Mapping Gender Differences in Technology Integration among Educators: A Bibliometric Analysis

Suraya Zakaria*, Siti Zuraidah Md Osman

School of Educational Studies, Universiti Sains Malaysia, 11800 Pulau Pinang, Malaysia

Corresponding Author: zsuraya@student.usm.my

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Abstract

The purpose of this study is to investigate the global research landscape on gender differences in technology integration among educators, a theme that has gained increasing importance in educational discourse nowadays as digital platform that reshapes teaching and learning approaches. Despite extensive scholarship on technology adoption in education, gender-based disparities in integration practices remain underexplored, raising concerns about equity, access and competence in digital pedagogy. To address this gap, a bibliometric analysis was conducted using the Scopus database, retrieving 955 publications from 2014 to 2024. The data were analyzed using Scopus Analyzer and VOSviewer software to map publication trends, keyword co-occurrences and co-authorship countries' collaboration. The results reveal a developing growth in publications with notable peaks in the last decade, reflecting the rising urgency of understanding gendered perspectives in digital education. Keyword analysis highlights recurring themes such as "technology integration","gender differences", and "educators" while related to the intersections with motivation, academic achievement and professional development. Co-authorship mapping indicates that research output is largely concentrated in countries such as United States, United Kingdom, Australia and China, with emerging contributions from Malaysia, Turkey, and India, although international collaborations remain uneven. The findings underscore the dominance of Western contexts in shaping the discourse, while research from developing regions remains comparatively limited. This bibliometric mapping not only illustrates the intellectual structure and thematic evolution of the field but also highlights persistent gaps, particularly the underrepresentation of female educators' perspectives and voices from the Global South. This paper concludes by emphasizing the need for more inclusive, cross-regional and gender-sensitive investigations to support equitable technology integration and inform evidence-based policy and professional development initiatives in education.

Keywords: Gender Differences, Technology Integration, Educator

INTRODUCTION

The integration of technology in educational settings has become a main focus in teaching and learning strategies, driven by rapid advancements in digital tools and the increasing demand for digital literacy among educators. As schools and universities worldwide adopt new technologies, understanding the factors influencing successful technology integration is critical (Amaniampong & Hartmann, 2023). Among these factors, gender differences have emerged as a significant area of inquiry with research exploring whether male and female educators differ in their technological competencies, adoption behaviors and attitudes. Some studies report that male teachers tend to score higher in technological knowledge and integration, while female teachers may excel in areas such as student technology literacy and community involvement, suggesting nuanced gendered patterns in technology that related

pedagogical practices (Oputa et al., 2024). However, other research finds minimal or no significant gender differences in technology use, skills, or attitudes, indicating that the digital gender gap among educators may be narrowing in certain contexts (Sanchez Prieto et al., 2020).

Despite these mixed findings, the literature highlights the importance of examining gender as a variable in technology integration, not only to identify potential disparities but also to inform targeted professional development and policy interventions. Systematic reviews and meta-analyses suggest that while small gender differences may exist—often favoring males in certain ICT skills—these effects are generally modest and context-dependent (Qazi et al., 2022). Moreover, factors such as professional development, school culture and regional disparities can interact with gender, shaping educators' experiences with technology in complex ways (Fan & Li, 2025). A bibliometric analysis of this research landscape can provide valuable insights into publication trends, influential works, and emerging themes, ultimately supporting efforts to promote equitable and effective technology integration across diverse educational environments.

LITERATURE REVIEW

A growing body of Scopus-indexed studies maps gender-linked patterns in educators' technology integration as contingent on knowledge domains, affect, and contextual affordances. According to Marange & Tatira (2024), reported higher male self-ratings on technology-related components among in-service mathematics teachers within TPACK-oriented investigations, whereas Fan & Li, (2025) observed that male primary mathematics teachers tended to emphasize technological facets while female teachers prioritized student technology literacy and community involvement. Beyond knowledge profiles, effect emerges as a salient correlate: Dallora et al. (2024) identified high technophilia but mid-level technology anxiety among nursing students in Sweden, with anxiety more pronounced for female participants, indicating a possible readiness constraint for equitable uptake. Convergent observations in language education suggest differentiated emphases, where D' Souza et al. (2021) found stronger student-centered beliefs among female instructors, alongside higher reported use frequency among male instructors, pointing to distinct motivational pathways that can nevertheless produce comparable engagement benefits.

Intention–behavior mechanisms in preservice and early-career cohorts underline the need for subgroup-sensitive supports. Adelana et al. (2024) showed that perceived usefulness and subjective norms predicted intention to adopt AI in genetics teaching among Nigerian biology teacher candidates, with subjective norms exhibiting stronger effects for female candidates despite broadly similar attitudinal baselines. Extending the behavioral lens, Y. Li et al. (2025) applied Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and documented robust links between intention and use behavior, alongside negative moderation by gender and experience on actual usage, highlighting potential attrition points in translation from readiness to enactment. Evidence on professional learning indicates that well-designed online technology-integration coursework can elevate STEM self-efficacy and knowledge without detectable gender gaps, suggesting the equalizing potential of structured development pathways (M. L. Wu & Zhou, 2025) (Akram et al., 2021).

