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Two and a Half Decades of Gifted Education Research: A Bibliometric Mapping (2000–2025)

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Abstract: *Research on gifted education has expanded significantly over the past decades, yet systematic mapping of its global evolution remains limited. While prior reviews have explored specific aspects, such as socio-emotional needs or program evaluation, few have provided a long-term bibliometric overview that includes both global and regional perspectives. In particular, the contributions of ASEAN countries and the integration of technology-driven approaches have been underexplored. This study conducts a bibliometric analysis of 5,010 Scopus-indexed documents on gifted education published between 2000 and 2025. Using VOS viewer (version 1.6.20), co-authorship, keyword co-occurrence, and country collaboration networks were analysed. The objective was to identify leading contributors, thematic clusters, collaboration patterns, and emerging research directions in the field. Results indicate that the United States dominates gifted education research, with strong collaborations across Europe and Asia, while Turkey and China serve as secondary hubs. ASEAN countries (e.g., Malaysia, Indonesia, Singapore) are visible but remain peripheral in international networks. Keyword analysis revealed four major clusters: (1) pedagogy and curriculum, (2) socio-emotional and psychological dimensions, (3) cognitive and psychometric approaches, and (4) an emerging technology and STEM frontier, including artificial intelligence and online learning. Publication trends show steady growth, with a peak of over 650 annual documents in recent years. This study contributes by providing a 25-year global overview of gifted education research, highlighting both the continuity of traditional themes and the rise of new digital directions. It also underscores the need to strengthen ASEAN's role in global collaborations. Findings have implications for researchers (expanding international partnerships), policymakers (supporting equitable and innovative gifted programs), and educators (integrating socio-emotional support with technology-enhanced approaches).*

Keywords: Gifted Education, Bibliometric Analysis, VOSviewer, Research Trends, ASEAN

1. Introduction

Gifted education has been the subject of increasing debate and investigation over the past decades. Although definitions vary across countries and institutions, estimates suggest that only a small proportion of students around 6.5% in some educational contexts are formally identified as gifted, with significant disparities depending on cultural, socioeconomic, and systemic factors(Cristina et al., 2025; Gagné, 2009; Renzulli, 2005; Sternberg, 2003). These

identification challenges highlight the persistent lack of consensus in defining and detecting high-ability learners, which is often influenced by biased instruments, parental background, and schooling opportunities.

To address definitional and identification challenges, several theoretical models have been proposed. Renzulli's Three-Ring Conception of Giftedness emphasizes above-average ability, task commitment, and creativity as overlapping traits necessary for gifted performance (Renzulli, 2005). Gagné's Differentiated Model of Giftedness and Talent (DMGT) distinguishes natural abilities (giftedness) from systematically developed skills (talent), thereby highlighting the role of environmental and intrapersonal factors (Gagné, 2004). Pfeiffer's Tripartite Model of Giftedness further categorizes giftedness into high intellectual ability, outstanding accomplishments, and potential to excel, making it widely applicable for educational assessment (Pfeiffer & Shaughnessy, 2020). Alongside these, Sternberg's Theory of Successful Intelligence integrates analytical, creative, and practical dimensions, underscoring that giftedness is multifaceted and context-dependent (Sternberg, 2017). These frameworks collectively show that the field has shifted from rigid IQ-based definitions toward broader, multidimensional understandings of giftedness.

Beyond identification, research on gifted learners explores a wide spectrum of cognitive, socio-emotional, and educational characteristics. Studies note that high-ability individuals require differentiated support, not only to maximize academic achievement but also to manage psychosocial challenges such as integration difficulties, emotional hypersensitivity, and increased risk of underachievement.(Bilgiler et al., 2024) To address these needs, educational strategies such as acceleration, enrichment, and technology-based interventions have been proposed and increasingly studied.(Gagné, 2004; Rogers, 2007) These strategies reflect recognition that gifted education requires holistic support that balances intellectual development with socio-emotional well-being.

The last two decades have seen rapid growth in the scholarly output on gifted education, with bibliometric analyses confirming a clear upward trajectory in publications (Cristina et al., 2025; Hernández-Torrano & Kuzhabekova, 2020) This surge reflects a shift in focus from traditional psychometric and cognitive approaches toward practical, technology-enhanced, and STEM-oriented perspectives. For example, recent science mapping shows a consolidation of STEM-related themes, identifying productive journals, authors, and institutions contributing to this strand of research (Bilgic & Baloğlu, 2025; Gül & Ayık, 2024) In parallel, technology-mediated learning has emerged as an important frontier, with bibliometric studies highlighting both the potential benefits and risks of digital practices in supporting 21st-century skills among gifted students (Şakar & Baloğlu, 2023)

Geographically, the United States, Germany, Spain, and Turkey have been identified as leading contributors to gifted education research, though new voices from Asia and Latin America are increasingly visible (Bilgiler et al., 2024). Within Asia,China, Japan, and South Korea have invested significantly in gifted and STEM-focused education, while ASEAN countries such as Malaysia, Indonesia and Singapore are gradually building visibility in global bibliometric networks. However, the contributions from ASEAN remain peripheral compared to Western and East Asian leaders, suggesting the need for stronger regional collaboration and knowledge exchange.

Despite this diversification, existing bibliometric reviews remain fragmented and often limited to specific themes such as mathematics (Bilgic & Baloğlu, 2025), technology (Suelves et al.,

2020) or twice-exceptionality (Şakar & Baloğlu, 2023) Many are constrained by short timeframes or narrow sets of journals, leaving gaps in understanding long-term global patterns and regional contributions.

To better understand the evolution of the field, bibliometric analysis offers a systematic approach to describe research growth, reveal collaboration networks, and identify thematic clusters. Previous bibliometric reviews (Cristina et al., 2025; Hernández-Torrano & Kuzhabekova, 2020) provide important insights but do not capture the broader, multidisciplinary picture across a sustained period. Addressing this gap, the present study analyzes 5,010 Scopus-indexed publications (2000–2025) using VOSviewer. Specifically, the objectives are to: (1) map global publication trends, (2) identify leading authors and countries (3) uncover thematic clusters through keyword co-occurrence, and (4) highlight emerging research frontiers such as STEM and technology-mediated learning within gifted education.

