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Evolution and trends in research on inclusive education: A bibliometric analysis and systematic review

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Abstract

Using a thorough bibliometric analysis, this study examines the development and patterns in inclusive education research during the previous 20 years. Since 2013, there has been a noticeable rise in scientific output, which is indicative of a heightened global emphasis on developing inclusive and accessible learning settings for all students. Even while the number of publications has increased significantly, the effect as indicated by citations has showed a mixed pattern, indicating that some recent studies have not yet attained the same degree of influence as older research. The analysis emphasizes the significance of a few major subjects that have dominated inclusive education research, including autism, assistive technology, and educational policies. Furthermore, the creation of inclusive policies and practices depends critically on a robust network of international cooperation, especially between scholars in the United States and Europe. Despite these advances, this study emphasizes the continued existence of important obstacles that prevent the successful application of inclusive education, including a lack of funding, inadequate teacher preparation, and institutional impediments. By highlighting areas that need more focus in order to keep moving forward toward more accessible and inclusive educational systems, this analysis offers a strong basis for future research.

Keywords: Assistive Technology, Bibliometric Analysis, Educational Policies, Inclusive Education, Research Trends.

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Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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1. Introduction

As a result of increased global awareness and a commitment to establishing more equitable and accessible learning environments for all students, research on inclusive education has grown significantly [1]. The concept of inclusive

education, which aims to integrate all students regardless of their abilities, disabilities, or special educational needs, has moved from being a peripheral one to a central position in academic research agendas and educational policies [2].

All students, regardless of their differences, have the right to learn together in a shared educational setting, according to the theory behind inclusive education [2]. From special education and civil rights movements, this idea has grown to encompass children from a variety of social, cultural, and ethnic backgrounds in addition to those with disabilities. Ensuring an inclusive educational system at all levels and throughout life is crucial, according to the 2006 United Nations Convention on the Rights of Persons with Disabilities (CRPD).

According to Thomas, et al. [3] the literature on inclusive education has highlighted the necessity of changing educational systems to better accommodate students' variety. Authors such as Aboelmaaty, et al. [4] inclusion entails more than just integrating special needs kids into mainstream classrooms; it also entails school reform to enable all students to learn alongside one another and realize their full potential. This viewpoint encourages educational techniques that value and address classroom diversity, implying a paradigm change in the way teaching and learning are conceptualized.

Furthermore, studies have demonstrated that inclusive settings help all students, not just those with special needs, as they learn how to collaborate and work as a team in a varied setting [5]. Educational systems face new problems from migration, socioeconomic disparities, and many forms of gender and cultural identity [6, 7]. In this way, inclusive education helps create cultures that respect and cherish individual differences by responding to a wider range of variety in addition to the requirements of students with disabilities.

There are still many obstacles to overcome in spite of the progress made in putting inclusive education policy into practice [8]. According to Sharma, et al. [9] structural constraints such a lack of funding, inadequate training for teachers, and unfavorable attitudes toward inclusion remain major challenges.

One essential method for assessing and charting the development and organization of a field of research is bibliometric analysis [10]. Finding significant authors and journals, investigating networks of collaboration between authors and institutions, and spotting new trends in scientific literature are all made possible by this kind of study [11]. In the context of inclusive education, a thorough bibliometric study offers important insights into the direction and areas that need greater attention, as well as how research in this field has changed over time.

The literature on the development and trends of inclusive education was bibliometrically analyzed in this study. The objective is to map the field's intellectual structure, find trends in scientific output, and highlight the most significant contributions by examining reputable academic databases like Scopus. We hope to uncover current trends and offer a thorough overview of the development of inclusive education research through this analysis.

A systematic and repeatable approach was ensured by the study's methodology, which included the use of sophisticated tools for data analysis, the use of precise inclusion and exclusion criteria, and the careful selection of search phrases.

2. Methodology

An effective method for assessing and charting a field's structure is bibliometric analysis. According to Munisi [12] and Mittal [13] this makes it possible to identify prominent writers, publications, and networks of collaboration between authors and institutions. According to Judijanto, et al. [14] bibliometric analysis generally makes it possible to track trends and predict significant advancements in a field of study.

The study's procedures were as follows: 1. Selection of databases. 2. Definition of Terms and Search Equations. 3. Inclusion and exclusion criteria. 4. Data extraction. 5. Bibliometric analysis.

2.1. Selection of Databases

For bibliometric research, the academic community recognized and valued the Scopus scientific database, which is why it was selected [15]. Scopus is essential for monitoring and evaluating scientific output because it enables thorough coverage of high-caliber publications [16]. Since it is not only frequently used to track publications but also contributes significantly to the global dissemination of knowledge, its inclusion guarantees the study's robustness and representativeness and offers a strong foundation for in-depth bibliometric analysis [17, 18].

