JURNAL UPI

ASEAN Journal of Science and Engineering Education

Journal homepage: http://ejournal.upi.edu/index.php/AJSEE/

The Role of Science and Technology Fields in Education and Journal Publications at Universitas Pendidikan Indonesia: Bibliometric analysis from 2021 to 2024

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ABSTRACT

This study examines the contribution of science and technology fields to journal article publications at Universitas Pendidikan Indonesia (UPI) between 2021 and 2024 using Scopus-indexed data. Analysis reveals a steady increase in the number of publications each year, totaling 2,170 articles. Engineering and computer science together contributed more than 800 publications, indicating the significant presence of STEM disciplines within UPI's academic output. Additionally, international collaboration was most prominent with countries such as Malaysia, Japan, and China. These findings underscore the vital role of science and technology in advancing educational research and international visibility at UPI. The paper recommends further integration of STEM approaches to support innovation in pedagogy and global academic competitiveness.

ARTICLE INFO

Article History:
Submitted/Received 23 Aug 2024
First Revised 20 Sep 2024
Accepted 21 Nov 2024
First Available online 22 Nov 2024
Publication Date 01 Dec 2024

Keyword:
Academic publication,
Engineering,
Science and technology,
Scopus,
Universitas Pendidikan Indonesia.

1. INTRODUCTION

In the era of digital transformation and knowledge-based economies, the role of science and technology in higher education institutions has become increasingly vital. Universities are not only centers for teaching and learning but also serve as key drivers of innovation and research dissemination through scientific publications. Universitas Pendidikan Indonesia (UPI), as a leading educational institution in Indonesia, has demonstrated a growing commitment to advancing its scholarly output, particularly in science and technology fields. Many reports regarding UPI current publication have been reported (Darmawan & Setiawati, 2015; Kastolani *et al*., 2018; Hurriyati *et al*., 2018; Nandiyanto *et al*., 2023; Yulifar *et al*., 2024).

Scientific publications indexed by Scopus are recognized as benchmarks of research productivity and global academic reputation (Nandiyanto *et al*., 2020a; Nandiyanto *et al*., 2020b). From 2021 to 2024, UPI's Scopus-indexed publications increased significantly, reflecting strategic efforts to elevate research quality and visibility. This growth aligns with national and institutional goals to integrate Science, Technology, Engineering, and Mathematics (STEM) into education and policy frameworks (Solihah *et al*., 2024; Rahmi *et al*., 2025; Fitrianti *et al*., 2024; Rasuman *et al*., 2024).

The present study explores the role and contribution of science and technology disciplines (particularly engineering and computer science) in shaping UPI's publication trends over four years. By analyzing data from Scopus and identifying publication patterns, subject area contributions, and international collaborations, this paper aims to highlight how science and technology are enhancing UPI's academic performance and supporting educational development. The findings are expected to inform institutional strategies for research enhancement and underscore the importance of STEM integration in improving the global competitiveness of teacher education universities like UPI.

2. METHODS

This study adopted a bibliometric analysis approach to examine the role of science and technology in academic publications produced by UPI from 2021 to 2024. Detailed information regarding bibliometric analysis is reported elsewhere (Rochman *et al*., 2024; Al Husaeni & Nandiyanto, 2022a; Al Husaeni and Nandiyanto 2022b). The primary data source is the Scopus database, which was filtered to include only documents categorized as "articles" within the specified timeframe. Other document types, such as conference papers, reviews, and book chapters, were excluded to ensure a consistent dataset focused on peer-reviewed scholarly contributions.

The analysis focused on three main indicators:

(i) Yearly Publication Trends: to assess the growth in the number of published articles from 2021 to 2024.
(ii) Subject Area Contribution: to determine the proportion of articles in fields related to science and technology, specifically engineering, computer science, environmental science, medicine, and related disciplines.
(iii) International Collaboration: to identify countries and regions contributing to co-authored publications with UPI, highlighting the extent of global academic partnerships.

Quantitative data were visualized through bar charts and pie charts, sourced directly from the Scopus analytics interface. This allowed for a comprehensive overview of UPI's publication trajectory, subject area distribution, and collaborative networks. The methodology is grounded in established bibliometric practices for institutional performance evaluation in higher education.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

3. RESULTS AND DISCUSSION

3.1. Publication Trends by Year (2021–2024)

Figure 1 shows the number of journal articles in the fields of science and technology published by UPI each year from 2021 to 2024 based on Scopus-indexed data. The data highlights a steady upward trend, indicating a growing research output. The analysis reveals a steady increase in the number of research articles published by UPI from 2021 to 2024. In 2021, a total of 433 articles were published, rising to 539 in 2022, 575 in 2023, and reaching 623 in 2024. This upward trend indicates a consistent improvement in UPI's research productivity over the four years, demonstrating the institution's growing emphasis on academic publication and scholarly output.

