023. This trend indicates that methodological

innovation has become an increasingly important concern within educational studies in response to rapid digital transformation and the expansion of technology-supported educational research (Rahi, 2017; Taherdoost, 2022). The growing number of publications also reflects the increasing demand for systematic, evidence-based, and interdisciplinary research approaches capable of addressing complex educational challenges in contemporary learning environments.

One of the most important findings of this study is the dominance of review-based methodologies, particularly bibliometric analysis and systematic literature review (SLR), within recent educational research publications. This finding is clearly reflected in both the citation analysis and VOSviewer visualization mapping, where terms such as bibliometric analysis, SLR, PRISMA, and meta-analysis emerged as highly connected and frequently occurring keywords. The dominance of these methodologies suggests a substantial shift from conventional empirical approaches toward evidence synthesis research, which enables researchers to systematically evaluate large volumes of scientific publications and identify emerging research trends (Paul et al., 2021; Susilawati et al., 2025). Furthermore, the increasing utilization of bibliometric and SLR approaches is strongly associated with the rapid growth of digital scientific databases, publication accessibility, and the need for efficient research mapping techniques in academic research environments (Al Husaeni & Nandiyanto, 2022; Barrot, 2021).

The visualization analysis also demonstrates the growing influence of artificial intelligence and digital technology within educational research methodology studies. Terms such as artificial intelligence, teaching, learning, and STEM education appeared within interconnected thematic clusters, indicating that educational research methodology is increasingly integrated with technology-driven educational practices. Previous studies similarly reported that artificial intelligence, virtual learning environments, and digital educational platforms have significantly transformed educational research and instructional innovation (Fitria, 2023; Jia et al., 2024). This transformation suggests that educational research methodology is evolving toward more data-driven, interdisciplinary, and technology-assisted research paradigms.

In addition, the emergence of PRISMA and meta-analysis within recent publications reflects the increasing emphasis on methodological rigor, transparency, and research validity in educational studies. Researchers increasingly utilize systematic review procedures and statistical synthesis approaches to strengthen evidence quality and improve research reliability. This finding aligns with previous studies emphasizing that evidence-based research methodologies play an essential role in supporting scientific credibility and future educational decision-making (Tomaszewski et al., 2020; Pregoner, 2024).

Overall, this study demonstrates that educational research methodology is undergoing substantial transformation in the digital and AI era. The increasing dominance of bibliometric analysis and systematic review methodologies indicates that educational researchers are increasingly prioritizing evidence synthesis, scientific mapping, and future-oriented research approaches. Therefore, future educational research should continue encouraging methodological innovation while maintaining methodological diversity to ensure balanced development between empirical investigation and evidence-based synthesis research within educational studies.

6. Conclusion

This study concludes that Educational Research Methodology has experienced substantial development during the period 2020–2026, particularly through the increasing dominance of review-based methodologies such as bibliometric analysis, systematic literature review (SLR), PRISMA, and meta-analysis. The bibliometric visualization further demonstrates that educational research methodology is increasingly influenced by digital transformation, artificial intelligence, and technology-assisted research practices. These findings indicate that contemporary educational research is evolving toward more systematic, evidence-based, interdisciplinary, and future-oriented methodological approaches within the digital and AI era.

7. Suggestion

Future studies are recommended to expand the scope of educational research methodology by exploring the integration of artificial intelligence, learning analytics, big data, and digital research ethics within educational research practices. In addition, future bibliometric studies may utilize broader international databases such as Scopus and Web of Science to obtain more comprehensive research mapping and global methodological perspectives. Researchers are also encouraged to maintain methodological diversity by balancing empirical research approaches with evidence synthesis methodologies to support more innovative, rigorous, and contextually relevant educational research development.

Declarations

Author Contributions. A.O.: Literature review, conceptualization. P.A.S.: methodology, data analysis. A.: original manuscript preparation. D.G.: review-editing. All authors have read and approved the published on the final version of the article)

Conflicts of Interest. The authors declare no conflict of interest.

Funding. This research received no external funding.

Ethical Approval. Ethical approval was not required for this study because the research utilised publicly accessible bibliographic data obtained from Google Scholar through the Publish or Perish application and did not involve human participants.

Data Availability Statement. The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments. The author would like to express gratitude to all researchers and scholars whose publications contributed to the bibliometric dataset analysed in this study.

