Bibliometric analysis of early childhood gender and sexuality education research

Ngoc Thi Thuy Thuong Tran[a] | **Viet-Nhi Tran**[a] ✉ | **Tam Thanh Nguyen**[a] | **Nhat Huu Ho**[a] |
Anh-Dung Hoang[a] | **Phuoc-Nguyen Cong Kieu**[b]

[a]Faculty of Preschool Education, University of Education, Hue University, Vietnam.
[b]Faculty of Psychology and Education, University of Education, Hue University, Vietnam.

Abstract Academic inquiry into gender and sexuality education (GaSE) in early childhood has shifted from a marginal to a central concern, prompted by its perceived value in fostering inclusive attitudes and supporting child development. This study presents the first bibliometric analysis of GaSE scholarship, moving beyond narrative reviews to quantitatively map its publication trends, intellectual structure, and thematic evolution. We analysed 119 Scopus-indexed articles published between 1932 and 2024, employing VOSviewer and R Biblioshiny for performance analysis and science mapping. Analysis of publication themes reveals a transition from a protection-oriented focus on preventing child sexual abuse toward a pedagogically centred approach emphasising concepts such as gender-flexible instruction. Performance analysis reveals a sharp increase in publications post-2016, alongside a pronounced geographical imbalance in authorship. North American and European researchers, particularly those from the United States, were the most productive contributors. The regional concentration is further evidenced by a low international collaboration index (7.563) pointing to a systemic limitation in global knowledge exchange. Co-citation analysis identifies the field's core theoretical influences as feminist theory, social constructivism, and queer pedagogies. The contributions of Butler's "gender performativity" and Robinson on the social construction of "childhood innocence" appear as foundational texts. Co-occurrence mapping delineates the conceptual structure of the field into four primary thematic clusters: (1) theoretical gender foundations, (2) educational implementation, (3) child protection frameworks, and (4) developmental perspectives. Despite the field's maturation, persistent gaps include a need for more culturally-adapted research and the establishment of validated assessment methodologies. By quantifying the field's structure and identifying these deficiencies, this study recommends focused actions to guide future inquiry: fortifying global research networks, conducting longitudinal studies, and grounding teacher preparation in evidence-based practices.

Keywords: bibliometric, early childhood, gender education, sexuality education, Scopus

1. Introduction

The evolution of gender and sexuality education (GaSE) in early childhood represents a critical intersection of developmental psychology, educational practice, and sociocultural dynamics. Historically, the discourse surrounding these topics in early education has undergone paradigmatic shifts, transitioning from being considered taboo to being recognized as essential components of holistic child development (Butler, 2006; Davies, 2003). This transformation, catalyzed by second-wave feminism and children's rights movements in the late 1960s, fundamentally reshaped approaches to early childhood education. In line with this, the UNESCO (2024) Gender Report highlights the pivotal role of early education in addressing gender biases that often manifest during formative years, thus shaping long-term attitudes and behaviors and fostering an inclusive mindset from a young age.

Early childhood is a crucial period for both gender identity development and foundational sexuality education and is influenced by complex interactions between biological predispositions and environmental factors (Bronfenbrenner & Morris, 2007). Social learning theory (Bandura, 1977) explains how children construct their understanding of gender and sexuality through observation and interaction, whereas gender schema theory (Bem, 1981) illuminates the development of their cognitive frameworks. Empirical evidence supports these theoretical foundations: gender awareness begins in infancy, with gender categorization abilities documented as early as six months (Fausto-Sterling, 2021). Moreover, children aged 3–6 years actively seek information about bodies and relationships (Balter et al., 2016), exhibit sophisticated gender stereotypes by age two, and demonstrate a need for basic sexuality education, including body awareness and personal boundaries, by age four (Balter et al., 2016).

The contemporary research landscape reflects diverse approaches to GaSE. Feminist poststructuralist theory has provided critical lenses for examining how educational institutions address—or avoid—these topics (MacNaughton, 2000). In sexuality education, while 89% of educators acknowledge its importance, only 32% feel adequately prepared (Brouskeli & Sapountzis, 2017), with significant cultural variations observed. Nordic countries, for example, often adopt more comprehensive models than many Asian and African countries (Zhang et al., 2013). Gender education approaches in early childhood typically aim to minimize gender differences or employ antibias strategies that explicitly address diversity and equity (Carnahan et al., 2024; Derman-Sparks & Edwards, 2021). Research suggests that minimizing gender differences may inadvertently reinforce existing inequities (Osborne & Davis, 2022; Tayler & Price, 2016), whereas antibias strategies actively promote inclusive environments (Nelson & Brown, 2019).

Despite these advancements, critical gaps persist. First, although teacher attitudes have been documented (Brouskeli & Sapountzis, 2017), empirical investigations into the belief–practice nexus in GaSE remain limited. Meta-analyses indicate that only 12% of studies examine this alignment, particularly in sexuality education (Emilson et al., 2016). Second, longitudinal research tracking the developmental impacts of early GaSE interventions is notably scarce, with only 7% of studies extending beyond one year (Hill & Jacobs, 2020). Third, the literature predominantly reflects Western contexts, with only 15% of studies examining non-Western settings (Zhang et al., 2013). This limits the understanding of cultural variations that are essential for developing effective, contextually appropriate GaSE strategies.

The current state of GaSE research presents a complex landscape that requires systematic analysis to understand its development and trajectory. While individual studies have explored specific facets, no comprehensive bibliometric analysis has yet mapped the evolution of this field across diverse geographical and cultural contexts. This gap is particularly significant given the increasing recognition of early childhood as a critical period for identity development and the corresponding need for evidence-based GaSE approaches.

To address this gap, the present study conducts a comprehensive bibliometric analysis of research on GaSE in early childhood, drawing from the literature published between 1932 and 2024. Specifically, the study addresses the following research questions (RQs):

RQ1: What is the geographical distribution and growth trajectory of the early childhood GaSE literature?

RQ2: Which journals, authors, and documents have had the most significant impact within the major thematic clusters of this literature?

RQ3: What are the core research themes and their conceptual structure, and how have they evolved over time?

RQ4: What are the recent developments and emerging trends in this research field?

This study aims to provide the first comprehensive bibliometric mapping of GaSE research in early childhood. Understanding the intellectual structure and evolution of this domain is crucial for advancing theoretical frameworks, informing teacher preparation and classroom practices, and guiding evidence-based policy development—particularly as societies continue to navigate evolving perspectives on gender and sexuality in educational contexts.

2. Materials and methods

This study employs bibliometric analysis to explore the evolving landscape of GaSE research in early childhood from 1932-2024. This methodological approach systematically identifies significant patterns, historical trends, and emergent research fronts from a large body of scientific literature (Donthu et al., 2021). It has been extensively validated in educational research for its ability to integrate both quantitative and qualitative insights through statistical analysis and network visualizations, thereby enhancing our understanding of intellectual landscapes and thematic developments (Khusna et al., 2024; Sugiarti et al., 2024).