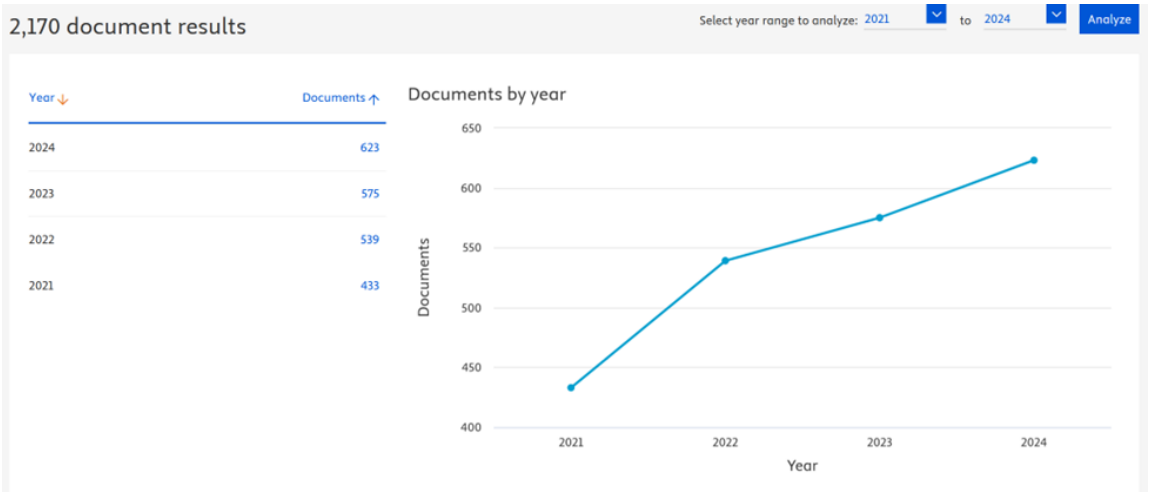

Figure 1. Annual Distribution of Science and Technology Journal Articles Published by UPI (2021–2024).

3.2. Subject Area Distribution

Figure 2 illustrates the major scientific disciplines in which UPI authors published the most journal articles during the period. The leading subject areas include Engineering, Computer Science, and Environmental Science, signifying the university's focus on key technological domains. From 2,170 articles published between 2021 and 2024, the largest share belongs to the Social Sciences with 969 documents, accounting for approximately 44.6% of the total. However, significant contributions also come from Science and Technology-related fields:

(i) Engineering: 607 articles (27.9%)
(ii) Computer Science: 198 articles (9.1%)
(iii) Environmental Science: 147 articles (6.8%)
(iv) Medicine: 233 articles (10.7%)
(v) Chemical Engineering and Chemistry: Together contributing over 8%

These findings underscore the active role of science and technology in UPI's research landscape, reflecting the university's multidisciplinary approach to knowledge creation. The prominence of engineering and computing disciplines demonstrates a positive alignment with national and global trends in STEM (Science, Technology, Engineering, and Mathematics) education.

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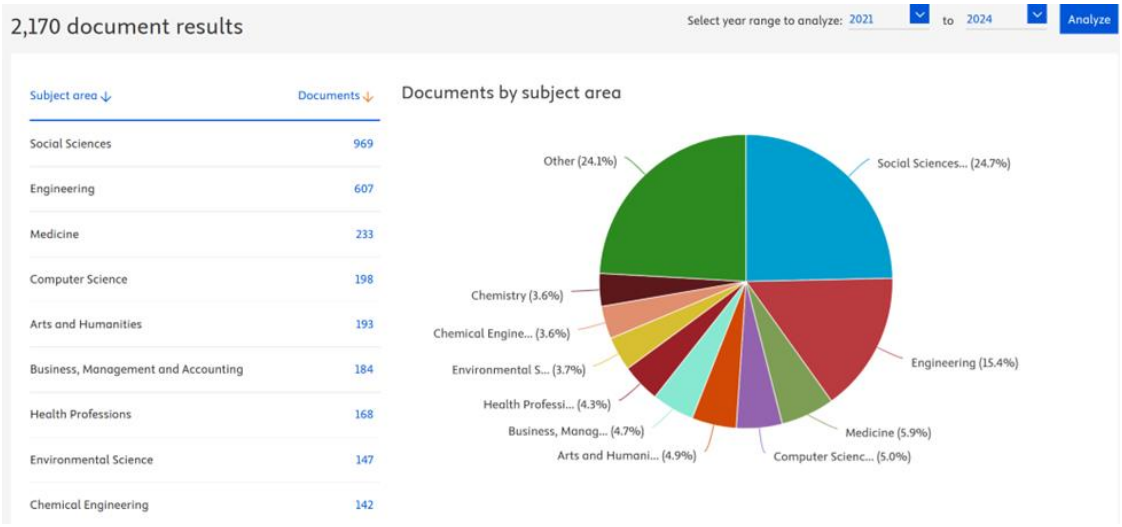