2.2. Definition of Terms and Search Equation

In order to guarantee that all pertinent works on the subject are included, bibliometric research requires the exact specification of terms and the creation of search algorithms. To represent the topic of the study as well as potential differences in terminology used in the literature, specific keywords such "inclusive education," "special education," "trends," and "evolution" were employed. To guarantee consistency and comparability of the findings, the search equation was modified for the database format (Scopus).

In Scopus, the following search formula was applied: TITLE-ABS-KEY("inclusive education" OR "special education" AND "trends" OR "evolution" OR "research trends" OR "research evolution").

2.3. Inclusion and Exclusion Criteria

To guarantee the quality and applicability of the chosen studies, the inclusion and exclusion criteria were established. First, 2024 was excluded, as it was the current year. Second, the results were limited to journal articles, book chapters, and conference papers, excluding other types of publications, such as reviews, books, notes, and conference reviews. Third, all the subject areas and available languages were considered.

2.4. Data Extraction

Data extraction was conducted systematically to ensure the efficient organization and management of the collected information. The data from Scopus were extracted from .csv format with the following information: number of citations, abstract, author names, keywords, and references, among others.

2.5. Bibliometric Analysis

Bibliometric analysis includes several essential components to understand the dynamics of research on inclusive education.

- Productivity and Citation Analysis: Scientific production over time and its impact were evaluated, providing insight into the evolution of research in the field.
- Source Analysis: Finding the major journals and assessing their influence on the subject will help to draw attention to the most important and pertinent works.
- Author, institution, and country analysis: Identify the most prolific writers and examine the networks of collaboration between them to provide insight into the cooperative nature of inclusive education research. The identification of nations and organizations as well as the mapping of cooperation between them should also be taken into account.
- Intellectual Structure Analysis: Mapping keywords that made it possible to recognize and classify the literature's primary subjects. This offers a clear picture of the study topic and its evolution.

2.6. Tools Used

Using R programming language version 4.3.3 and RStudio version 2023.12.0 Build 369, data analysis and graph creation were carried out. This decision was made because of R's versatility in result visualization and its capacity to manage massive data sets. For keyword network analysis, VOSViewer 1.6.20—a program well-known in bibliometric research for its ability to graphically depict intricate relationships in huge datasets—was used.

The technique outlined guarantees a thorough and methodical investigation of the development and patterns in inclusive education research. While the inclusion and exclusion criteria and search equations assure that the study thoroughly and accurately collects the most relevant articles, the choice of Scopus as a data source ensures the inclusion of high-quality publications [18]. Productivity, citations, sources, authors, and intellectual structure analyses are combined to give a comprehensive picture of the field's research, enabling the discovery of both emerging trends and understudied regions [19]. The validity and applicability of the study's conclusions are strengthened by the use of sophisticated tools like RStudio and VOSViewer, which guarantee reproducible and visually interpretable results [20, 21].

3. Results

An initial search of 1,247 papers was obtained from the August 14, 2024, document search. Following the application of the inclusion and exclusion criteria, 1,002 papers were left for examination.

3.1. Productivity and Citation Analysis

Two key elements are depicted in Figure 1: productivity, which is determined by the quantity of published articles, and the citations that these documents have accumulated over time. The first document on productivity was published in 1954, followed by a 12-year period of inactivity until 1967. From then on, productivity showed moderate growth until 2012, followed by a considerable increase from 2013, with notable acceleration in recent years. This increase suggests an intensification in academic production within the field, reaching its peak in 2023, which may indicate a growing interest or development in the area of research.

Regarding citations, this trend showed greater variability. Since 2000, the number of citations has increased, reaching a significant peak in 2016. However, after that year, the number of citations declined noticeably. This pattern suggests that, despite the sustained increase in document production, its impact, as measured by citations, does not follow a similar trend. The peak in 2018 may indicate that some documents published during that period were particularly influential, but the subsequent decline could reflect that more recent works have not had the same impact, possibly because they have had less time to be cited.

The significant growth in productivity, especially since 2012, reaching the highest number of documents by 2023 (n=92 documents), has not translated into a proportional increase in impact, as measured by the number of citations. This could suggest that the quality or novelty of more recent research has not generated the same level of interest or that the field has reached a certain degree of saturation in its academic influence.