2.1. Research Design and Data Collection

The research process followed the four-step bibliometric research framework suggested by Donthu et al. (2021). The Scopus database was selected as the primary data source because of its extensive coverage of the social science and education fields, particularly its systematic indexing system, which is well suited for bibliometric analysis (Kataeva et al., 2023; Pranckutė, 2021). While other databases, such as Web of Science, ERIC, and Google Scholar, offer valuable resources, Scopus was chosen for its broader international journal coverage and robust metadata analysis capabilities, which have been identified as advantageous for bibliometric studies in education (Pranckutė, 2021; Su & Yang, 2024). The timeframe of 1932-2024 was chosen to capture the full historical development of the research field, providing a comprehensive view of its evolution from the earliest studies through contemporary approaches.

Data extraction occurred on November 2, 2024, via the following Boolean search string applied to titles, abstracts, and keywords: *(TS-AB-KEY (("sex*" OR "gender") AND ("education") AND ("early childhood" OR "early child" OR "preschool*" OR "pre-school*" OR "pre-k*" OR "kindergarten*" OR "nursery" OR "toddler*" OR "young child*" OR "1-3 year*" OR "0-6 year*" OR "3-6 year*" OR "ECE" OR "ECEC"))*

This search string was developed and refined iteratively. Initial broad searches (e.g., using fewer specific terms for "early

childhood") yielded a high volume of irrelevant results, whereas overly narrow strings risk excluding foundational or cross-disciplinary work. The final string was chosen to optimize the balance between precision and recall and was validated against a set of core GaSE articles. The selection of keywords was informed by previous reviews and studies on gender (Kataeva et al., 2023), sexuality education (Barriuso-Ortega et al., 2024; Kee-Jiar & Shih-Hui, 2020; Kim et al., 2023), and early childhood education (Su & Yang, 2024; Wang et al., 2023).

2.2. Selection criteria and screening process

In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009), as illustrated in Figure 1, specific inclusion and exclusion criteria were applied. The inclusion criteria were as follows: (1) peer-reviewed journal articles to ensure scholarly rigor; (2) an explicit focus on gender and/or sexuality education to maintain topical relevance; (3) an early childhood context (defined as ages 0-6) to align with established developmental parameters; and (4) empirical, theoretical, or methodological contributions that advance understanding in the field. The exclusion criteria eliminated review articles to avoid duplication of findings, editorial notes (n = 5) due to their limited scholarly contribution, and publications from unrelated journals (n = 76) that mentioned keywords but did not substantively address GaSE in early childhood.
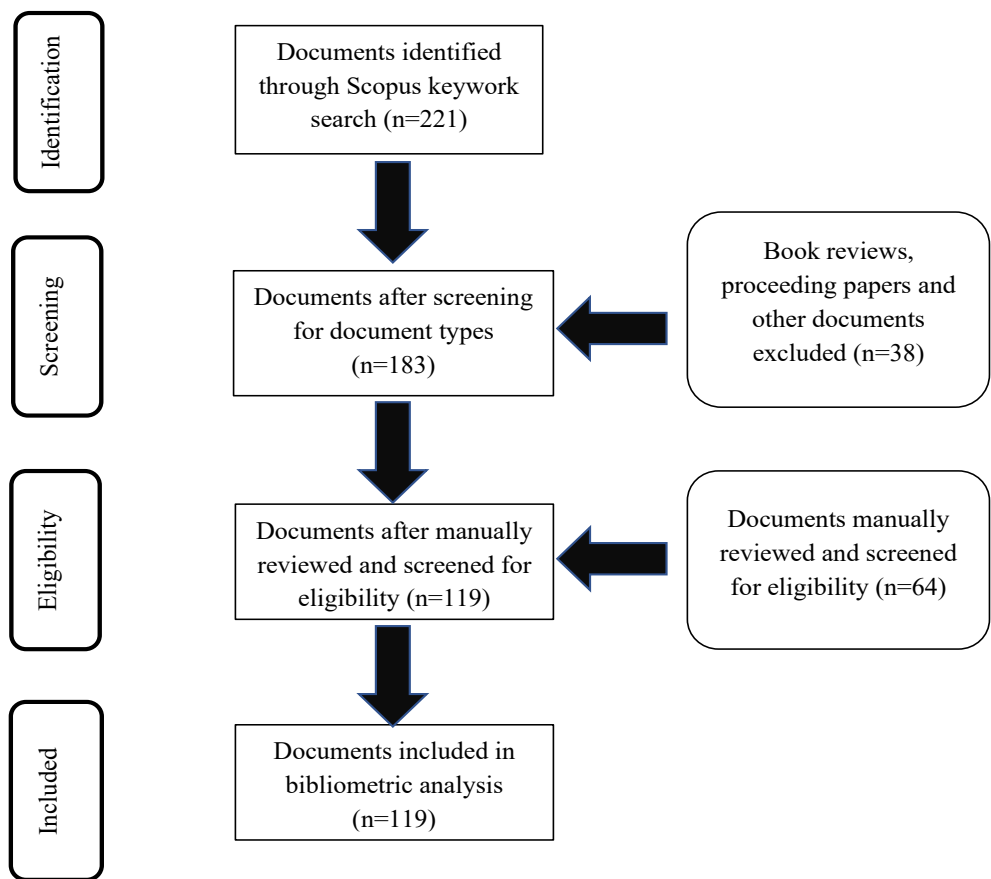

Figure 1 PRISMA flow diagram for steps in identifying and screening (Moher et al., 2009).

The initial search resulted in 221 articles. The screening process involved three phases, conducted by two independent reviewers, with any discrepancies resolved through consultation with a third reviewer: (1) title and abstract screening for initial relevance assessment; (2) full-text screening to confirm adherence to inclusion criteria; and (3) a quality assessment to evaluate methodological rigor. This process resulted in a final dataset of 119 research articles. Prior to analysis, author keywords were manually standardized to harmonize variant terms (e.g., 'gender-role' and 'gender roles' unified), merge synonyms where contextually appropriate for thematic coherence, and ensure consistent terminology (e.g., singular vs. plural forms). A thesaurus specific to the dataset was developed to enhance the reliability of co-occurrence analyses.

2.3. Analytical Framework and Network Visualization Techniques

The analysis utilized the R Biblioshiny package (version 4.0.2) alongside VOSviewer software (version 1.6.18) (Van Eck & Waltman, 2014) to examine the 119-document corpus. Three primary network analysis techniques were employed:

• Co-occurrence Network Analysis: This technique visualizes keyword relationships. A minimum threshold of three occurrences per keyword was established to balance the focus on substantive themes with comprehensive coverage, resulting in 46 keywords for the final network. Node size represented keyword frequency, edge thickness depicted co-occurrence strength, and color clustering identified thematic groupings.