2. Method

In conducting bibliometric analysis, it is essential to ensure both the breadth and depth of coverage of the academic literature. Among the major scientific databases (Web of Science, Google Scholar, and Scopus), **Scopus was chosen** as the primary data source due to its wide disciplinary scope, strong coverage of educational research, and advanced analytical features(Gavel & Iselid, 2008). Bibliometric data were retrieved from the Scopus database, selected for its comprehensive coverage of multidisciplinary research in education, psychology, and social sciences. The search was conducted on 3 September 2025 using the following query in title, abstract, and keywords "gifted education" OR "gifted student*" OR "gifted learner*" OR "high ability" OR "talented youth". The initial search returned 13,778 records. To ensure data quality and relevance, several refinement steps were applied as shown in Figure 1.

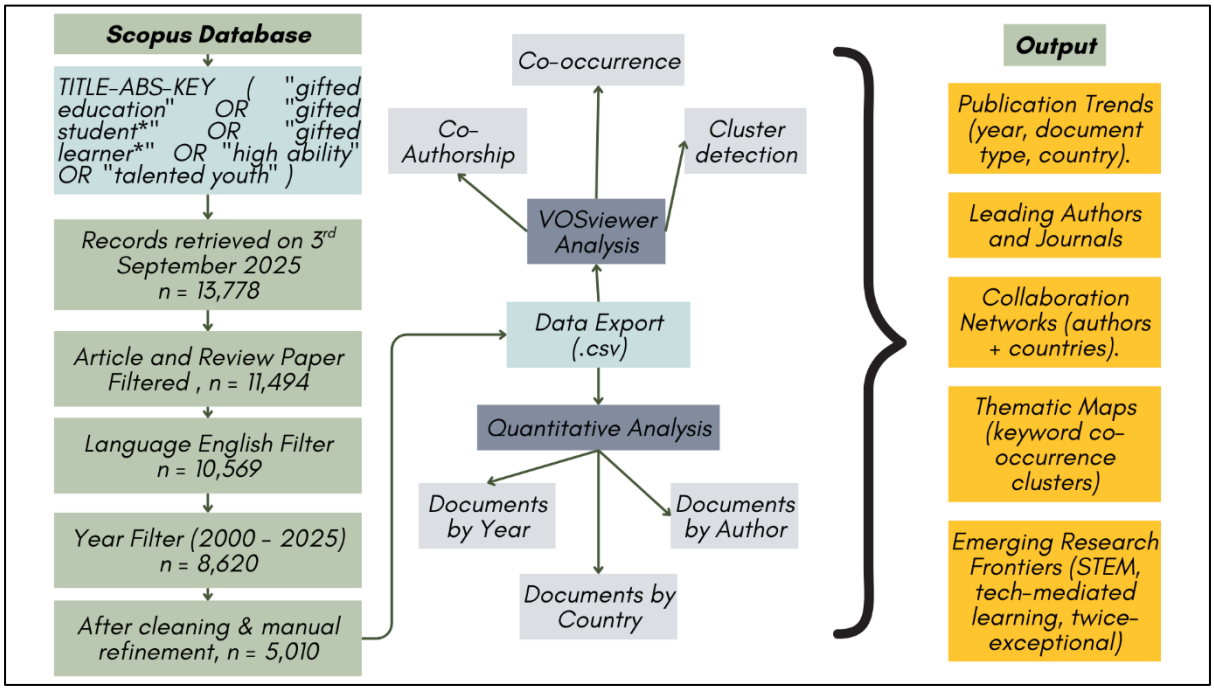

Figure 1: Methodological framework of the bibliometric analysis

Records were retrieved from Scopus using the query TITLE-ABS-KEY ("gifted education" OR "gifted student*" OR "gifted learner*" OR "high ability" OR "talented youth") (search date: 3 September 2025). After filtering for document type (articles and reviews), language (English), and year (2000–2025), the corpus was cleaned and refined to a final dataset of 5,010 publications. Metadata were exported in CSV format and analyzed in VOSviewer (v1.6.20). Two complementary strands were conducted: (i) quantitative/descriptive tabulations (documents by year, country, author, and journal) and (ii) network mapping (co-authorship among authors and countries; keyword co-occurrence and cluster detection). Outputs include global publication trends, leading contributors, collaboration networks, thematic maps, and emerging frontiers in gifted education.

2.1 Data Source and Search Strategy

This section will explain how to extract data from databases. The workflow begins with Scopus as the sole data source due to its broad disciplinary coverage in education and psychology and its compatibility with bibliometric export formats. On 3 September 2025, a Boolean search were executed in titles, abstracts, and author keywords using the terms “gifted education,” “gifted student,” “gifted learner*,” “high ability,” and “talented youth.” A total of 13,778 records were retrieved. Quality controls were then applied in four stages: (1) restricting to articles and reviews to ensure peer-reviewed scholarship (n = 11,494), (2) limiting to English-language items to maintain consistency of text fields (n = 10,569), and (3) applying a year window of 2000–2025 to capture two and a half decades of development (n = 8,620). After these steps, a manual screening and refinement process was performed to remove items that are outside of the scope of educations and psychology such as biomedical or neurophysiological studies and remove duplicate entries, yielding a final analytic corpus of 5,010 publications.

2.2 Data Preparation and Analysis

All bibliographic metadata were exported from Scopus as CSV format, including authors, affiliations, titles, abstracts, author keywords, sources, publication year, country information, and citation counts. Minimal normalization was applied to harmonize obvious spelling variants in author names and institutions where needed (e.g., hyphenation or diacritics), but no additional stemming or thesaurus consolidation was imposed so that the keyword maps would reflect how terms appear in the literature. From this common dataset, the analysis proceeded along two complementary strands. First, a quantitative analysis and descriptive strand summarized research production of documents per year, documents by country and most productive authors and journals. These outputs establish the scale and trajectory of the field and identify where activity is concentrated geographically and acts as baseline view of the growth and global distribution of gifted education research.

Next, network and science mapping were executed in VOSviewer (v1.6.20) which three network types were constructed using fractional counting to avoid over-weighting publications with many co-authors. A co-authorship networks were constructed to reveal collaboration patterns among authors and countries. Then, keyword co-occurrence analysis was conducted to identify frequently used terms and thematic clusters within the field to uncover thematic structures. For readability and to balance precision with coverage, we set minimum thresholds of 10 publications for authors in co-authorship analyses and 5 occurrences for keywords in co-occurrence analyses. Where VOSviewer indicated multiple components, we reported the largest connected component to focus on the dominant structure of the field. In each map, node size represents productivity or term frequency, link thickness reflects the total link strength

such intensity of co-authorship or co-occurrence, and colors denote clusters detected by VOSviewer's modularity algorithm.