References

- Al Husaeni, D. F., and Nandiyanto, A. B. D. (2022). Bibliometric computational mapping analysis of publications on mechanical engineering education using VosViewer. *Journal of Engineering Science and Technology*, 17(2), 1135-1149
- Alnajem, M., Mostafa, M. M., & ElMelegy, A. R. (2021). Mapping the first decade of circular economy research: a bibliometric network analysis. *Journal of Industrial and Production Engineering*, 38(1), 29-50. <https://doi.org/10.1080/21681015.2020.1838632>
- Araújo, A. G., Carneiro, A. M. P., & Palha, R. P. (2020). Sustainable construction management: A systematic review of the literature with meta-analysis. *Journal of Cleaner Production*, 256, 120350. <https://doi.org/10.1016/j.jclepro.2020.120350>
- Arifin, Z., Saputro, S., & Kamari, A. (2025). The effect of inquiry-based learning on students' critical thinking skills in science education: A systematic review and meta-analysis. *Eurasia Journal of Mathematics, Science and Technology Education*, 21(3), em2592. <https://doi.org/10.29333/ejmste/15988>
- Barrot, J. S. (2021). Scientific mapping of social media in education: A decade of exponential growth. *Journal of Educational Computing Research*, 59(4), 645-668. <https://doi.org/10.1177/0735633120972010>
- Bozkurt, A. (2022). A retro perspective on blended/hybrid learning: Systematic review, mapping and visualization of the scholarly landscape. *Journal of Interactive Media in Education*, 2022(1). <http://doi.org/10.5334/jime.751>
- Chen, J., Kolmos, A., & Du, X. (2021). Forms of implementation and challenges of PBL in engineering education: a review of literature. *European Journal of Engineering Education*, 46(1), 90-115. <https://doi.org/10.1080/03043797.2020.1718615>
- Chen, P. Y., Hwang, G. J., Yeh, S. Y., Chen, Y. T., Chen, T. W., & Chien, C. H. (2022). Three decades of game-based learning in science and mathematics education: an integrated bibliometric analysis and systematic review. *Journal of Computers in Education*, 9(3), 455-476. <https://doi.org/10.1007/s40692-021-00210-y>
- Dirie KA, Alam MM, Maamor S (2024), Islamic social finance for achieving sustainable development goals: A systematic literature review and future research agenda. *International Journal of Ethics and Systems*, 40(4), 676–698. <https://doi.org/10.1108/IJOES-12-2022-0317>
- Fernández-Batanero, J. M., Montenegro-Rueda, M., Fernández-Cerero, J., & García-Martínez, I. (2022). Digital competences for teacher professional development. Systematic review. *European journal of teacher education*, 45(4), 513-531. <https://doi.org/10.1080/02619768.2020.1827389>
- Fitria, T. N. (2023). Augmented reality (AR) and virtual reality (VR) technology in education: Media of teaching and learning: A review. *International Journal of Computer and Information System (IJCIS)*, 4(1), 14-25.
- Imran, R., Fatima, A., Salem, I. E., & Allil, K. (2023). Teaching and learning delivery modes in higher education: Looking back to move forward post-COVID-19 era. *The International Journal of Management Education*, 21(2), 100805.
- Ismail, A., Bhakti, D. D., Sari, L., Kemalia, L. D., and Susilawati, A. (2024). Integration of augmented reality based on android in the problem-solving laboratory. *Journal of Engineering Science and Technology*, 19, 70–79.
- Jamali, S. M., Ale Ebrahim, N., & Jamali, F. (2023). The role of STEM Education in improving the quality of education: a bibliometric study. *International Journal of Technology and Design Education*, 33(3), 819-840. <https://doi.org/10.1007/s10798-022-09762-1>
- Javaid, M., Haleem, A., Singh, R. P., and Suman, R. (2023). Sustaining the healthcare systems through the conceptual of biomedical engineering: A study with recent and future potentials. *Biomedical Technology*, 1, 39-47. <https://doi.org/10.1016/j.bmt.2022.11.004>
- Jia, F., Sun, D., & Looi, C. K. (2024). Artificial intelligence in science education (2013–2023): Research trends in ten years. *Journal of Science Education and Technology*, 33(1), 94-117. <https://doi.org/10.1007/s10956-023-10077-6>