Discipline-embedded implementations frequently register minimized or null gender effects when pedagogical design scaffolds tools integrally. Ulbrich et al. (2025) showed that 3D modeling and printing within preservice mathematics education produced inclusive outcomes across creative and technical dimensions when anchored in coherent Science, Technology, EngineeringSTEAM objectives. In middle-school science reported significant achievement gains from virtual reality–based instruction without gender differences, implying that immersive, high-structure environments can stabilize performance outcomes (Ozkan et al., 2025). For learners with mathematics difficulties, (Polydoros et al., 2025) noted overall gains in fraction understanding with blended digital interventions, with slightly higher improvements for female students, indicating that learner outcomes can manifest gender-linked variability even when teacher-side integration appears comparable.

Contextual and systemic conditions frequently overshadow gender main effects, while methodological choices shape interpretability. According to Fan & Li (2025) documented advantages in urban and eastern Chinese regions across Technological Pedagogical Content Knowledge (TPACK) and technology-related readiness, with gender differences attenuating once access and professional development conditions were considered. Earlier platform studies similarly linked enabling infrastructure such as classroom projection to stronger perceived instructional assistance and integration competence, without reliable gender gaps. Policy environments that foreground digital transformation, as discussed and sectoral diagnostics from vocational education in Indonesia reported by Riyanda et al. (2025), situate integration equity within resource, support, and governance ecosystems. At the same time, cross-sectional survey reliance, self-report measures, and limited fidelity checks constrain causal claims and risk confounding gender interpretations with infrastructure, leadership, and support deficits. Research needs therefore include longitudinal tracking from preservice into in-service, intersectional modeling of context–gender interactions, and experimental or quasi-experimental designs with standardized treatments to test whether integration structures neutralize or amplify gender-linked disparities (M. Li, 2025).

RESEARCH OBJECTIVES

1. Which are the country contributing publications of gender differences in technology integration among educators?
2. What are the research trends of gender differences in technology integration among educators according to the year of publication?
3. What are the type of document by subject area of gender differences in technology integration among educators?
4. What are the popular keywords related to the trends of gender differences in technology integration among educators?
5. What are co-authorship countries' collaboration to the trends of gender differences in technology integration among educators?

METHODOLOGY

Bibliometrics are used to describe the cross, control, and research of bibliographic statistics collected in educational journals that are scientific in character (Alves et al., 2021; Assyakur & Rosa, 2022; Verbeek et al., 2002). It includes basic descriptive statistics, including, publishing journals, publication year and main author classification (Y. C. J. Wu & Wu, 2017) and includes sophisticated methods as well, such as, document co-citation analysis. A good literature review is an iterative task comprising specific stages of identifying suitable keywords, conducting literature search and analysis to come up with a thorough bibliography and credible findings (Fahimnia et al., 2015). To do so, the emphasis was put on the best publications, which can help to obtain useful information about the theoretical frameworks of the study field. To guarantee the quality of data, the given study relied on the Scopus database when collecting the data (Al-Khoury et al., 2022; di Stefano et al., 2010). Furthermore, to make sure only high-quality publications are included, only papers published in established were selected, books and lecture notes have been intentionally left out (Gu et al., 2019). Interestingly, Elsevier Scopus with its rich coverage resources was used to source the publications between 2014 to December 2024 to be used in the subsequent analysis.

a. Data Search Strategy

Study involved a screening sequence to determine the search terms for article retrieval. The procedure was involved by querying Scopus database with online (TITLE-ABS-KEY ("technology integration" OR "ICT integration" OR "digital technology" OR "educational technology" OR "technology use" OR "technology adoption" OR "technology implementation") AND TITLE-ABS-KEY(educator* OR

teacher* OR lecturer* OR instructor* OR "school leader*" OR "academic staff" OR "faculty member*") AND TITLE-ABS-KEY (gender OR male OR female OR men OR women OR "gender differences" OR "gender gap") thereby assembling 1457 articles. Subsequently, the query string was revised so that the search string (TITLE-ABS-KEY("technology integration" OR "ICT integration" OR "digital technology" OR "educational technology" OR "technology use" OR "technology adoption" OR "technology implementation") AND TITLE-ABS-KEY(educator* OR teacher* OR lecturer* OR instructor* OR "school leader*" OR "academic staff" OR "faculty member*") AND TITLE-ABS-KEY(gender OR male OR female OR men OR women OR "gender differences" OR "gender gap")) AND PUBYEAR > 2013 AND PUBYEAR < 2025 AND (LIMIT-TO (LANGUAGE,"English")) refinement included 955 articles which was used for bibliometric analysis. As of August 2025, all articles from Scopus database relating gender differences in technology integration among educators were incorporated in the study.