In depth explanation, VOSviewer's clustering algorithm was employed to visualize thematic groupings. Each node represents an author or keyword, with node size corresponding to frequency of publications or occurrences and link strength reflecting collaboration or co-occurrence intensity. The analysis produced network, overlay, and density visualizations, providing insights into both historical and emerging research foci. Together, this pipeline converts the Scopus corpus into a coherent set of outputs aligned with the study objectives: (1) a time-series of publication growth (2000–2025); (2) ranked lists and maps of leading authors, journals, institutions, and countries; (3) collaboration networks among authors and nations; and (4) keyword-based thematic clusters that reveal both established lines of inquiry (e.g., pedagogy, identification, socio-emotional needs) and emerging frontiers (e.g., STEM-related gifted education, technology-mediated learning, and twice-exceptionality). This figure summarizes those steps to ensure replicability and to provide a clear audit trail from database query to bibliometric insights. The outputs of these analyses are presented in the Results section, including publication trends, collaboration networks, and thematic clusters.

3. Results and discussions

3.1 Publication Trends (2000 – 2025)

The bibliometric analysis of Scopus-indexed publications revealed a steady and progressive growth of research in gifted education over the past 25 years. The temporal distribution of publications in gifted education research between 2000 and 2025 is illustrated in **Figure 2.**

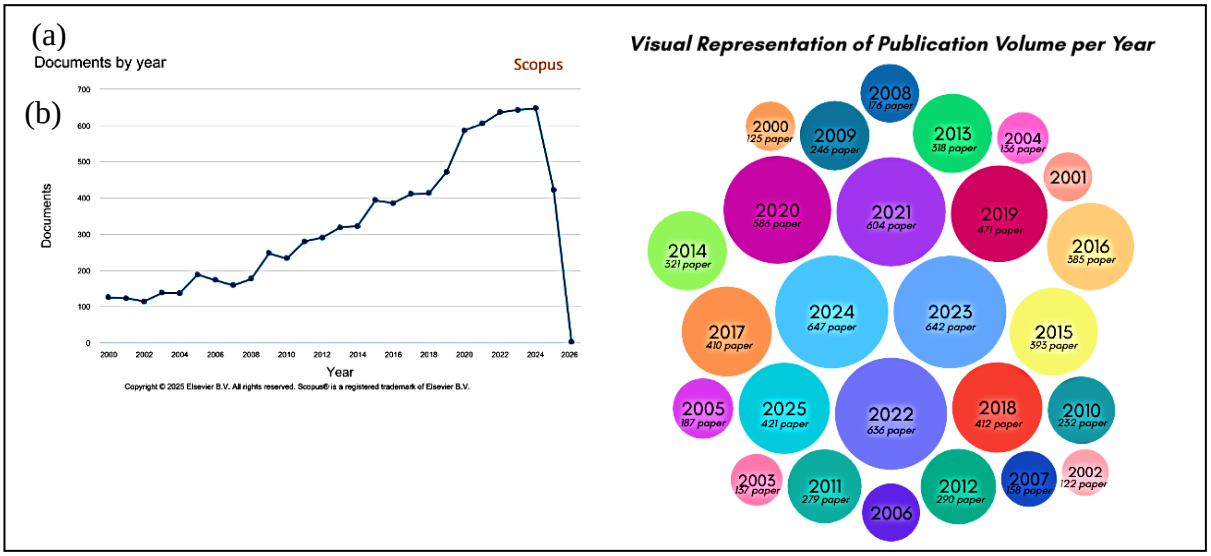

Figure 2: (a) A line chart shows annual trend of publications in gifted education research based on Scopus data, (b) A bubble visualization of yearly publication volume in gifted education research from 2000 to 2025

Figure 2 presents the annual trajectory of research output on gifted education between 2000 and 2025. The line chart (a) demonstrates a steady increase in publications from 2000, with notable surges after 2010 and a marked acceleration post-2018, reaching a peak of over 640 documents in 2023 and 2024. This trajectory reflects both the maturation of the field and heightened international interest in addressing issues of equity, STEM participation, and technology-mediated learning for gifted students. In parallel, the bubble chart (b) offers a

complementary perspective by visualizing both the volume and distribution of publications across years. The size of each bubble corresponds to the number of publications, providing an intuitive comparison of yearly contributions. The dominance of the 2020s is immediately visible, particularly 2022–2024, which together account for the highest concentration of studies in this dataset. Earlier years such as 2000–2005, while foundational, contributed far fewer publications, underscoring how the field has gained momentum only in the past 15 years.

Taken together, these two figures highlight the dual narrative of long-term growth and recent acceleration in gifted education research. The line chart clarifies the upward trajectory and temporal inflection points, while the bubble visualization emphasizes the sheer volume of output concentrated in the most recent decade. This reinforces the bibliometric finding that gifted education has transitioned from an emerging area to a consolidated and expanding domain of inquiry. Overall, the field demonstrates a consistent upward trajectory, with notable accelerations in the past two decades. From an initial dataset of 13,778 records, refinement yielded 5,010 publications between 2000 and 2025, demonstrating the expanding scholarly attention to this field. The annual distribution of publications shows relatively modest activity in the early 2000s, followed by a consistent upward trend after 2010. Notable surges were observed in the post-2015 period, coinciding with the increasing integration of technology and STEM-related themes into gifted education research. From 2000 to 2009, publication output remained modest, averaging fewer than 250 documents annually. This early phase reflects a period in which research on gifted education was still consolidating its theoretical foundations and was largely confined to national contexts, with limited global reach.

Beginning around 2010, a gradual but sustained increase can be observed, coinciding with the diversification of themes beyond psychometric and cognitive approaches to include socio-emotional needs, equity in identification, and the integration of enrichment and acceleration strategies. A particularly sharp rise occurred after 2018, with publications exceeding 600 per year between 2020 and 2024. This growth reflects increasing international attention to talent development, the influence of global education policies emphasizing inclusion and excellence, and the proliferation of specialized outlets for high-ability research. The peak in 2022–2024 aligns with broader trends in educational research, such as the expansion of STEM education initiatives and the adoption of technology-mediated learning tools for gifted students. These developments have spurred new lines of inquiry into how digital resources, enrichment programs, and policy frameworks can support diverse gifted populations(Gül & Ayık, 2024; Suelves et al., 2020).