• Cocitation Network Analysis: This method involves examining citation patterns to reveal theoretical foundations. A minimum threshold of four citations per document was set to focus on impactful works, yielding 12 documents for analysis. The node size indicates the citation frequency, and the edge thickness represents the cocitation strength.

• Thematic evolution analysis: Using Sankey diagrams, this analysis traced the temporal development of the research themes. Themes were mapped across three distinct periods: pre-2000, 2000-2015, and post-2015. These periods were identified on the basis of an initial exploratory analysis of publication growth rates and significant shifts in keyword frequencies, aligning with discernible developmental phases within the GaSE field. The flow width in the Sankey diagram represents the thematic connection strength across periods.

Quantitative bibliometric indicators, including publication metrics (e.g., total publications, growth rates), citation analysis (e.g., total citations, citations per document), productivity measures (e.g., h-index, collaboration index), and geographical distribution metrics, were calculated via fractional counting methods to accurately represent international collaborations. Journal and author impacts were evaluated through multidimensional metrics, including citation counts and h-index values. Thematic evolution was further quantified via flow strength metrics, as well as diversification and integration indices, to assess the balance between thematic specialization and theoretical coherence in the field's development. This integrated methodological approach provides a robust foundation for examining the intellectual structure and evolutionary trajectory of GaSE research in early childhood.

3. Results

3.1. Research Growth and Geographic Distribution

The final dataset included 119 Scopus-indexed articles on GaSE in early childhood, spanning from 1932-November 2024. The earliest paper, published in 1932, marks the beginning of scholarly engagement with this field. Figure 2 presents the longitudinal growth of scientific production, revealing an initially slow start, followed by distinct phases of expansion over nine decades.
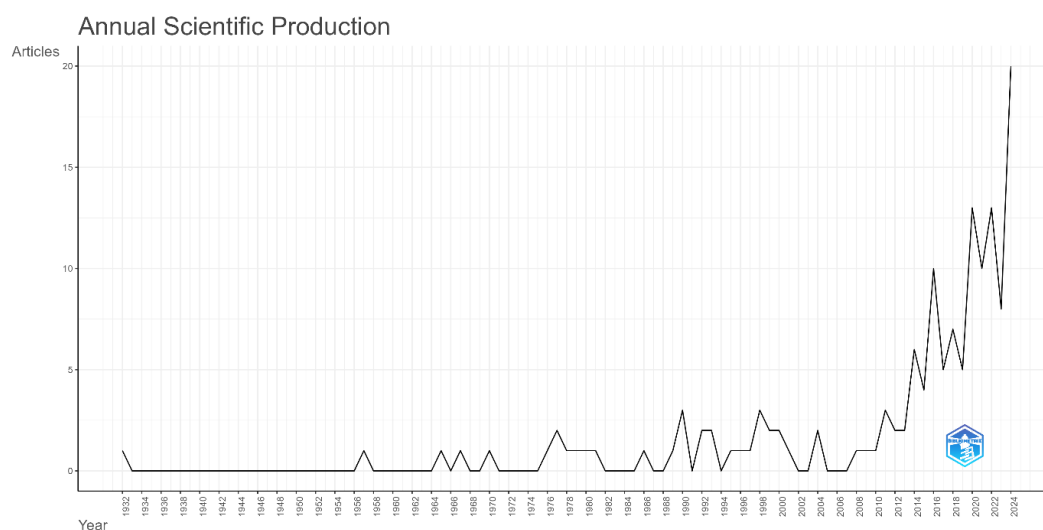

Figure 2 Number of articles on GaSE in early childhood (1932-2024).

The growth trajectory of GaSE research can be categorized into three main phases:

• Nascent period (1932–late 1970s): During this phase, research on GaSE in early childhood was limited, with publications appearing infrequently. This suggests that the topic was peripheral to mainstream educational discussions.

• Transitional period (1980s–1990s): A modest increase in research activity occurred during this period, with an average annual growth rate of approximately 3.19%. This growth coincided with broader societal shifts, including the rise of feminist theory, which influenced educational practices and began to shape the field's foundational frameworks.

• The research intensification period (2000–2024) marked a significant acceleration in the output of GaSE research. This phase can be further divided into two subperiods. From 2000-2015, known as early intensification, there was a sharp rise in the number of publications, characterized by more sophisticated methodologies and an increase in theoretical diversity. From 2016 onward, the field experienced rapid expansion, with publication rates reaching unprecedented levels. This surge was accompanied by a notable increase in citations, signaling the growing academic credibility of GaSE. This rapid growth aligns

with broader educational policy shifts that emphasize inclusive pedagogies and gender-sensitive approaches in early childhood education. The sharp increase in research output since 2016 highlights the increasing recognition of GaSE as a distinct and vital area of scholarly inquiry.

Table 1 outlines the geographic distribution of research contributions, highlighting notable regional disparities in both output and international collaboration. The United States leads the field with 32 publications and 475 citations, reflecting its strong research infrastructure. Canada has 12 publications and 128 citations, whereas Australia (9 publications, 151 citations) and the United Kingdom (8 publications, 127 citations) have made considerable contributions, particularly in pedagogy and theoretical advancements. Sweden, with 7 publications and 48 citations, maintains a stable presence, which is consistent with the Nordic region's emphasis on progressive, gender-sensitive pedagogy. Emerging contributions from Asia are visible, with China (5 publications, 70 citations) and Indonesia (4 publications, 70 citations) making notable impacts despite relatively lower publication volumes. In contrast, Spain, with 6 publications, has a relatively low citation count (15), whereas Finland (5 publications, 41 citations) shows higher international visibility than Turkey (5 publications, 27 citations), despite similar publication counts.

Table 1 Top countries' contributions to GaSE in early childhood research from 1932—2024.

Country	Documents	Total citations	Total link strength
United States (USA)	32	475	4
Canada	12	128	0
Australia	9	151	2
United Kingdom (UK)	8	127	3
Sweden	7	48	2
Spain	6	15	0
China	5	70	1
Finland	5	41	2
Turkey	5	27	1
Indonesia	4	70	1

The "Total link strength" metric provides insights into international collaboration patterns. The USA (link strength: 4) and the UK (link strength: 3) are central nodes in global research networks, whereas countries such as Australia, Finland, and Sweden (all with link strength: 2) actively participate in cross-border research. However, the overall mean international collaboration index of 7.563 suggests that while some international co-authorship exists, there is substantial untapped potential for expanding cross-cultural research networks, particularly with underrepresented regions in the Global South. This Western-dominated landscape in shaping GaSE discourse underscores the importance of fostering more inclusive research efforts to create culturally diverse theoretical frameworks and pedagogies.