Additionally, Figure 1 spans 69 years of scientific research related to the studied topic. Until 2012, this period could be considered the initial phase of research on inclusive education, while from 2013 onwards, it could be identified as the evolution phase of research. Dellaert [22] notes that education, in its relationship with human beings, offers the best opportunities to develop the self-regulatory and creative forces of adolescents. However, he also highlighted that special education requires a sharp diagnostic sense based on scientific observations. His study suggests that salvation of individuals with disabilities is inseparable from respect for the creative potential inherent in their being. When referring to the "eternal child," he mentions that this demands complete devotion from the teacher to their task and constant effort, arguing that such an attitude cannot be content with intellectual systems that will never capture the fullness of life, which represents the only path towards the individual's maturity and gradual evolution.

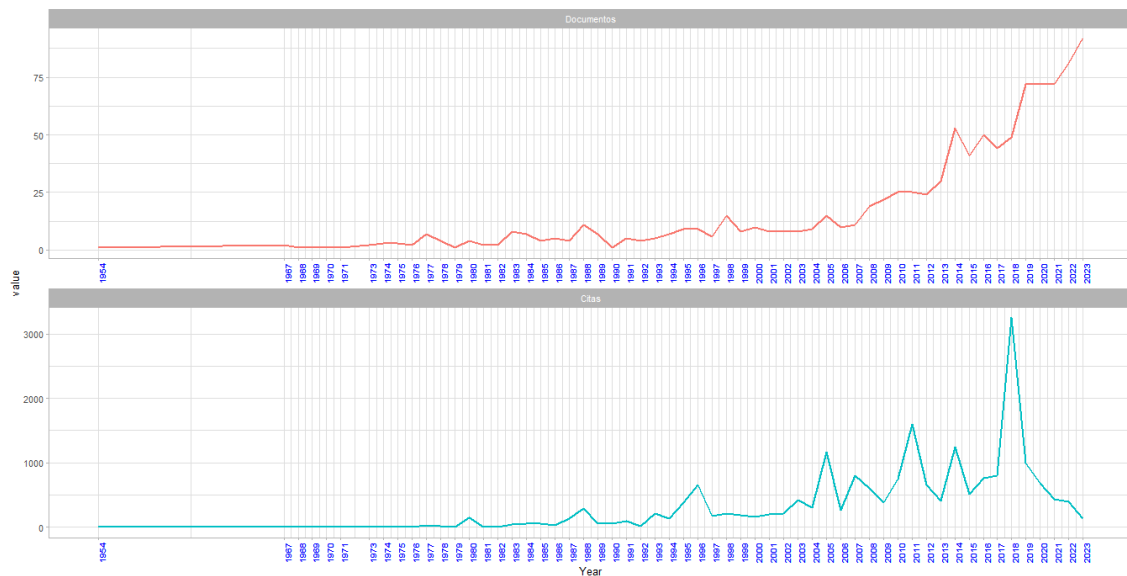


Figure 1.
Evolution of Productivity and Citation Impact of Publications (1954-2023).

The second document with the greatest impact ($n=1300$ citations) emerged during the initial phase of research. Boyle, et al. [23] studied the evolution and trends in research on inclusive education, analyzing the prevalence of developmental disabilities in American children and selected populations over a recent 12-year period. During the study period, the prevalence of any developmental disability increased from 12.84% to 15.04%, with observed increases in conditions such as autism, attention deficit hyperactivity disorder (ADHD), and other developmental delays, while hearing loss showed a significant decline. Between 2006 and 2008, one in six children in the US received a diagnosis of developmental impairments as a result of this rise in their identification. Boyle, et al. [23] emphasized the increasing demand for inclusive education and health services.

The work by Baio [24] which was part of the evolution phase of the research, had the most influence ($n=2792$ citations). The authors highlighted the importance of educational evaluations in identifying children who could need special education services by using school records to find cases of autism spectrum disorder (ASD). This implies that inclusive education methods depend on the efficient identification of situations through educational institutions. The study's conclusions highlight the necessity of public health initiatives to recognize and address ASD. Since early detection can result in prompt treatments that support the educational requirements of children with ASD, this is essential for inclusive education.

3.2. Source Analysis

Significant variations in academic impact were found when the 10 journals with the most published papers on inclusive education were analyzed (Figure 2). With 24 publications and 1,195 citations overall—an average of 49.79 citations per article—"Exceptional Children" is in first place. At an average of 26.45 citations per article, the "International Journal of Inclusive Education," which had 22 papers and 582 citations, came next.