The slight decline observed in 2025 should be interpreted cautiously. Similar to other bibliometric studies, this reduction likely results from the lag in indexing newly published documents in Scopus rather than an actual decrease in scholarly activity. Previous reviews (Cristina et al., 2025; Hernández-Torrano & Kuzhabekova, 2020) have noted the same indexing limitation when analyzing recent years. Thus, this trend confirms that gifted education has evolved into a mature and expanding research field, with significant growth in the past decade. It also demonstrates the responsiveness of the field to emerging educational priorities, particularly in relation to STEM integration, equity, and digital transformation. This finding aligns with earlier bibliometric reviews, which documented a transition from primarily psychometric and identification-focused studies toward applied, interdisciplinary approaches (Cristina et al., 2025; Hernández-Torrano & Kuzhabekova, 2020)

The growth trajectory suggests that gifted education has matured from a niche area into a globally recognized research domain with continuous expansion. Importantly, the pattern also

reflects broader educational research trends, including the rise of digital learning, equity-focused debates, and STEM education as policy priorities. The sustained increase in output indicates that gifted education is not only an established area of inquiry but also one that continues to evolve in response to new social, cultural, and technological challenges.

3.2 Country Contribution and Global Distribution

The bibliometric analysis of 5,010 Scopus-indexed documents between 2000 and 2025 reveals clear geographical disparities in the production of research on gifted education. Figure 3 presents the top ten contributing countries, with the United States emerging as the dominant leader, accounting for 2,263 publications, nearly double the output of the next closest country. This overwhelming contribution reflects the long-standing institutionalization of gifted education in the U.S., supported by specialized research centers, policy frameworks, and dedicated journals (Hernández-Torrano & Kuzhabekova, 2020; VanTassel-Baska & Cross, 2018)

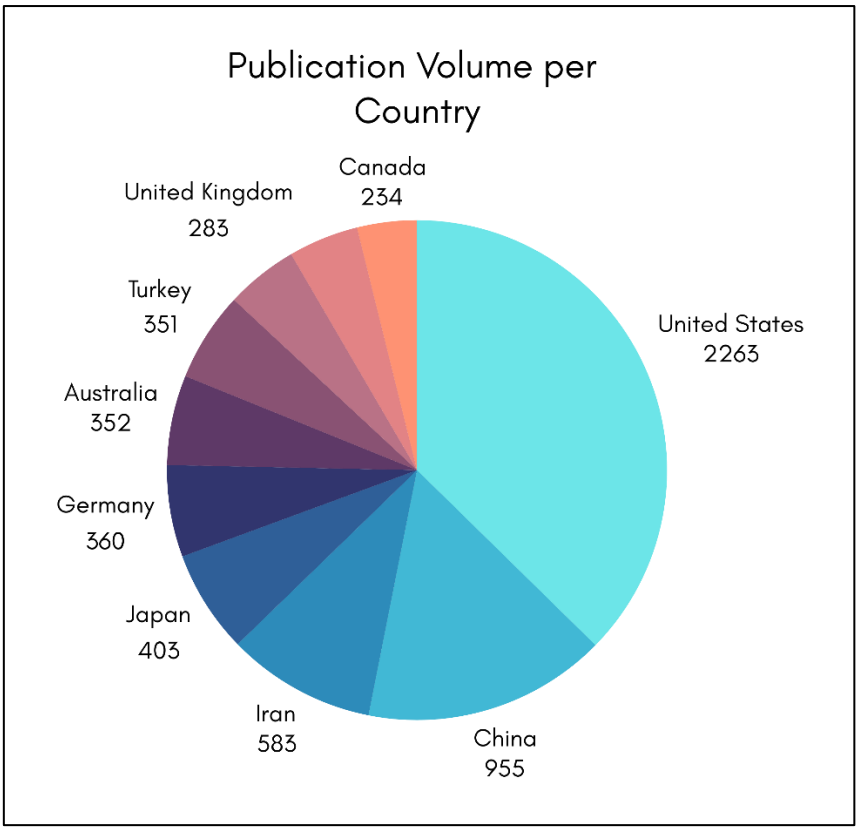

Figure 3: Global top contributors of research in gifted education from 2000 to 2025

Following the U.S., China ranks second with 955 publications, reflecting the country's growing interest in talent development and STEM-oriented gifted education, particularly in the last decade (Gül & Ayık, 2024). Iran occupies third place with more than 500 publications, which is noteworthy given its smaller higher education system compared to global leaders; this suggests a concentrated and policy-driven investment in high-ability student research. Other significant contributors include Japan, Germany, Australia, and Turkey, each producing between 300 and 450 publications. Meanwhile, European countries such as the United Kingdom and Spain, along with Canada, also appear among the top ten, indicating a wider global engagement in the field(Cristina et al., 2025).

While these results highlight the dominance of a few countries, the distribution of contributions is highly uneven. The dataset shows a strong Western and Asian presence, with limited representation from African and Latin American contexts. Previous reviews have noted the same gap, emphasizing the need to diversify perspectives in gifted education research (Bilgiler et al., 2024). This unevenness suggests that although gifted education has matured into a global field, its academic discourse continues to be disproportionately shaped by a handful of high-output nations.

While the United States and China dominate global research output, the ASEAN region also shows meaningful contributions, albeit at a smaller scale. As illustrated in Figure 4, Malaysia (146 publications) and Indonesia (131) lead the region, followed by Thailand (98), Singapore (53), Viet Nam (46), and the Philippines (16). The absence of records from Brunei, Cambodia, Lao PDR, and Myanmar highlights the uneven development of gifted education research within Southeast Asia.