3.2. Leading Journals and Influential Authors

The dissemination and scholarly impact of GaSE research are largely shaped by prominent journals and influential authors. Table 2 provides an overview of the five most impactful journals in early childhood GaSE research, selected on the basis of their h-index, total citations received by articles within this dataset, and the number of relevant papers published.

Table 2 Top five impactful journals related to the field of GaSE in early childhood.

Journal	Scopus h-index	Total citations	Number of papers	Year of first publication	Scopus Ranking 2023
Early Child Development and Care	6	188	7	1999	Q3-Q2
Sex Education	3	30	6	2017	Q2
Child Abuse and Neglect	2	99	3	1992	Q1
Early Years	2	43	3	2020	Q2
European Early Childhood Education Research Journal	2	36	3	2016	Q1

'Early Child Development and Care' stands out as the leading journal, with the highest h-index (6) in this dataset and 188 citations across seven articles published since 1999. Its sustained presence over two decades highlights its critical role in publishing foundational research, particularly in the areas of developmental and pedagogical approaches to GaSE. Although the journal *"Sex Education"* is a more recent addition to early childhood GaSE (with its first relevant publication in 2017), it has rapidly gained recognition as a specialized journal. With an h-index of 3 and 30 citations from six papers, it has become a key platform for research focused on teacher preparation and the implementation of developmentally appropriate sexuality education. The journal *'Child Abuse and Neglect'* also stands out, with an h-index of 2 and 99 citations from three papers published since 1992. Its high citation rate per paper (33) reflects the field's historical roots in child protection frameworks, with early GaSE research often intersecting with this area. Two European journals, *'Early Years'* (h-index 2, 43 citations from three papers since 2020) and the *'European Early Childhood Education Research Journal'* (h-index 2, 36 citations from three

papers since 2016), also play significant roles. *'Early Years'* quickly gained prominence by focusing on practical pedagogical applications, whereas the *'European Early Childhood Education Research Journal'* has contributed to the growing body of work on gender-conscious pedagogy. The chronological distribution of first publications in these journals—from *'Child Abuse and Neglect'* (1992) to *Early Years* (2020)—reflects the evolution of the field from protection-oriented frameworks to more comprehensive, pedagogically focused GaSE approaches.

Table 3 highlights the five most productive and influential authors between 1990 and 2020, which were selected on the basis of their productivity (number of papers), citation impact (total citations), and h-index within this dataset. These scholars, who represent diverse geographical contexts, have made key contributions to the field. Bogat, G. A. (USA), with four publications since 1990 (h-index 3, 41 citations), is known for laying early methodological foundations for researching gender development in educational settings. Davies, A. W. J. (Canada), with three publications since 2016 (h-index 3, 56 citations), has significantly influenced contemporary discussions on the relationship between teacher perceptions and children's gendered behaviors. Heikkilä, M. (Finland), with three publications since 2020 (h-index 3, 36 citations), exemplifies the Nordic tradition of "gender-conscious pedagogy." Zhang, W. (China), with three publications since 2014 (h-index 3, 67 citations), has expanded the understanding of Asian perspectives on GaSE, with exceptional citation impact (averaging 22.3 citations per paper). Chapman, R. (Australia), despite having only two publications since 2016 (h-index 2), has garnered significant influence, with 74 citations, particularly through his research on gender socialization processes in preschools. Overall, the consistent h-index values (ranging from 2--3) across these leading authors reflect a field characterized by distributed influence rather than dominance by any single researcher or paradigm. This aligns with the multidisciplinary and evolving nature of early childhood GaSE research.

Table 3 Top five most productive authors related to the field of GaSE in early childhood.

Author	Country	Number of papers	Scopus h-index	Total citations	Year of first publication
Bogat, G. A.	USA	4	3	41	1990
Davies A. W. J	Canada	3	3	56	2016
Heikkilä M.	Finland	3	3	36	2020
Zhang W.	China	3	3	67	2014
Chapman R.	Australia	2	2	74	2016

3.3. Top Influential Papers

In addition to individual authors and journals, specific research articles have played a pivotal role in shaping foundational knowledge, theoretical frameworks, and methodological approaches within early childhood GaSE research. Table 4 presents the eight most influential research articles identified in this dataset, which are selected on the basis of a combination of local citation (LC) counts (citations within the 119-document corpus) and global citation (GC) counts (total citations in Scopus). These papers have significantly impacted both the specific GaSE research niche and the broader academic landscape. An analysis of these articles reveals a chronological evolution in terms of research focus and methodology.

Table 4 Top eight impactful research articles about GaSE in early childhood from 1932—2024.

Author, Year, Journal	Title	Local Citations	Global Citations	LC/GC Ratio (%)
Menmuir & Kakavoulis, (1999), Early Child Dev Care	Sexual Development and Education in Early Years: A Study of Attitudes of Pre-school Staff in Greece and Scotland	5	8	62.50
Kakavoulis A, (1998), European Early Childhood Education Research Journal	Early childhood sexual development and sex education: A survey of attitudes of nursery school teachers	4	56	7.14
Kurtuncu et al. (2015), Sex Disabil	The Sexual Development and Education of Preschool Children: Knowledge and Opinions from Doctors and Nurses	4	22	18.18
Chapman R, (2016), Early Child Dev Care	A case study of gendered play in preschools: how early childhood educators' perceptions of gender influence children's play	4	56	7.14
Wurtele et al. (1992), Child Abuse Negl	Sexual abuse prevention education for young children: a comparison of teachers and parents as instructors	2	85	2.35
Brouskeli & Sapountzis (2017), Res Educ	Early childhood sexuality education: Future educators' attitudes and considerations	2	58	3.45
Warin & Adriany (2017), J Gender Stud	Gender flexible pedagogy in early childhood education	2	5	40.00
Cheung et al. (2021), J Educ Teach	Preservice early childhood teachers' perceptions about sexuality education and behavioral intentions toward children's curiosity about sexuality	2	5	40.00

Foundational Period: *Establishing Frameworks and Exploring Attitudes (1992–1999):* The earliest highly influential papers in this dataset focused on establishing conceptual frameworks, primarily by exploring stakeholder attitudes and initiating cross-cultural comparisons. Wurtele, Kast, and Melzer (1992), published in Child Abuse & Neglect, stand out with the highest global citation count (GC = 85). This comparative analysis of teachers versus parents as instructors for sexual abuse prevention education not only contributes significantly to understanding effective intervention delivery but also sets early methodological standards for evaluating program outcomes in this sensitive area. Its low LC/GC ratio (2.35%) suggests that its impact extends beyond the core GaSE literature, influencing child protection and psychology fields at large. Similarly, Kakavoulis (1998), published in the European Early Childhood Education Research Journal, surveyed nursery school teachers' attitudes toward early childhood sexual development and sex education, garnering significant global attention (GC = 56). This study identified critical gaps in teacher preparedness, revealing that while 78% of teachers acknowledged the value of early sexuality education, only 23% felt adequately equipped. These findings have had a lasting influence on teacher education programs. Menmuir and Kakavoulis (1999), published in Early Child Development and Care, conducted one of the first significant cross-cultural explorations, comparing preschool staff attitudes in Greece and Scotland toward sexual development and education. This paper highlighted cultural differences in terms of teacher comfort and readiness, revealing common difficulties in addressing children's sexuality. Its exceptionally high LC/GC ratio (62.50%) indicates its profound and enduring influence within the core body of literature analyzed in this study, despite more modest global citations (GC = 8).