With 20 publications and 473 citations, "Remedial and Special Education" comes in third place with an average of 23.65 citations per article. The "European Journal of Special Needs Education" also published 20 documents with a total of 352 citations and an average of 17.6 citations per article. The "Revista Brasileira de Educacao Especial" has 18 documents with 60 citations, resulting in a low average of 3.33 citations per article. In contrast, the "Journal of Special Education" with 15 documents and 564 citations averages 37.6 citations per article, while the "British Journal of Special Education," with 14 documents and 356 citations, reaches an average of 25.43 citations per article.

"Journal of Autism and Developmental Disorders," although having only 12 documents, accumulates 626 citations, achieving the highest average with 52.17 citations per article. "Topics in Early Childhood Special Education" and "International Journal of Special Education" each published 10 documents, with averages of 19.4 and 12.3 citations per article, respectively. These results reflect variations in the academic influence of each journal in the field of inclusive education, particularly highlighting the high impact of "Journal of Autism and Developmental Disorders" and the more limited impact of the "Revista Brasileira de Educacao Especial."

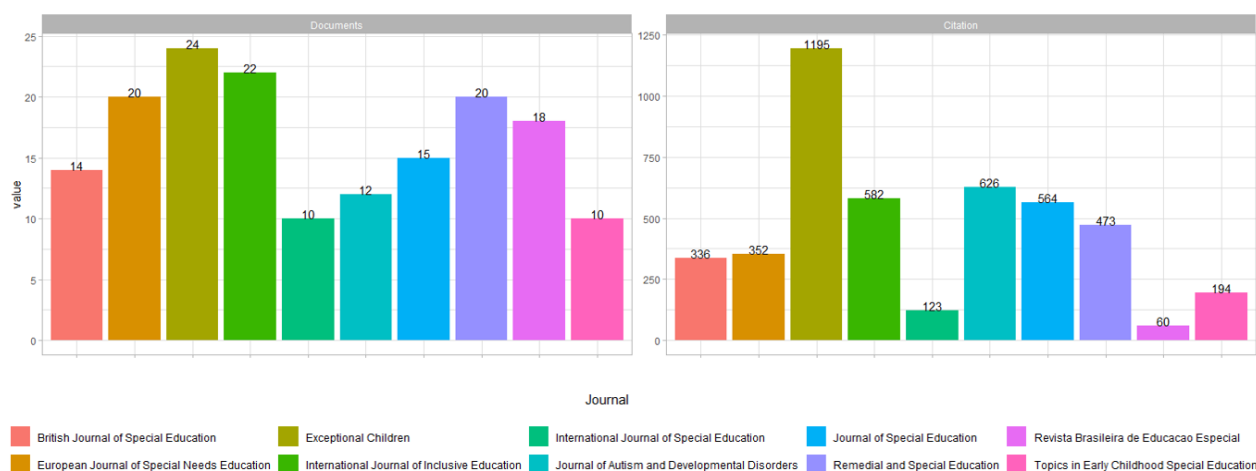


Figure 2.

Top 10 Journals with the Most Published Documents.

Blackorby and Wagner [25] study is the most cited in "Exceptional Children," with 519 citations. The authors describe the findings on trends in employment, wages, post-secondary education, and residential independence of young people with disabilities in their first five years after high school. The study indicates that young people with disabilities continue to lag behind their peers in the general population, with these results varying by gender, ethnicity, and high school completion status. In another study (n=111 citations), the authors proposed a practice-based model to foster effective performance by special education teachers. Grounded in learning science, the model includes teacher-training approaches that align with the literature [26]. Another study concludes with a proposal to reconsider what constitutes equity for students with disabilities and offers a model that recognizes different interpretations of equity for some students with disabilities [27].

The study by Shevlin, et al. [28] published in the "International Journal of Inclusive Education," achieved the greatest impact on this source with 65 citations. The authors analyzed how teachers in Ireland perceive the implementation of inclusive education following significant changes in educational policy. Despite legislative support and additional resources, they mentioned that teachers expressed concerns about their ability to apply effective inclusive practices. The study highlights the importance of an inclusive school culture, but also reveals that mixed perceptions among teachers, combining support with fears and doubts, may hinder the full implementation of inclusion in the Irish educational system.

The document published in the "Remedial and Special Education" journal with the most significant impact (n=105 citations) was the research by Chinn and Hughes [29]. The authors indicated that underrepresentation in classes for gifted and talented students remains a problem for Black, Hispanic, and Native American students with mild intellectual disabilities, moderate intellectual disabilities, and severe emotional problems.