Table 1 Data searching in Scopus

Scopus	(TITLE-ABS-KEY("technology integration" OR "ICT integration" OR "digital technology" OR "educational technology" OR "technology use" OR "technology adoption" OR "technology implementation") AND TITLE-ABS-KEY(educator* OR teacher* OR lecturer* OR instructor* OR "school leader*" OR "academic staff" OR "faculty member*") AND TITLE-ABS-KEY(gender OR male OR female OR men OR women OR "gender differences" OR "gender gap")) AND PUBYEAR > 2013 AND PUBYEAR < 2025 AND (LIMIT-TO (LANGUAGE,"English"))

Table 2 The selection criterion in searching

Criterion	**Inclusion**	**Exclusion**
Language	English	Non-English
Time Line	2014-2024	<2014

b. Data Analysis

The simplified bibliometric software VOSviewer is designed by Nees Jan van Eck and Ludo Waltman (van Eck & Waltman, 2017). The graphical tool most popularly used to display and analyze scientific literature, as well as in producing simple network structures and visually clustering related objects and producing density maps. Its flexibility enables the exploration of co-authorship, co-citation, and keyword co-occurrence networks that would offer an understanding to a researcher regarding the directions of research. The advantage of the interactive interface is that it is continuously updated thus it makes the large mass of data to be explored efficiently and dynamically. The features that distinguish VOSviewer as a helpful tool in searching that which is difficult to understand in a particular research field include the capabilities to calculate various metrics, customize various visualizations and the compatibility of VOSviewer with a range of sources of bibliometrics data.

A characteristic of VOSviewer is that it can take difficult-to-interpret bibliometric data and render these maps and charts in visualizable form. The software specializes in network visualization, giving particular attention to clustering together related items, analysing patterns of co-occurring keywords and creating density maps. Beef on its straightforward user interface, which enables a skilled and, at the same time, new users to navigate across the research spaces with ease. VOSviewer is continuously being developed and thus is one of the better tools in providing useful insights based on the computation of metrics and the customization of visualization outputs. Its ability to integrate with other forms of bibliometric data, such as co-authorship networks and citation networks, places the VOSviewer as a tool that cannot be ignored by the user in gaining useful insights of their research areas.

The data sets include data on the title, journal, citation, year of publication and keyword data in plain text version, which were extracted through the Scopus database between 2014 and till

December 2024. VOSviewer software 1.6.19 was used to analyze these datasets. With the application of VOS clustering and mapping, this software has been able to provide means of examination and creation of maps. As an alternative to the Multidimensional Scaling (MDS) method, VOSviewer aims to place items in low-dimensional spaces so that the distance between any two objects is an appropriate measure of their relatedness and similarity. In this regard, VOSViewer is similar to the MDS approach (Appio et al., 2014). Unlike MDS that mainly computes the similarity measure like Cosine and Jaccard indices, VOS deploys a more suitable measures to normalize the co-occurrence frequencies; these include the associatio strength (ASij) which is computed as (Van Eck and Waltman, 2007):

$$ASij \text{ ¼ } Cij$$
$$Wiwj$$

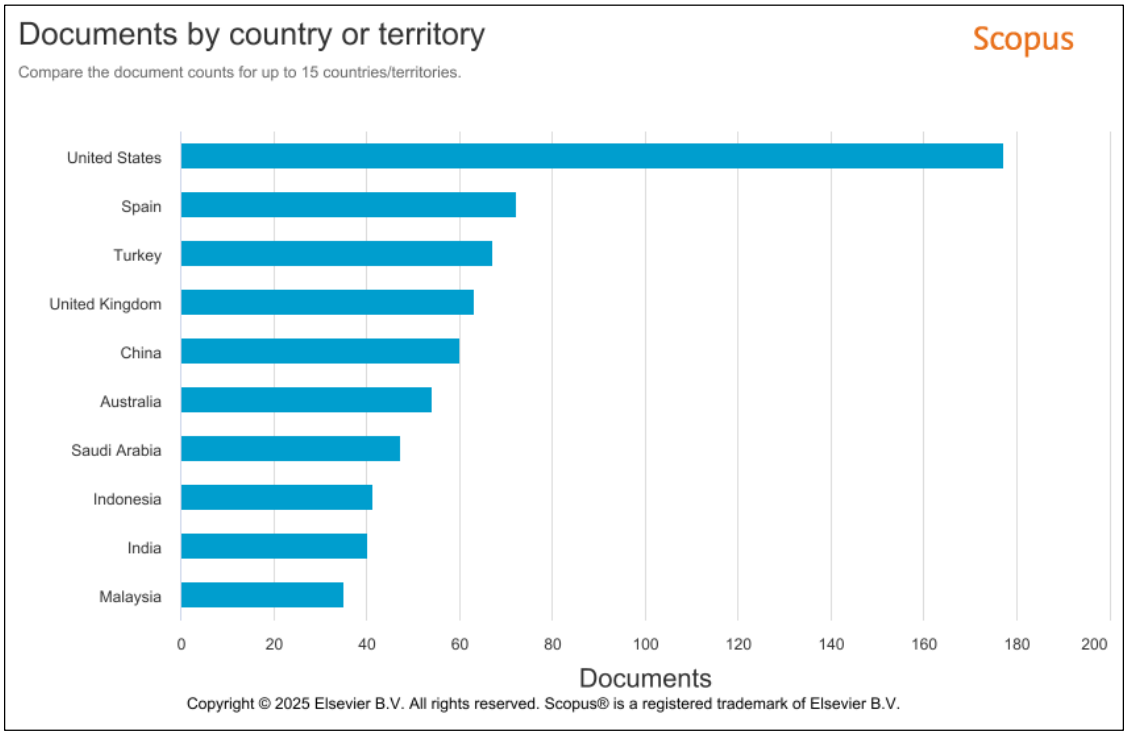
The latter is defined as a proportion proportional to the ratio between number of observations on the one hand of cooccurrences of i and j and on the other hand the number of expectations of co-occurrences of i and j based on the assumption that co-occurrences of i and j are statistically independent (Van Eck and Waltman, 2010). Therefore, by using this index, VOSviewer positions items as a map, having accounted for the weighted sum of the squared distance of all item pairs. As Appio et al. (2016) admitted, the normalization based on LinLog/modularity was applied. Moreover, by conducting visualisation of the data set using VOSviewer patterns forming on mathematical relationships have been identified and analyses of keyword co-occurrence, citation analysis, co-citation analysis have been carried out.