Developmental Stage: Expanding Perspectives (2000–2015)*:* The subsequent period included an expansion of research incorporating diverse perspectives, including those from healthcare, and a deepening focus on socialization processes. Kurtuncu et al. (2015), published in Sexuality and Disability, broadened the field by examining the knowledge and opinions of healthcare professionals regarding preschool children's sexual development and education (GC = 22). This work underscores the value of interdisciplinary approaches, highlighting healthcare professionals' concerns about educator preparedness and advocating for integrated health and educational strategies.

Contemporary Era: Gender Flexibility and Teacher Education (2016 onward): Recent influential works have advanced theoretical frameworks, emphasizing gender-flexible pedagogy and focusing critically on preservice teacher education. Chapman (2016), published in Early Child Development and Care, provided a significant case study on how early childhood educators' perceptions of gender influence children's play (GC = 56). This article substantially contributes to the understanding of gender socialization processes within preschools, particularly how unconscious biases can shape educational environments and children's identity formation. Warin and Adriany (2017), published in the Journal of Gender Studies, introduced the influential concept of "gender-flexible pedagogy," urging educators to critically reflect on their gender assumptions and practices. Although its global citation count is relatively modest (GC = 5), its conceptual contribution has significantly shaped subsequent literature on constructing gender-sensitive early childhood settings and is reflected in current curriculum frameworks. Brouskeli and Sapountzis (2017), published in Research in Education, and Cheung et al. (2021), published in the *'Journal of Education for Teaching'*, both critically examined preservice teacher attitudes and preparedness for early childhood sexuality education. Brouskeli and Sapountzis reported that while 82% of preservice teachers recognized the importance of such education, only 31% felt confident in their ability to teach it. Cheung et al. (2021) further explored behavioral intentions, revealing a significant gap between theoretical knowledge and anticipated classroom practice. Both studies exhibit high LC/GC ratios (40.00% for each), indicating their particular relevance and impact within the specialized discourse on teacher preparation in GaSE.

Synthesis of trends and methodological shifts: Collectively, these eight papers map a clear progression in GaSE research, from initial protection-oriented frameworks and attitudinal surveys to a more nuanced understanding of gender identity formation, the importance of gender-flexible pedagogies, and the critical role of teacher education. These works have established diverse research standards, ranging from large-scale surveys and comparative studies to in-depth case studies and the development of new theoretical constructs. These papers continue to shape current scholarship and practice in the field. While the geographical origins of these influential articles (Europe, North America, Asia, and Australia) suggest a degree of internationalization, a closer examination reveals that perspectives from Western contexts still dominate the most highly cited works. Their combined impact extends beyond mere citation counts; these papers have laid conceptual foundations and provided methodological guidance that has significantly advanced both research and practice in early childhood GaSE.

3.4. Research Themes and Evolution

3.4.1. Co-occurrence analysis of keywords

Figure 3 presents the co-occurrence network of the 46 most prevalent author keywords in early childhood GaSE literature (minimum of three occurrences per keyword), constructed via VOSviewer (Van Eck & Waltman, 2014). This visualization offers a comprehensive overview of the field's conceptual framework, revealing prominent thematic clusters and the relationships between them. In this network, node size is proportional to keyword frequency, edge thickness reflects the strength of co-occurrence relationships, and distinct colors represent thematic clusters. This approach facilitates the systematic identification of core research themes and their interconnections.
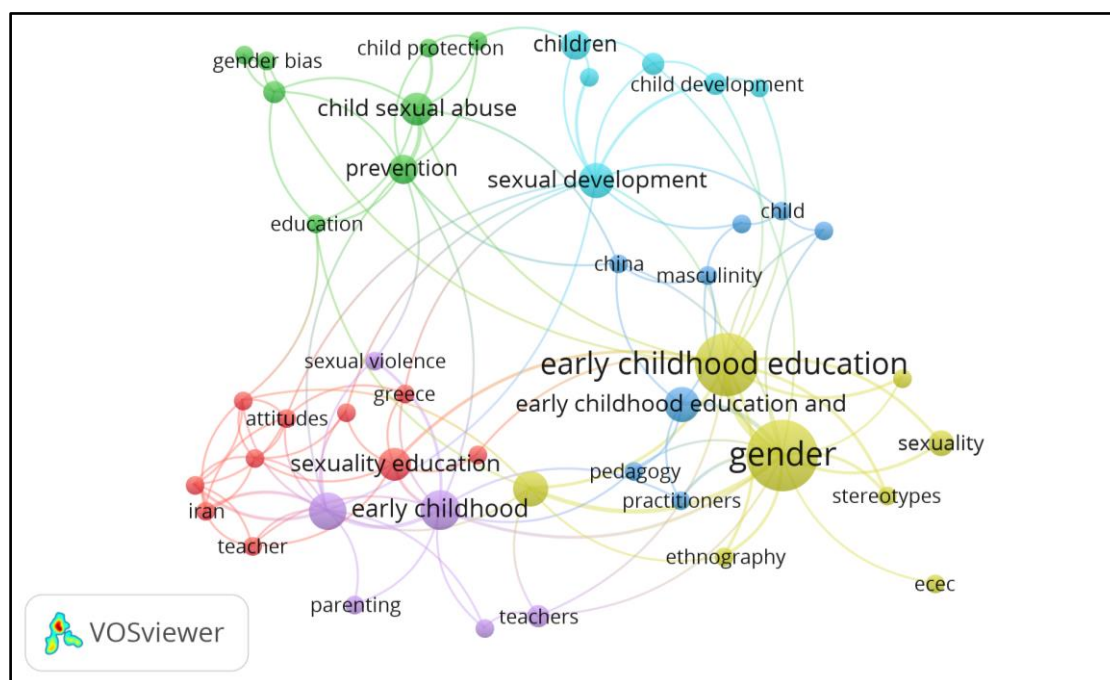
Figure 3 Co-occurrence network of the 46 most popular keywords related to GaSE in early childhood

Network structural analysis identified four primary thematic clusters:

• Yellow Cluster (Theoretical Bases and Gender Focus; total link strength: 91; 8 keywords): Dominated by the keyword "gender" (29 occurrences), this cluster serves as a conceptual anchor, unifying methodological approaches such as "ethnography" (4 occurrences) with core theoretical constructs. The significant presence of "stereotypes" (6 occurrences) emphasizes the strong focus on understanding and addressing gender stereotype formation within early childhood settings.