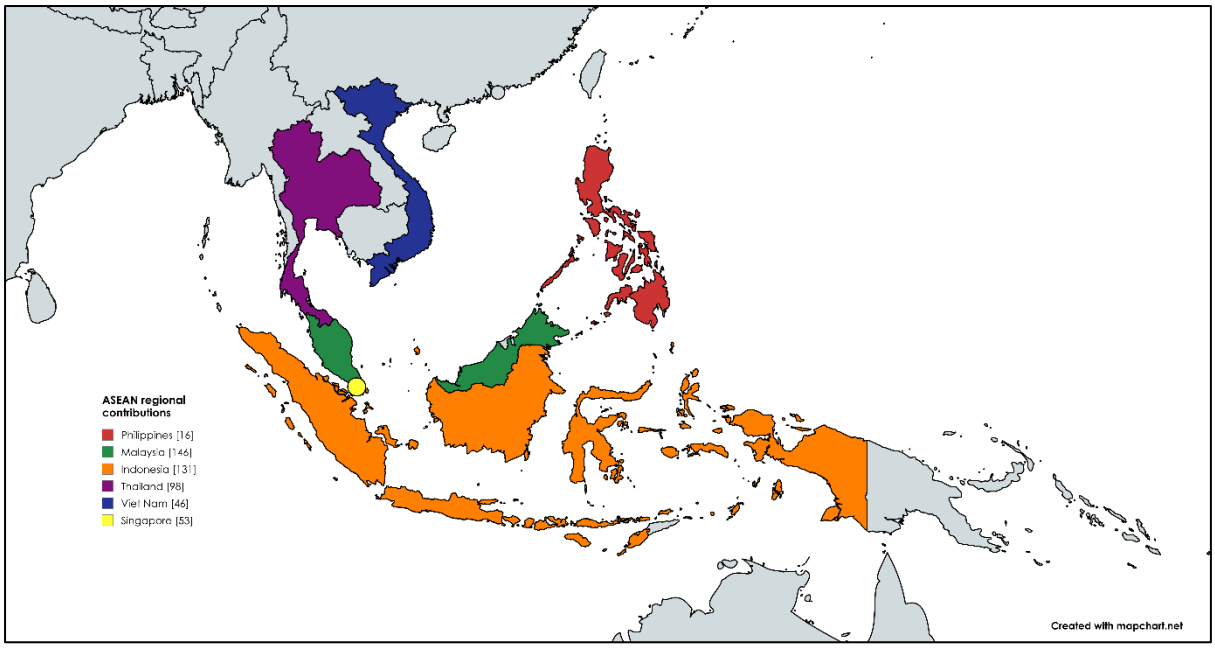

Figure 4: Contribution of ASEAN Countries to Gifted Education Research (2000–2025)

This regional pattern underscores the growing but still emerging role of ASEAN in global gifted education scholarship. The relatively stronger contributions from Malaysia and Indonesia reflect national policies supporting STEM and educational excellence, while countries like Singapore and Thailand have established traditions of educational research with international collaborations. By contrast, the limited representation of other ASEAN members suggests potential areas for future capacity building, regional collaboration, and knowledge exchange.Beyond sheer publication counts, collaboration patterns provide a richer understanding of global engagement. Figure 5 illustrates the international co-authorship networks using VOSviewer.

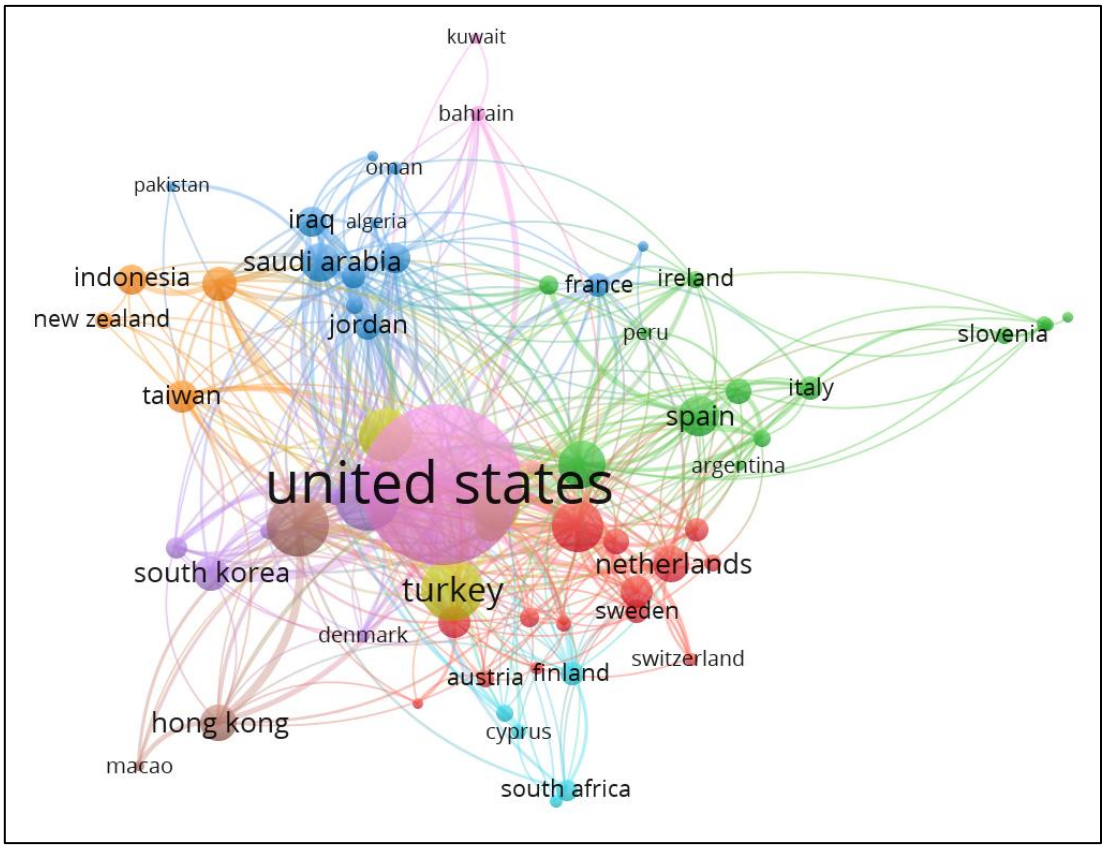

Figure 5: Global collaboration map generated using VOSviewer

The United States not only dominates in volume but also acts as a central hub, forming extensive partnerships with both Western Europe and Asian countries. Notable clusters are visible, such as the U.S.–European nexus (United Kingdom, Germany, Spain, Netherlands), the Middle Eastern cluster (Iran, Saudi Arabia, Turkey), and the Asia-Pacific group (China, Japan, South Korea, Australia). These clusters indicate regional cooperation patterns but also underscore the centrality of U.S. scholars in cross-continental collaborations (Son et al.,2024; Suelves et al., 2020)Interestingly, smaller countries such as Slovenia, Cyprus, and New Zealand appear in the collaboration map despite their modest publication counts. Their presence suggests that while national output is limited, their research communities engage in transnational partnerships that extend their visibility in the global network. Such collaborations may serve as a compensatory mechanism for countries with fewer institutional resources but strong connections to leading research hubs (Gómez-León, 2025).