Therefore, using this index, VOSviewer arranges items as a map by minimizing the weighted square of the distance amongst all item pairs. To normalize the LinLog/modularity, the implementation as described by Appio et al. (2016) was put in place. Moreover, using the visualisation tool VOSviewer in the data set the patterns based on mathematical relationship were revealed and such analyses as keyword coin, citation analysis and co-citation analysis could be conducted. The study of development of research field during a period can be studied through keyword co-occurrence analysis (Zhao, 2017) and is effective to identify popular topics in the various fields (Li et al., 2016). Generally, the citation analysis can be explored to determine major research issues, overall trends, and techniques, and to investigate the significance of the historical context of the field under major research focus (Allahverdiyev and Yucesoy, 2017). One of the commonly used bibliometric techniques is document-citation analysis (Appio et al., 2016; Fahimnia et al., 2015; Liu et al., 2015), and the output is a map based on the theory of networks to determine the significance of evidence (Liu et al., 2015).

RESULT AND FINDING

1. Which are the country contributing publications of gender differences in technology integration among educators?

Figure 1 The country contributing publications of gender differences in technology integration among educators



The figure highlights the global distribution of research publications on gender differences in technology integration among educators reveals significant geographical disparities in scholarly output. The United States emerges as the dominant contributor with approximately 180 publications, substantially outpacing all other countries in this research domain. This American leadership likely reflects the country's extensive educational technology infrastructure, substantial research funding mechanisms and the historical prominence of gender studies in academic discourse within United States institutions.

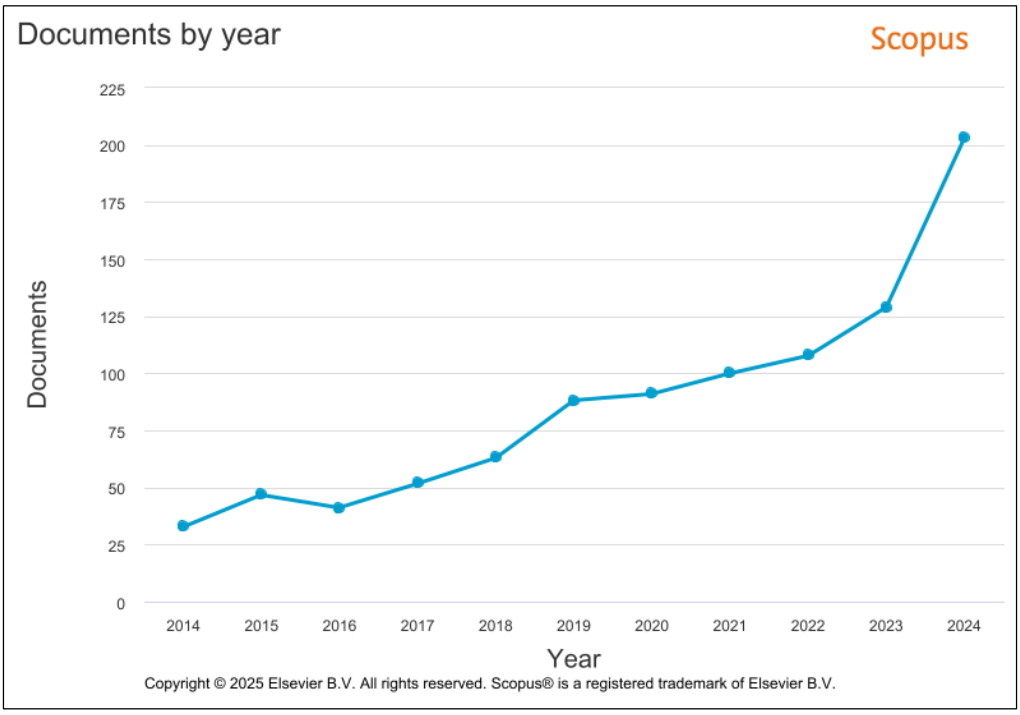
European and Commonwealth nations demonstrate moderate but significant research activity in this field. Spain leads European contributions with roughly about 80 publications, followed by the United Kingdom and Turkey with approximately 60 publications of each meanwhile Australia also shows meaningful engagement with around 50 publications. This pattern suggests that developed nations with established educational systems and gender equality initiatives have prioritized investigating how male and female educators differently adopt and integrate technological tools in their teaching and learning practices. The relatively strong showing from Turkey is remarkable, potentially indicating growing interest in educational technology research within emerging market economies.