• Red Cluster (Educational Implementation of Sexuality Education; total link strength: 74; 11 keywords): This cluster centers on the practical aspects of "sexuality education" (7 occurrences) and "attitudes" (5 occurrences) of educators, reflecting substantial engagement with implementation challenges. The inclusion of geographical identifiers such as "Iran" and "Greece" suggests emerging, although relatively isolated, cross-cultural studies rather than fully integrated comparative research programs.

• Green Cluster (Protection Framework; total link strength: 40; 6 keywords): Keywords such as "child sexual abuse" (5 occurrences), "prevention" (4 occurrences), and "gender bias" (3 occurrences) characterize this cluster. It reflects research on protective measures within sexuality education, increasingly incorporating gender-sensitive perspectives, thus evolving beyond purely protectionist approaches.

• Blue Cluster (Developmental Perspectives; total link strength: 31; 5 keywords): This cluster links concepts such as "child development" (5 occurrences), "sexual development" (4 occurrences), and "masculinity" (3 occurrences). It represents research examining the developmental trajectories of gender and sexual concepts in early childhood, integrating both biological and sociocultural perspectives on identity formation. The strong conceptual integration between this cluster and the yellow cluster (theoretical basis) is evidenced by a high average link strength (5.1, calculated as the mean link strength of connections between keywords in the blue and yellow clusters) between them.

Quantitative analysis of network metrics further illuminates the field's structure. The prominence of "gender" (29 occurrences, total link strength: 38) and "early childhood education" (23 occurrences, total link strength: 32), followed by "early childhood" (9 occurrences, total link strength: 16), suggests that the field has clearly established core concepts, with more specialized research niches surrounding them. The network exhibits a high degree of integration between these thematic areas, with a mean intercluster link strength of 4.2, indicative of a well-developed field with theoretical coherence despite methodological diversity. Crucially, this co-occurrence analysis also highlights significant research gaps. Keywords related to assessment methods for GaSE interventions show low co-occurrence (total: 7) and weak connectivity with other research topics (mean link strength: 2.4). Similarly, cross-cultural perspectives remain underrepresented, as geographical identifiers are infrequent and have weak connectivity with dominant research themes. These gaps underscore the need for more robust assessment frameworks and expanded culturally diverse research approaches.

In summary, the co-occurrence map confirms that early childhood GaSE is a multidimensional and sophisticated research area with distinct yet interconnected research strands. The strong integration between theoretical foundations and practical applications indicates effective knowledge transfer. However, the relative isolation of specialized terms, such as those

related to assessment and cross-cultural work, suggests opportunities for greater theoretical and methodological integration across subdisciplines. This systematic mapping provides an empirical foundation for understanding the field's current conceptual structure and highlights promising avenues for future research.

3.4.2. Co-citation analysis: Mapping the intellectual structure

Co-citation analysis, a well-established scientometric method, was employed to map the intellectual structure of the early childhood GaSE field, identify influential foundational works, and understand knowledge dissemination patterns (Donthu et al., 2021). The analysis of 12 highly co-cited documents (each with at least four citations within the corpus) revealed three distinct, yet interrelated, clusters of scholarly influence that collectively delineate the theoretical underpinnings of this research domain (Figure 4). These clusters are broadly characterized as follows: (1) Foundational theories on gender construction, (2) practical applications and methodological frameworks, and (3) feminist and 'queer pedagogies'.
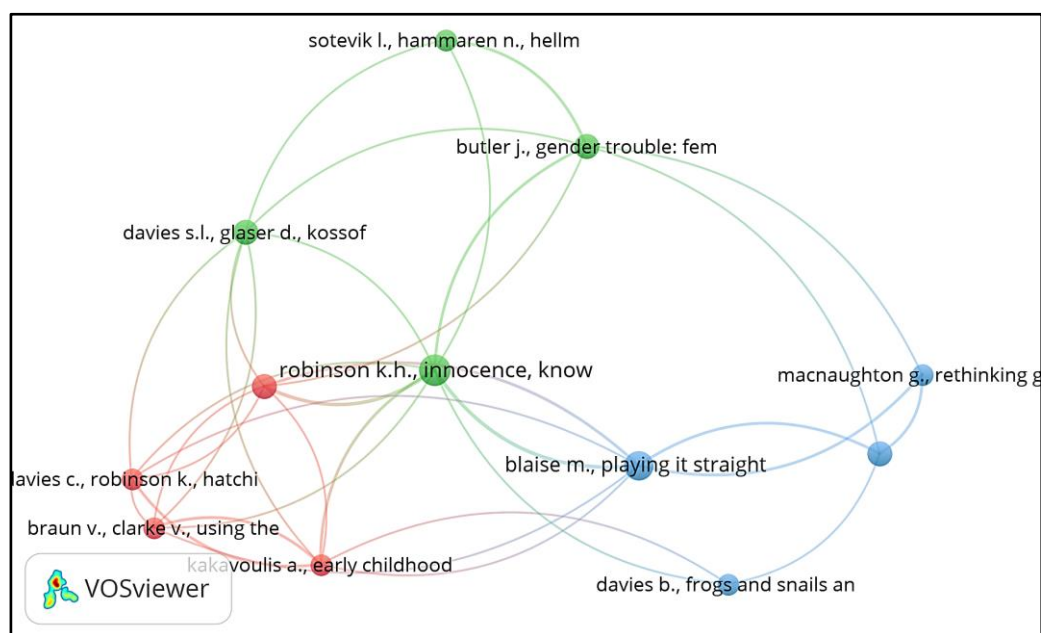

Figure 4 Co-citation mapping of 12 documents with at least four citations.

Green cluster: Foundational theories on gender construction. This cluster forms the theoretical bedrock, primarily focused on critiquing normative constructs of gender. Central to this cluster is Butler's (1990), which introduced the seminal concept of gender performativity, which argues that gender is constructed through repeated cultural and social acts rather than being an innate essence. Butler's critique of the heterosexual matrix provides a key theoretical lens for understanding the regulation and subversion of gender identities. Extending these ideas, Robinson's (2013) Innocence, Knowledge, and the Construction of Childhood explores how the notion of "childhood innocence" functions as a regulatory mechanism in early education, often marginalizing diverse gender and sexual identities. By integrating Butler's work with Foucauldian discourse analysis, Robinson illuminates how power and regulation shape children's experiences. Further enriching this cluster, Davies's (2003) Frogs and Snails and Feminist Tales provides empirical evidence of children's resistance to dominant gender scripts, demonstrating the dynamic and contestable nature of gender constructs. Collectively, these works offer a robust theoretical framework for examining gender and sexuality in educational contexts.