Taken together, the country-level analysis highlights two important trends: first, the consolidation of gifted education research within a set of established leaders, particularly the United States and China; and second, the emergence of new players that contribute through collaborative networks rather than sheer volume. These findings suggest that the future of gifted education research lies not only in expanding output but also in fostering equitable global participation, particularly from underrepresented regions such as Africa and Latin America.

3.3 Author Productivity and Collaboration

Beyond country-level contributions, a small group of highly productive scholars has played a central role in shaping the field of gifted education. As shown in Figure 6, the co-authorship network generated through VOSviewer reveals clusters of leading authors who act as anchors of intellectual development. Among the most influential are Paula Olszewski-Kubilius, Joyce

VanTassel-Baska, Albert Ziegler, Jennifer Jolly, and Michael Matthews, each of whom has contributed extensively to areas such as talent development, curriculum design, enrichment strategies, and socio-emotional needs. Their sustained output reflects both the dominance of U.S. scholarship and the growing international reach of European and Asian researchers.

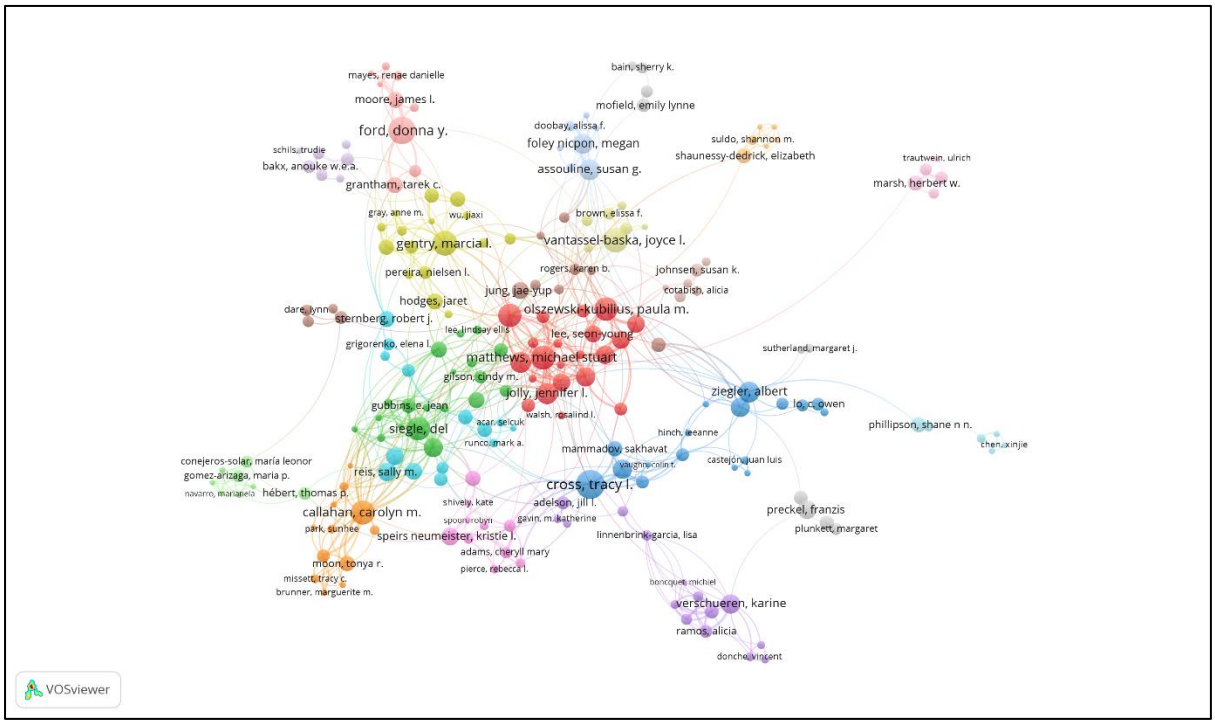

Figure 6: Co-authorship network of leading authors in gifted education research (2000–2025), visualized using VOSviewer. Node size represents publication volume, link thickness denotes collaboration strength, and colors indicate clusters

Collaboration patterns indicate that research networks remain relatively clustered, with strong intra-regional partnerships in the United States and Europe, and emerging but smaller clusters in Asia-Pacific. Bridging scholars such as Shane Phillipson (Hong Kong) help link Western and Asian communities, signaling an important step toward global integration. Nevertheless, several influential theorists, including Robert Sternberg, appear more isolated in the co-authorship map, highlighting that theoretical impact does not always translate into extensive collaboration networks.

At the institutional level, Scopus data show that universities such as Northwestern University, the University of North Texas, and the University of Erlangen-Nürnberg are among the most productive contributors to the field. These institutions not only generate high publication counts but also serve as hubs of collaboration, frequently partnering with other institutions across regions. Thus, the author and institutional analyses emphasize that while global productivity in gifted education is distributed across many countries, the intellectual leadership of the field remains concentrated within a relatively small circle of scholars and institutions. This reinforces earlier bibliometric findings that highlight both the centrality of U.S.-based researchers and the increasing visibility of European and Asian contributions (Cristina et al., 2025; Hernández-Torrano & Kuzhabekova, 2020).

3.4 Keyword Co-occurrence and Thematic Cluster

Keyword analysis provides insights into the intellectual structure of gifted education research by highlighting the most frequently co-occurring terms and their thematic groupings. Using VOSviewer, a co-occurrence map was generated from the final dataset of 5,010 publications, with a minimum threshold of five keyword occurrences. The resulting network identified several major clusters as shown in Figure 7 where each corresponding to distinct but interconnected areas of inquiry.