The representation from major Asian economies presents an interesting contrast, with China contributing approximately 40 publications despite its globalized and technological advancement in educational sector. Southeast Asian countries including Indonesia, India and Malaysia show relatively modest output of 20 to 30 publications each. This distribution may reflect differences in research priorities, gender differences in funding allocation or varying stages of technology integration in educational systems. The lower publication numbers from these populous country suggest potential

opportunities for expanding the research collaboration and knowledge exchange to understand gender dynamics in technology adoption across diverse cultural and educational contexts.

2. What are the research trends of gender differences in technology integration among educators according to the year of publication?

Figure 2 The research trends of gender differences in technology integration among educators according to the year of publication

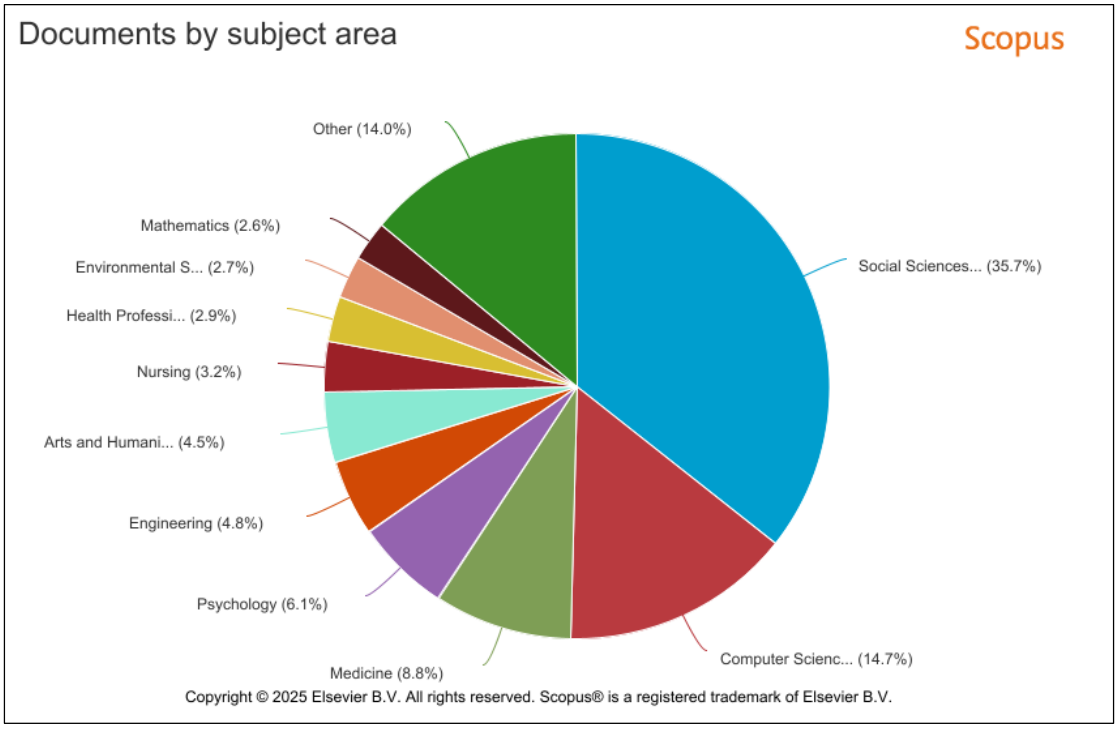


The publication trend from 2014 to 2024 reveals a dynamic evolution in research interest concerning gender differences in technology integration among educators. The data shows relatively modest research output during the initial years from 2014 to 2016, with the publications remaining below than 50 documents annually. However, a notable acceleration begins around 2017 to 2018, suggesting the increasing within academia and society recognition of gender disparity in educational technology adoption. The most striking feature of this trend is the dramatic surge observed from 2019 onwards, with publications appearing to peak around 2020 to 2021, reaching approximately 200 documents per year. This substantial increase likely reflects the heightened focus on educational technology during the COVID-19 pandemic, when remote learning technology integration rapidly and exposed existing gender gaps in digital competency among educators.

The subsequent years from 2022 to 2024 demonstrate ways to maintain a high level of research activity, though with some stabilization compared to the peak of the pandemic. This pattern suggests that gender differences in technology integration among educators has evolved from a specific area to a mainstream concern within educational research. The consistent output in recent years indicates that the initial pandemic-driven interest has matured into a systematic and rigorous process, likely supported by the recognition that technology integration is no longer a temporary emergency measure but a permanent feature of modern education. The overall continuous increase over the decade highlights the importance of understanding how gender influences educators' technology adoption patterns, professional development needs and ultimately student learning outcomes in digitally-enhanced educational environments.