Figure 2. Top Subject Areas of UPI Science and Technology Publications (2021–2024).

3.3. International Collaboration

Figure 3 maps UPI's global research partnerships, highlighting collaborative publications with institutions in various countries. The data indicates strong international ties, particularly with nations such as Malaysia, Japan, and Australia, enhancing UPI's global academic footprint. Regarding co-authored publications, the highest collaboration was with Malaysia, contributing to 295 documents. This is followed by Japan (73), China (54), Australia (48), and India (41). Such data indicate strong regional ties and South–South cooperation, especially within the ASEAN and Asia-Pacific regions. Collaborations with advanced research nations such as Japan and Australia further suggest UPI's strategic positioning in global academic networks, particularly in science and technology sectors.

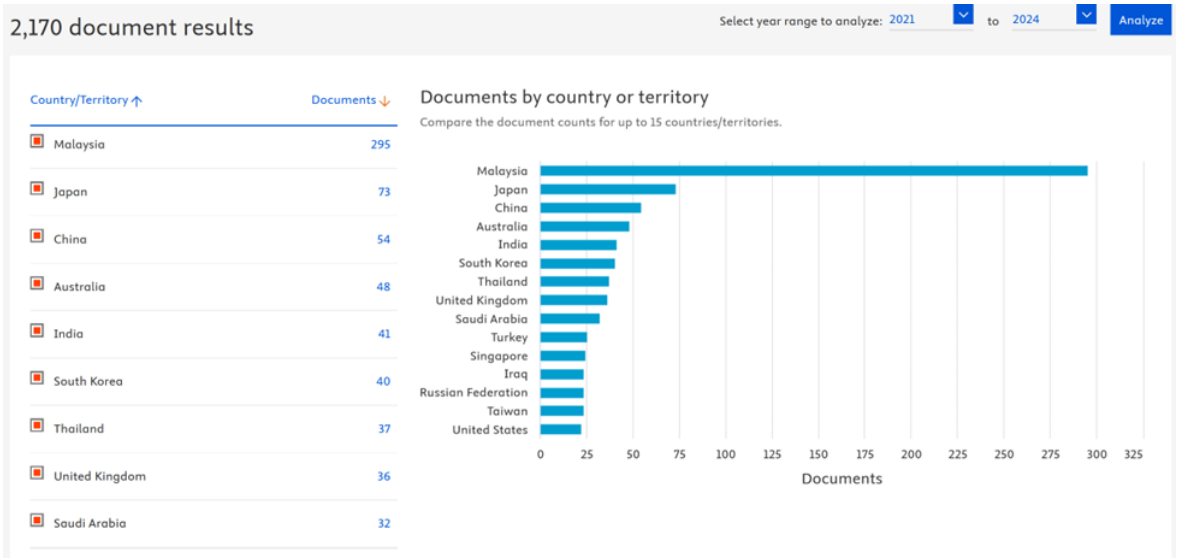

Figure 3. UPI's International Collaboration in Science and Technology Publications (2021–2024).

3.4. Implications

The increase in publications and international collaborations in engineering, computer science, and related disciplines suggests that UPI is successfully enhancing its global research profile in science and technology. These improvements contribute to the university's visibility

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in global rankings, support national educational priorities in STEM, and position UPI as a leading center of innovation and applied research in Indonesia.

4. CONCLUSION

This bibliometric analysis demonstrates the growing contribution of UPI to scientific and technological research in the period from 2021 to 2024. The university has shown consistent growth in article publication volume, with a notable rise in outputs related to engineering, computer science, and environmental science. This trend reflects a strategic alignment with global developments in STEM and reinforces the role of science and technology fields in strengthening Indonesia's higher education landscape. Additionally, the data indicates robust international collaboration, particularly with neighboring Asian countries, suggesting UPI's expanding influence and visibility in global academic networks. Overall, the results highlight the critical importance of continued investment in science and technology research to drive innovation, enhance institutional rankings, and contribute meaningfully to national development goals.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

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