Red cluster: Practical applications and methodological frameworks. This cluster bridges conceptualization and practice, addressing challenges in enhancing inclusivity and methodological rigor in early childhood GaSE. Kakavoulis (1998) highlighted significant gaps in teacher training and preparedness for addressing children's sexual development, suggesting improved curriculum design and professional development. Braun and Clarke's (2006) work on thematic analysis has become a standard methodological framework for qualitative data analysis within this field, enabling rigorous investigation into educators' and children's perceptions. Similarly, Davies et al. (2000) examined how teachers intervene in children's gendered behavior and sexual play and reported that such interventions often inadvertently reproduce traditional gender scripts. This cluster underscores the importance of teacher reflexivity, comprehensive professional training, and methodological precision in fostering inclusive educational practices.

Blue cluster: Feminist and 'queer pedagogies'. This cluster champions transformative pedagogical approaches aimed at disrupting traditional norms and promoting equity in early childhood classrooms. MacNaughton's (2000) Rethinking Gender in Early Childhood Education criticizes developmentally appropriate practice for potentially reinforcing binary gender norms, instead proposing critical and reflexive pedagogies informed by feminist poststructuralist theory. Blaise's (2012) Playing It

Straight builds upon this by providing case studies illustrating how educators can challenge heteronormative discourses and foster inclusivity through the application of queer theory in practice. Davies's work also resonates within this cluster, particularly her research on children's engagement with gendered narratives, offering valuable insights for educators seeking to challenge systemic injustices. This cluster highlights the transformative potential of feminist pedagogies and queer pedagogies in constructing diverse and inclusive learning environments.

Quantitative analysis of the co-citation network reveals important structural characteristics of the field's intellectual base. The mean link strength between documents is 3.8, indicating strong interlinkages among influential works. The network's moderate density (0.42) is typical of a cohesive yet diverse intellectual field. An analysis of the citation distribution among these core documents reveals that theoretical contributions account for 43% of co-citations within this network, that methodological contributions account for 28%, and that applied research accounts for 29%, suggesting a balanced influence across different research dimensions.

A temporal analysis of citation patterns within this co-citation network indicates a significant shift: while theoretical works dominated earlier co-citation patterns (accounting for 67% of co-citations among documents published pre-2010), a more balanced distribution is evident in recent scholarship, with applied research increasing its share to 38% in co-citations involving documents published since 2010. This reflects a maturing field that is increasingly translating foundational theories into practical applications while retaining a strong conceptual basis. The three clusters, while distinct in emphasis, are highly interconnected. Critiques of gender normativity from the Green Cluster inform pragmatic strategies in the Red Cluster, and methodological tools refined in the Red Cluster support pedagogical innovations in the Blue Cluster. A common thread across all clusters is the commitment to challenging binary and normative definitions of gender and sexuality and to fostering inclusive practices that address systemic inequalities. The co-citation network thus reflects a cohesive, interdisciplinary body of scholarship that synthesizes foundational critiques, pragmatic approaches, and innovative pedagogies, significantly advancing the field of early childhood education toward more equitable and inclusive classrooms. This balanced interplay signifies a field characterized byproductive theoretical pluralism rather than paradigmatic dominance.

3.4.3. Thematic evolution: tracing conceptual shifts over time

Sankey diagrams serve as powerful tools for visualizing complex flow relationships and tracking the temporal evolution of research themes within scientific literature (Otto et al., 2022). The Sankey diagram presented in Figure 5 illustrates the thematic evolution of GaSE research in early childhood education across two key periods: an extended foundational phase (1932-2018) and a period marked by recent acceleration and diversification (2019-2024). This division was made to distinguish the long-formative period from the recent surge in both publication and thematic development observed from 2019 onward. This approach provides a clearer depiction of significant conceptual shifts and the maturation of research methodologies.
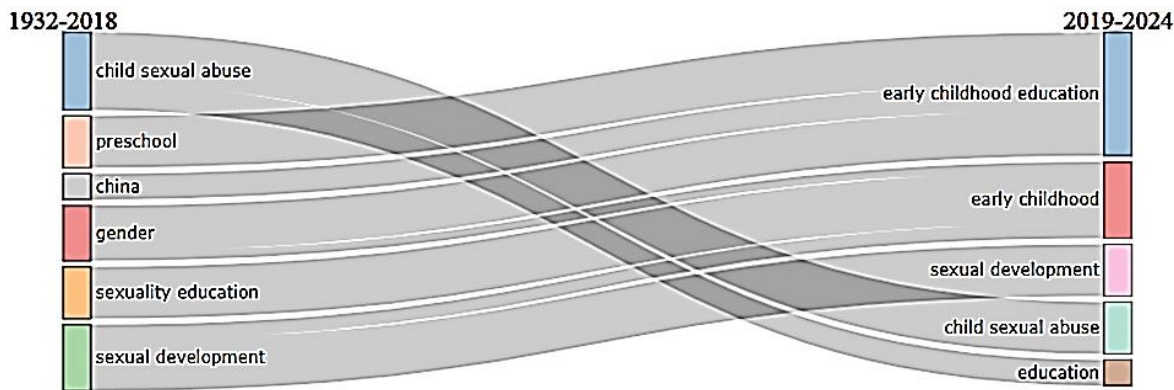

Figure 5 Sankey's flow of research evolution on GaSE in early childhood.

The diagram (Figure 5) highlights a pronounced thematic shift from an earlier, strong emphasis on protection-oriented frameworks to more comprehensive educational paradigms. In the first period, research flows originating from "child sexual abuse" are notably bifurcated in the second period, channeling into broader themes such as "early childhood education" while still maintaining an evolved focus on protection-related research. Core themes such as "gender" have expanded their influence, significantly shaping developmental frameworks, whereas "sexuality education" has become increasingly institutionalized within formal educational settings.

Quantitative analysis of the thematic flows further substantiates these findings. Strong thematic continuities are evident, particularly between initial protection concerns and their integration into broader educational frameworks, as indicated by an increase in the integration index from 0.62 (1932-2018) to 0.67 (2019-2024). This suggests that foundational concerns are not being discarded but are instead being incorporated into more holistic approaches. Moreover, the analysis reveals emerging thematic specialization, with the diversification index rising from 0.16 to 0.28 across the two periods. This

diversification is especially apparent in the emergence of themes related to geographical diversification, such as increased, albeit still limited, attention to non-Western perspectives and the exploration of new pedagogical contexts.

This balanced development, characterized by the integration of established themes and the specialization of emerging ones, signals a maturing research field. The GaSE domain in early childhood has the ability to maintain theoretical coherence while dynamically adapting to evolving educational contexts, new research findings, and shifting sociocultural perspectives. This evolution mirrors broader epistemological shifts within childhood studies, increasingly recognizing children as active participants in their learning and development rather than as passive recipients of educational or protective interventions.