3. What are the type of document by subject area of gender differences in technology integration among educators?

Figure 3 The type of document by subject area of gender differences in technology integration among educators



A bibliometric analysis of gender differences in technology integration among educators reveals several key patterns emerge that illuminate the interdisciplinary nature of subject areas. Social Science dominance, the fundamental recognition at 35.7% of publications, reflects that educational technology adoption is primarily a social phenomenon, requiring examination through sociological, anthropological and educational research lenses. This substantial representation suggests that researchers understand gender disparities in technology use cannot be addressed through purely technical solutions, but require in-depth investigation of social structures, cultural norms, and institutional practices that shape how male and female educators engage with educational technologies.

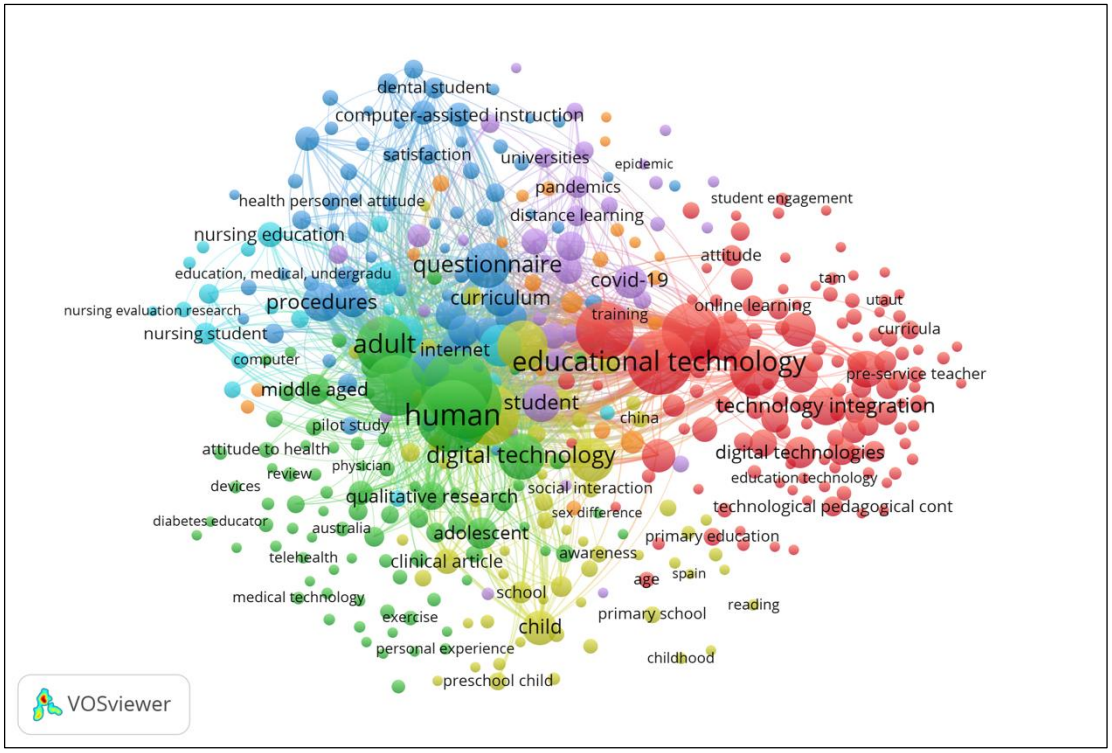
The second largest category, Computer Science at 14.7%, combined with Engineering at 4.8% and Mathematics at 2.6%, totals approximately 22.1% of publications, indicating significant technical interest in this field. This distribution suggests a productive dialogue between Social Science researchers who examine the human factors and computer scientists, develop and evaluate technological solutions. The field of Psychology at 6.1% further reinforces the understanding that individual cognitive, behavioral and motivational factors play crucial roles in how gender influences technology adoption patterns among educators. This psychological dimension is essential for understanding the underlying mechanisms that drive differential technology engagement between male and female educators.

The contribution of health which related fields in Medicine (8.8%), Nursing (3.2%), and Health Professions (2.9%) are totaling nearly 15% of publications, highlighting the particular relevance of gender and technology integration issues in the healthcare education sector. This substantial presence likely reflects the gendered nature of health professions and the critical importance of technology competence in modern healthcare practice. The inclusion of Arts and Humanities (4.5%) and Environmental Science (2.7%) demonstrates that intersection of gender and

technology in education extend beyond traditional STEM fields, encompassing diverse disciplinary contexts where technology integration challenges manifest differently across gender lines.