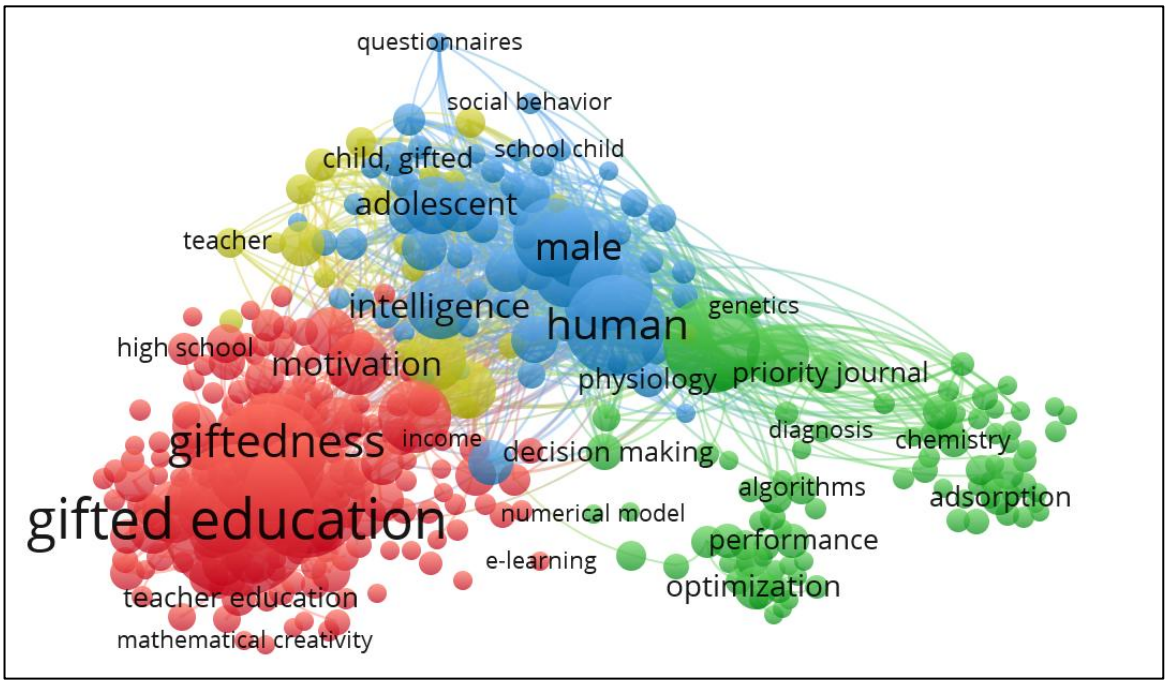

Figure 7: Keyword co-occurrence network in gifted education research (2000–2025), visualized using VOSviewer. Node size represents frequency of occurrence, link thickness denotes co-occurrence strength, and colors indicate thematic clusters.

The largest cluster centers on “gifted education,” and “giftedness”, reflecting core debates on identification, definitions, and conceptual frameworks. Closely linked terms such as intelligence, creativity, and talent development underscore the continuing relevance of psychological and educational theories in framing giftedness. A second cluster emphasizes educational practices and interventions, with keywords such as curriculum, enrichment, acceleration, teacher education, and assessment. This cluster illustrates the strong focus on translating theoretical conceptions into classroom strategies and policy frameworks, a trend consistent with earlier bibliometric reviews (Hernández-Torrano & Kuzhabekova, 2020)

Another cluster highlights socio-emotional dimensions, including terms such as motivation, underachievement, well-being, self-concept, and twice-exceptionality. These reflect increasing scholarly attention to the holistic development of gifted students, beyond purely cognitive measures. Finally, emerging clusters are visible around STEM education and technology-mediated learning, with terms such as STEM, innovation, digital learning, online learning, and 21st-century skills. This suggests a growing research frontier that integrates gifted education with broader educational policy priorities, aligning with recent findings by (Gül & Ayık, 2024; Suelves et al., 2020).

Hence, the keyword clusters demonstrate that the field of gifted education has evolved from its traditional focus on definitions and identification toward a more multidimensional structure.

While foundational debates remain, recent scholarship increasingly integrates pedagogy, socio-emotional development, STEM priorities, and technology-enhanced learning, reflecting the dynamic and interdisciplinary nature of the field.

3.5 Emerging Frontiers

The bibliometric mapping of keywords and thematic clusters reveals not only the established areas of gifted education research but also several emerging frontiers that are shaping the future of the field. Two particularly salient directions are the integration of STEM education and the exploration of technology-mediated learning. First, STEM education for gifted learners has gained prominence in the past decade, reflecting global policy priorities around innovation and human capital development. Keywords such as STEM, science education, mathematics, innovation, and creativity increasingly cluster together, suggesting a shift toward positioning gifted education as a driver of excellence in high-demand knowledge economies. Recent science mapping confirms that STEM studies within gifted education are expanding rapidly, with productive institutions and authors emerging across the United States, China, and Europe (Bilgic & Baloğlu, 2025; Gül & Ayık, 2024)This trend underscores the potential of gifted education to contribute not only to individual development but also to national and regional competitiveness.

Second, technology-mediated learning has emerged as another frontier. Keywords such as digital learning, online learning, technology integration, and 21st-century skills highlight a growing body of work exploring how digital platforms, enrichment tools, and virtual classrooms can enhance the educational experience of high-ability students. While technology is often presented as an enabler of personalized learning, bibliometric reviews also caution that poorly implemented practices may risk fostering passive or superficial engagement (Gómez-León, 2025; Suelves et al., 2020)Nevertheless, the clustering of technology-related terms suggests that this theme is consolidating as a distinct research stream, particularly in the context of post-pandemic educational transformations. A third frontier relates to the equity and inclusion agenda. While not as dominant in keyword frequency, terms such as underrepresentation, diversity, and twice-exceptional are increasingly visible, indicating rising attention to the challenges of ensuring fair identification and support for gifted learners from marginalized backgrounds (Bilgiler et al., 2024; Şakar & Baloğlu, 2023) This points to a future research direction where gifted education intersects with broader discourses on equity and social justice in education.