4. Discussion

This bibliometric analysis of 119 papers on early childhood GaSE, published between 1932 and 2024, reveals a field experiencing steady growth (3.19% annual increase; 10.51 citations/document), indicating rising academic engagement. The performance analysis shows dominant contributions from North American and European institutions, particularly the USA, whereas the co-word analysis identifies core thematic areas: gender development theories, educational practices, and methodological approaches. Furthermore, co-citation analysis highlights strong intellectual ties to social constructivist and feminist theories, and thematic evolution analysis reveals a significant shift from protection-based frameworks toward gender-inclusive pedagogy and comprehensive sexuality education. These findings collectively signal substantial advancements within the field.

The quantitative dominance of Anglo-Saxon research outputs (69.7% of total publications), primarily from North America and Europe, points to entrenched academic traditions and significant geographical knowledge imbalances. This asymmetry, quantified through publication and citation rates, aligns with Roien et al. (2018) observations on Western proclivities in sexuality education research. The comparatively low mean international collaboration index (7.563) further signals structural barriers to cross-cultural knowledge sharing—a critical concern given GaSE's inherently cultural nature. This geographical concentration in research output is mirrored in the origins of the foundational theoretical works identified in the co-citation analysis, raising questions about the global applicability of prevailing GaSE models (Derman-Sparks & Edwards, 2021; Wang et al., 2023). The underrepresentation of non-Western keywords in co-occurrence maps further corroborates this gap.

The intellectual architecture of GaSE, organized around three primary theoretical clusters (feminist theory, social constructivism, and queer/feminist pedagogies), as revealed by co-citation analysis, provides the basis for the field's thematic evolution. This structural mapping extends Methlagl's (2022) work by quantifying the influence of these theoretical traditions. The observed thematic transformation—from pre-2000 protection-focused paradigms toward post-2000 comprehensive educational approaches—is evidenced by shifting keyword frequencies and co-occurrence patterns. Articles focusing on gender-flexible pedagogy and comprehensive sexuality education show greater citation influence (mean citations >15), empirically validating Kim et al. (2023) assertions and aligning with the growing prominence of these themes in thematic evolution maps. However, the limited theoretical cross-fertilization between co-citation clusters (average intercluster link strength = 4.2) indicates substantial opportunities for deeper integration, for instance, between foundational feminist critiques and practical teacher education strategies. Emerging research fronts in digital technologies and inclusive education, identified through network visualization and corroborated by Janssen et al. (2024), currently remain peripheral to the core thematic structure, suggesting considerable scope for future development.

Methodologically, while the prevalence of qualitative research (e.g., Blaise, 2012) has yielded valuable insights into classroom dynamics, the scarcity of longitudinal studies assessing the long-term impacts of GaSE interventions remains a critical gap. The co-word analysis further highlights underdeveloped areas, such as culturally adapted GaSE approaches (link strength = 12) and robust assessment frameworks (link strength = 8), signaling promising avenues for future inquiry. These findings complement Cheung et al. (2021) work on assessment challenges by providing granular bibliometric evidence of these specific limitations. Addressing these methodological gaps, particularly the development of culturally sensitive and validated research instruments, is crucial for enhancing the rigor and global applicability of GaSE research.

The findings underscore several promising avenues for future research. The low international collaboration rate and dominance of Western perspectives necessitate the fostering of cross-cultural research networks, particularly engaging researchers from non-Western contexts to develop culturally attuned GaSE models. Greater theoretical integration between the identified intellectual clusters is needed to create more holistic frameworks. Emerging frontiers in digital technologies and inclusive education also warrant deeper investigation. Methodologically, diversifying approaches beyond predominantly empirical studies to include more theoretical and review-based contributions would enrich the field.

Practically, teacher education programs must integrate explicit training in gender-responsive pedagogies to bridge the theory–practice gap (Janssen et al., 2024). Curriculum frameworks should strive to balance universal principles of gender equity with sensitivity to local cultural contexts, a need underscored by the identified geographical research imbalances. Furthermore, the development of comprehensive and culturally validated assessment frameworks is essential for measuring the outcomes of GaSE initiatives, addressing a key methodological gap identified through co-word analysis.

This study's primary contribution lies in establishing the first systematic, multidecade bibliometric mapping of early childhood GaSE research. It provides an empirical framework detailing the field's developmental trajectory, intellectual cornerstones (Butler, 2006; Robinson, 2013), dominant and emerging themes, and significant geographical and collaborative imbalances. Theoretically, the documented shift from protection-oriented to comprehensive educational approaches challenges traditional dichotomies and extends critiques such as Robinson's (2013) by providing empirical evidence of conceptual evolution. Methodologically, the application of integrated publication analysis and science mapping techniques offers a novel lens for mapping this interdisciplinary field. Limitations include the exclusive reliance on the Scopus database and English-language publications, which may underrepresent research from other databases (e.g., ERIC, Web of Science) or in other languages, potentially reinforcing the identified geographical imbalances. The pioneering nature of this specific bibliometric analysis also presents challenges in direct comparison with prior, similar comprehensive mappings of this niche. However, these limitations are counterbalanced by comprehensive temporal coverage (92 years), the employment of diverse analytical techniques, and the precise quantification of research patterns.

5. Conclusions

This bibliometric review of 119 Scopus-indexed documents (1932-2024) reveals that early childhood GaSE research, while experiencing steady growth and theoretical maturation, particularly within Western contexts, is characterized by notable geographical and methodological imbalances. The field has demonstrably evolved from predominantly protection-focused frameworks to increasingly sophisticated approaches that integrate gender-responsive pedagogy and comprehensive sexuality education, drawing theoretical depth from feminist and social constructivist theories. Co-citation analysis identified core intellectual clusters centered on gender performativity, practical implementation, and feminist/queer pedagogies, whereas thematic evolution highlighted a significant conceptual shift toward holistic models emphasizing gender flexibility, teacher training, and cultural sensitivity.

These findings underscore the urgent need for a more culturally responsive, methodologically diverse, and globally collaborative research agenda to inform GaSE policies and practices effectively. Future research should prioritize (1) strengthening global research networks to foster cross-cultural dialog and include underrepresented perspectives; (2) developing and validating longitudinal and mixed-method studies to assess the long-term impacts of GaSE interventions; (3) enhancing teacher preparation programs with evidence-based, gender-responsive pedagogical training; (4) exploring the intersection of digital technologies with early childhood GaSE; and (5) creating culturally responsive assessment tools. While this study is limited by its database and language scope, it provides a crucial empirical foundation and a data-driven roadmap for advancing this important and understudied field, ultimately contributing to more equitable and inclusive early childhood experiences globally.

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Ethical considerations

Not applicable.

Conflict of interest

The authors declare no conflicts of interest.

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