4. What are the popular keywords related to the trends of gender differences in technology integration among educators?

Figure 4 Network visualization map of keywords' co-occurrence to the trends of gender differences in technology integration among educators



The bibliometric analysis highlights several dominant clusters of keywords that reflect how gender differences in technology integration among educators are situated within educational and health discourses. High frequency terms such as "female" (279 occurrences) and "male" (269 occurrences) indicate that gender remains an analytical category in studies of technology integration, particularly when examined scientific study of aging and older like "adult" (178 occurrences) and "middle aged" (45 occurrences). This demonstrates a strong research emphasis on demographic factors influencing the use and technology adoption. On the other hand, keywords such as "digital technology" (108 occurrences), "e-learning" (110 occurrences) and "technology integration" (72 occurrences), reveal the academic interest of digital transformation in education and the way these tools intersect with gendered practices.

The analysis also shows a prominent connection between technology adoption and learning outcomes. In line with the keywords such as "academic achievement" (14 occurrences), "academic performance" (9 occurrences), "student" (70 occurrences) and "students" (133 occurrences), emphasize that technology integration is frequently studied through its impact on learners' performance. This suggests that research not only focuses on educators' adoption of technology but also evaluates downstream effects on student competence, assessment and engagement. The emergence of terms like "active learning" (8 occurrences), "blended learning" (16 occurrences) and "problem-based learning" (12 occurrences) underscores the pedagogical dimension that highlights how technology facilitates learner-centered approaches across gendered teaching practices.

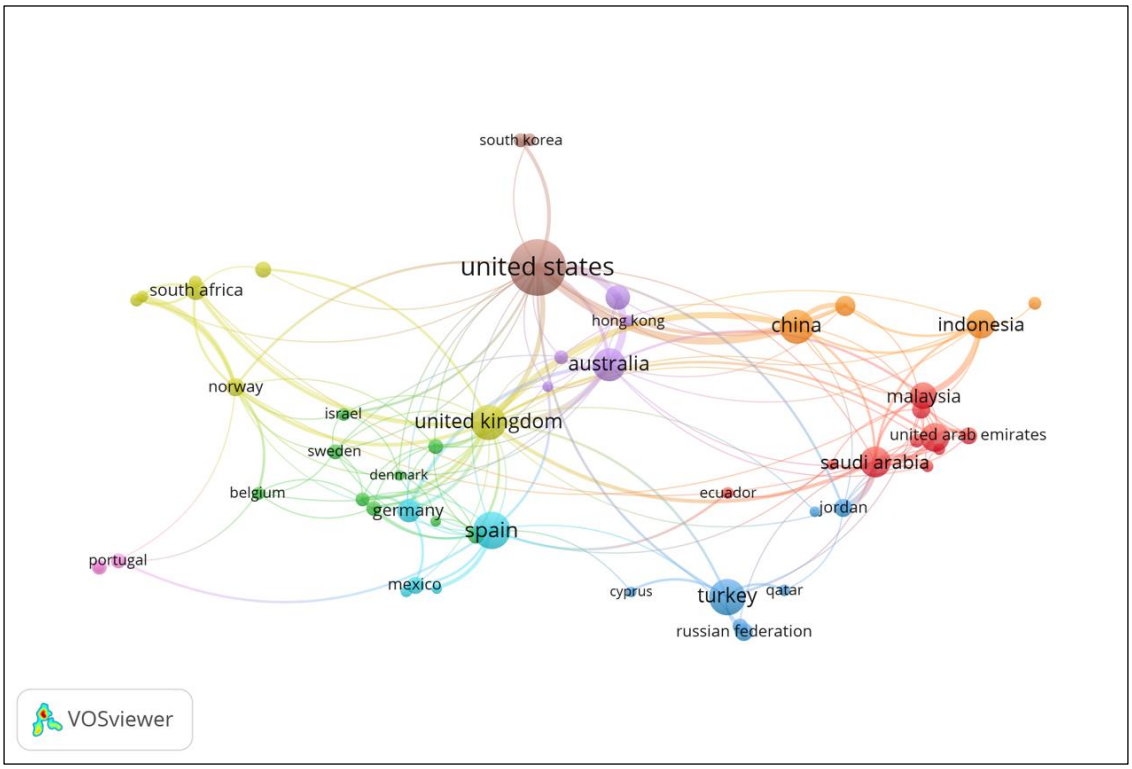
Based on the findings of the dataset reveals that significant intersections with psychological, health, and social dimensions. Keywords such as "attitude" (21 occurrences), "motivation" (24

occurrences) and "self-efficacy" (20 occurrences), suggest that individual beliefs and dispositions play a critical role in leveraging technology integration. The presence of terms like "anxiety" (13 occurrences), "technostress" (5 occurrences) and "behavioral intention" (5 occurrences), reflects ongoing concerns about barriers and enablers of digital adoption. Additionally, health-related clusters which are adolescent health, nursing education, clinical competence indicate that research on technology integration extends beyond general education into professional and vocational contexts, where gender differences may manifest differently. Collectively, these findings suggest that scholarship in this field is both multidimensional and interdisciplinary and needs to combine with educational technology, psychology, health sciences and sociology to better understand gendered patterns of technology use among educators.

5. What are co-authorship countries' collaboration to the trends of gender differences in technology integration among educators?