In summary, the analysis highlights that the intellectual core of gifted education research remains anchored in conceptualization and pedagogy, but its future trajectory is shaped by STEM integration, digital innovation, and equity-oriented approaches. These emerging frontiers suggest that gifted education is becoming increasingly interdisciplinary, bridging psychology, pedagogy, technology, and policy, and aligning itself with global educational priorities for the 21st century.

4. Comparison with previous bibliometric studies

Bibliometric research on gifted education is still relatively limited, with most prior studies focusing on narrow themes, short timeframes, or restricted journal sets. The present analysis extends this literature by providing a multidisciplinary and longitudinal perspective across 25 years (2000–2025), drawing on 5,010 Scopus-indexed publications. Earlier reviews such as (Hernández-Torrano & Kuzhabekova, 2020) mapped the field over six decades but were limited to four specialized journals in gifted education. Their findings highlighted the long-

term consolidation of the field and the dominance of U.S.-based scholarship, which is consistent with the present results. However, by expanding beyond journal restrictions, the current study captures a wider range of contributions, including interdisciplinary intersections with psychology, teacher education, and STEM studies.

More recent work by Cristina et al (2025), examined trends and topic evolution within high-ability education, emphasizing the decline of psychometric approaches and the rise of applied and socio-educational perspectives (Pfeiffer & Shaughnessy, 2020). The present analysis confirms this transition, showing how enrichment, socio-emotional development, and technology-mediated learning now form visible thematic clusters in the global network. Importantly, the current dataset's broader coverage allows for the identification of emerging frontiers such as STEM and digital learning, which were less developed in earlier reviews. Similarly, Gómez-León (2025) and Suelves et al (2020), focused on technology-mediated learning, revealing both opportunities and risks for gifted students in digital environments. While these studies provided valuable thematic insights, they were narrower in scope. The current analysis situates technology as part of a broader thematic evolution, demonstrating how digital learning intersects with 21st-century skills and STEM priorities.

Finally, Bilgic & Baloğlu (2025) and Gül & Ayık (2024) provided bibliometric mappings of mathematics and STEM in gifted education, respectively. These studies underscored the importance of domain-specific inquiry but remained sectoral. By contrast, the present research integrates these strands into a comprehensive overview, situating STEM as one of several converging frontiers within the global discourse on giftedness. Taken together, these comparisons show that while earlier bibliometric efforts established foundational insights into specific themes or journals, the current study contributes by offering the most comprehensive, multidisciplinary, and regionally inclusive analysis to date. In particular, the inclusion of country-level comparisons and ASEAN regional perspectives provides a novel lens absent in prior studies. This positions the present work as both a continuation and an expansion of earlier bibliometric reviews, offering a consolidated map of gifted education research and highlighting trajectories for future inquiry.

5. Implications and Future Direction

The findings of this bibliometric analysis have important implications for research, practice, and policy in gifted education. By mapping 25 years of scholarship, several patterns emerge that highlight both achievements and persistent gaps. The steady growth in publication output since 2000 demonstrates that gifted education has transitioned from a niche domain into a mature research field with global visibility. However, the dominance of scholars and institutions from the United States and Europe underscores the need for more balanced international contributions. Limited representation from regions such as Africa, South America, and parts of Southeast Asia points to missed opportunities for comparative and cross-cultural studies. Expanding collaborative networks beyond the traditional hubs could enrich theoretical perspectives and diversify methodological approaches.

The clustering of keywords around enrichment, acceleration, and socio-emotional development reflects the growing recognition that gifted learners require holistic educational strategies. For practitioners, this reinforces the importance of designing interventions that balance cognitive challenge with emotional support. The prominence of teacher education within the thematic clusters also signals the critical role of professional preparation in ensuring effective classroom implementation. Country-level analyses reveal striking disparities in research output. While

the United States, China, and several European nations have established strong publication records, many countries still lack consistent engagement in gifted education research. Policymakers in underrepresented regions may benefit from the development of national research agendas, funding mechanisms, and international partnerships that can stimulate local capacity. The ASEAN case demonstrates both progress (e.g., Malaysia, Indonesia, Thailand) and gaps (e.g., Brunei, Cambodia, Lao PDR, Myanmar), suggesting regional collaboration as a viable strategy for strengthening the field.

Emerging frontiers identified in this study particularly STEM education, technology-mediated learning, and equity-focused approaches offer fertile ground for future research. As global education systems grapple with challenges of digital transformation and inclusion, gifted education can play a central role in shaping innovative and equitable pathways for high-ability learners. Future bibliometric work could complement keyword-based analyses with citation networks or topic modelling to deepen understanding of intellectual evolution. Moreover, longitudinal tracking beyond 2025 will be necessary to assess whether the surge in output observed in the past decade represents a sustained trajectory or a temporary peak. In sum, the implications of this study point toward a field that is both consolidating and diversifying. By strengthening international collaborations, expanding into underrepresented regions, and embracing emerging interdisciplinary frontiers, gifted education research can continue to contribute meaningfully to global educational priorities in the 21st century.

6. Conclusion

This study provides a comprehensive bibliometric mapping of gifted education research from 2000 to 2025, based on 5,010 Scopus-indexed publications. Using VOSviewer for co-authorship, co-occurrence, and thematic analysis, the results confirm a consistent upward trajectory in publication output, with marked acceleration after 2010. Four main insights emerge. First, global publication trends show that gifted education has matured into a consolidated field, with the past decade witnessing its strongest growth. Second, country and author analyses reveal the dominance of the United States, China, and several European nations, alongside emerging but uneven contributions from regions such as ASEAN. Third, keyword mapping highlights the intellectual structure of the field, with clusters focusing on identification and conceptualization, pedagogical interventions, socio-emotional development, and policy. Finally, emerging frontiers emphasize STEM integration, technology-mediated learning, and equity concerns as critical directions for future research.

By situating these findings in relation to earlier bibliometric studies, this paper extends existing knowledge through its broader dataset, longer time span, and regional perspective. The implications highlight both the consolidation of the field and the need for greater international collaboration, interdisciplinary approaches, and attention to underrepresented regions. Overall, the results demonstrate that gifted education is not only an established research domain but also one that continues to evolve in response to changing educational priorities, technological transformations, and societal demands. As the field advances, fostering inclusive and innovative approaches will be crucial for ensuring that gifted learners worldwide are supported to reach their full potential.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this research. This study was conducted independently, without any commercial or financial relationships that could be construed as a potential conflict of interest.

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