- Kumar, M., George, R. J., & PS, A. (2023). Bibliometric analysis for medical research. *Indian journal of psychological medicine*, 45(3), 277-282. <https://doi.org/10.1177/02537176221103617>
- Liu, Z., Ren, L., Xiao, C., Zhang, K., & Demian, P. (2022). Virtual reality aided therapy towards health 4.0: A two-decade bibliometric analysis. *International journal of environmental research and public health*, 19(3), 1525. <https://doi.org/10.3390/ijerph19031525>
- Lombardi, R., de Villiers, C., Moscariello, N., & Pizzo, M. (2022). The disruption of blockchain in auditing—a systematic literature review and an agenda for future research. *Accounting, Auditing & Accountability Journal*, 35(7), 1534-1565. <https://doi.org/10.1108/AAAJ-10-2020-4992>
- Mohajan, H. K. (2018). Qualitative research methodology in social sciences and related subjects. *Journal of Economic Development, Environment, and People*, 7(1), 23-48.
- Paul, J., Lim, W. M., O’Cass, A., Hao, A. W., & Bresciani, S. (2021). Scientific procedures and rationales for systematic literature reviews (SPAR-4-SLR). *International journal of consumer studies*, 45(4), O1-O16. <https://doi.org/10.1111/ijcs.12695>
- Pregoner, J. D. (2024). Research approaches in education: A comparison of quantitative, qualitative and mixed methods. *IMCC Journal of Science*, 4(2), 31-36.
- Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues, and instruments development. *International Journal of Economics and Management Sciences*, 6(2), 1-5. 10.4172/2162-6359.1000403
- Rashmi, K., & Kataria, A. (2022). Work–life balance: a systematic literature review and bibliometric analysis. *International Journal of Sociology and Social Policy*, 42(11-12), 1028-1065. <https://doi.org/10.1108/IJSSP-06-2021-0145>
- Riandi, R., Permanasari, A., and Novia, N. (2022). Implementation of biotechnology in education towards Green Chemistry teaching: A bibliometrics study and research trends. *Moroccan Journal of Chemistry*, 10(3), 10-3. <https://doi.org/10.48317/IMIST.PRSM/morjchem-v10i3.33060>
- Rodríguez Aboytes, J. G., & Barth, M. (2020). Transformative learning in the field of sustainability: a systematic literature review (1999-2019). *International Journal of Sustainability in Higher Education*, 21(5), 993-1013. <https://doi.org/10.1108/IJSHE-05-2019-0168>
- Susilawati, A., Al-Obaidi, A. S. M., Abduh, A., Irwansyah, F. S., & Nandiyanto, A. B. D. (2025). How to do research methodology: From literature review, bibliometric, step-by-step research stages, to practical examples in science and engineering education. *Indonesian Journal of Science and Technology*, 10(1), 1-40. <https://doi.org/10.17509/ijost.v10i1.78637>
- Susilawati, A., Kustiawan, I., Rochintaniawati, D., and Hasanah, L. (2023). Research trends about STEM of internet of things for science teachers: A bibliometric analysis. *Journal of Engineering Science and Technology*, 18, 41-50.
- Taherdoost, H. (2022). What are different research approaches? Comprehensive review of qualitative, quantitative, and mixed method research, their applications, types, and limitations. *Journal of Management Science and Engineering Research*, 5(1), 53-63. <https://doi.org/10.30564/jmser.v5i1.4538>
- Tomaszewski, L. E., Zarestky, J., and Gonzalez, E. (2020). Planning qualitative research: Design and decision making for new researchers. *International Journal of Qualitative Methods*, 19, 1609406920967174. <https://doi.org/10.1177/1609406920967174>
- Xu, J., Lio, A., Dhaliwal, H., Andrei, S., Balakrishnan, S., Nagani, U., & Samadder, S. (2021). Psychological interventions of virtual gamification within academic intrinsic motivation: A systematic review. *Journal of affective disorders*, 293, 444-465. <https://doi.org/10.1016/j.jad.2021.06.070>
- Zhang, P., & Tur, G. (2024). A systematic review of ChatGPT use in K-12 education. *European Journal of Education*, 59(2), e12599. <https://doi.org/10.1111/ejed.12599>