Analysis of co-authorship networks reveals that research focusing on gender differences in technology integration among educators is dominated by a few key countries with influence and high productivity. The United States leads substantially with 177 documents, 2906 citations and 45 total link strength, positioning it as the platform for collaboration. Similarly, the United Kingdom (63 documents, 1396 citations, and Australia (54 documents, 1249 citations) demonstrate both high productivity and robust collaborative ties, suggesting that Anglophone countries play an extremely important role in driving and shaping this research area. These countries not only produce significant output but also act as connectors linking diverse regions, thereby reinforcing their leadership in the global academic network.

Figure 5 Network visualization map of co-authorship countries' collaboration to the trends of gender differences in technology integration among educators



European and Asian countries also emerge as strong contributors, though with varying collaborative intensity. For instance, Spain (71 documents, 1920 citations) and Turkey (69 documents, 1315 citations) exhibit relatively high productivity meanwhile Spain showing stronger international visibility through citations. China with 61 documents and 1007 citations also features prominently,

reflecting its growing investment in educational technology research. However, some countries with notable output, such as India (41 documents, 326 citations) and Indonesia (41 documents, 274 citations) recorded the lower citation impact, suggesting that while research activity is increasing in emerging regions, the international influence and visibility of these studies remain limited.

Moreover, countries such as Norway (15 documents, 694 citations), Saudi Arabia (47 documents, 510 citations) and Malaysia (35 documents, 593 citations) demonstrate moderate productivity but relatively strong collaboration linkages, indicating growing integration into global research networks. By contrast, countries like Brazil, Ghana and Hong Kong have produced a number of documents but show minimal collaboration strength of total link strength equal to 1, highlighting a need for stronger international partnerships to enhance visibility and scholarly impact. Overall, the data suggests that while research activity is geographically diverse, international collaboration is uneven, with Western countries and selected Asian nations maintaining a dominant role in shaping discourse on gender and technology integration in education.

CONCLUSIONS

The bibliometric analysis demonstrates that scholarly interest in gender differences in technology integration among educators is unevenly distributed across geographical regions with emerging the United States as the leading contributor. European nations such as Spain, United Kingdom, Turkey together with Australia, also represent strong publication activity, while Asian countries display lower but growing engagement including China, India, Indonesia and Malaysia. This distribution suggests that research leadership is concentrated in regions with established infrastructures for educational technology and gender studies, to expand their presence although developing economies are beginning. The findings indicate opportunities for wider international collaboration, particularly to capture perspectives from underrepresented regions where cultural and educational contexts may reveal distinct gender-related dynamics in technology adoption.

In research productivity, analysis of temporal trends indicates a marked shift with gradual growth before 2017 followed by a surge during the pandemic years, when remote teaching highlighted disparities in digital competency. Although publication levels have stabilized after the pandemic, the sustained output demonstrates that the topic has matured into a recognized research priority. Subject area distribution further reinforces its interdisciplinary nature, led by the social sciences but supported by computer science, psychology, and health-related fields, showing how social, technological and professional considerations intersect. Collectively, the data reveal a field that is both expanding and diversifying, with gender differences in technology integration increasingly recognized as central to discussions of digital pedagogy, educational equity and workforce readiness.

The keyword analysis demonstrates that research on gender differences in technology integration among educators is shaped by a broad intersection of educational, psychological and health-related themes. Core terms such as male, female and adult highlight the centrality of demographic variables, while digital technology, e-learning and technology integration indicate the continuing focus on how educators adopt and apply digital tools. The recurring link to student outcomes, reflected in terms such as academic achievement and student performance, suggests that much of the research connects educators' technology use with its implications for learners. Psychological constructs including motivation, self-efficacy and technostress reveal attention to the individual factors influencing technology adoption, while health-related keywords demonstrate the relevance of this topic in professional and vocational education contexts. Taken together, the keyword clusters underscore the multidimensional nature of the field, where educational practices intersect with cognitive, social and health perspectives.

The co-authorship analysis highlights a research landscape dominated by a small group of highly connected countries. The United Kingdom, United States and Australia function as central

hubs, producing high volumes of publications and fostering extensive international collaborations. Spain, Turkey, and China also contribute significantly, though with varying levels of visibility and influence, while emerging economies such as India and Indonesia are increasing their output but remain less internationally impactful. Countries like Norway, Saudi Arabia, and Malaysia demonstrate meaningful collaboration strength despite moderate productivity, pointing to their integration into global research networks. In contrast, several nations with some research activity display limited collaboration, reducing their scholarly influence. Overall, the co-authorship patterns reveal that although contributions come from diverse regions, international connectivity remains uneven, with Western and selected Asian countries shaping the global dialogue on gender and technology integration in education.

DECLARATION OF GENERATIVE AI

The authors declare that Claude and Gemini tools were used to support the writing process of this manuscript. These tools were utilised to assist in language refinement, organisation of ideas and improvement of clarity. All content, interpretations and conclusions presented in this article are the authors' own, and the use of the tools did not replace the authors' intellectual contributions. The authors have thoroughly reviewed, edited and verified the accuracy of all generated text prior to submission.

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Conflict of Interest: No conflict of interest was involved in this research.

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