On the other hand, the research with the greatest impact (n=120 citations) was in the "European Journal of Special Needs Education (European Journal of Special Needs Education). (2010). The results of this study show that the support provided by teaching assistants (TAs) has a negative impact on students' academic progress, particularly for those with special educational needs (SEN). These findings make the current SEN support system highly questionable, as TAs have unintentionally become primary educators for students with SEN. The authors offer suggestions on how to maximize the effectiveness of TAs' support. In the "Revista Brasileira de Educacao Especial," the study by Baptista [30] stands out, showing how multifunctional resource rooms have become a central component of Brazilian educational policy to ensure Specialized Educational Assistance (AEE) for students with disabilities, developmental disorders, and high abilities. With over 15,551 rooms constructed between 2005 and 2009, the study shows that the adoption of these rooms has significantly increased over time, suggesting a considerable change in the nation's educational approach. The paper does, however, also draw attention to the difficulties in putting this into practice, including the requirement for more specialized training for instructors and improved communication between general education and specialist teachers. The Brazilian experience offers significant insights for worldwide trends in inclusive education and a useful illustration of how educational policy might change to meet the needs of students with disabilities.

With 147 citations in the "Journal of Special Education," the study by Skiba, et al. [31] is particularly noteworthy. The authors indicated that the inconsistent relationships between disproportionality in special education and academic achievement may indicate a developmental trend in the systemic contribution to racial disparity. They also mentioned that suspension and expulsion rates consistently predict district-level disproportionality rates in special education.

Florian [32] examines in his article "Inclusion: Special or Inclusive Education and Future Trends," the complex relationship between special education and inclusive education, highlighting how the former, although historically seen as a solution to educational injustices, has also contributed to the marginalization of students with special needs. Florian argues that true inclusion must go beyond mere physical integration, promoting a shift in pedagogical practices that allows for addressing diversity in classrooms without relying on specific approaches for special education. This method highlights the need for improved teacher preparation since educators must be able to incorporate inclusive teaching practices into their regular lessons, encouraging a pedagogical and cultural shift that recognizes diversity as an essential component of

education for all. Florian's ideas underline the importance of this shift as a key evolution in contemporary trends in inclusive education research. A publication of this study was the "British Journal of Special Education."

For individuals with autism spectrum disorder (ASD), a study that was published in the "Journal of Autism and Developmental Disorders" assessed the viability and efficacy of a virtual interview training program. It was discovered through a randomized controlled trial that the training, which included didactic instruction and virtual character-based interview simulations, was not only well received by participants but also markedly enhanced their performance in actual job interviews when compared to the control group. The participants also reported feeling more confident when doing the interviews. According to Smith, et al. [33] the findings showed that virtual reality training is a viable and easily available method for enhancing interviewing abilities in adults with ASD, hence assisting them in overcoming significant obstacles to employment.

3.3. Author, Institution, and Country Analysis

The "top five Authors with the Most Scientific Production in Inclusive Education" analysis shows a wide range of geographical locations and a noteworthy influence in the area. With 8 publications and 275 citations, Katsiyannis, et al. [34] of Clemson University (USA) is in first place. This indicates a high level of importance in the field, since each document has an average of 34.4 citations. With five publications and 178 citations, Shevlin, M. from Trinity College Dublin (Ireland) stands out for the effect of his work and has an average of 35.6 citations per document. Jahnukainen [35] from the University of Helsinki (Finland) and Norwich [36] from the University of Exeter (UK), both with 6 documents and 163 and 134 citations respectively, have averages of 27.2 and 22.3 citations per document, indicating significant but slightly lower contributions in terms of relative impact. Cooc, N. from The University of Texas at Austin (USA) with 5 documents and 111 citations has an average of 22.2 citations per document. These authors, from key institutions in the United States, Europe, and the United Kingdom, reflect not only geographic diversity in research on inclusive education, but also critical contributions to the development of policies and practices in this field. The analysis suggests that in addition to the number of publications, the impact measured by the number of citations per document reinforces these authors' positions as leaders in inclusive education research over the past two decades (Table 1).

Table 1.

Top 5 Authors with the Highest Scientific Output in Inclusive Education.

Author	Institution	Country	Documents	Citation
Katsiyannis, et al. [34]	Clemson University	United States	8	275
Jahnukainen [35]	Uiversidad de Helsinki	Finland	6	163
Norwich [36]	University of Exeter	United Kingdom	6	134
Cooc [37]	The University of Texas at Austin	United States	5	111
Shevlin, et al. [28]	Trinity College Dublin	Irleand	5	178

Katsiyannis, et al. [34] research trend is "Stability in the Overrepresentation and Underrepresentation of Students from Racial and Ethnic Groups." For instance, in his most influential study (n=97 citations), conducted between 2004 and 2008 in the District of Columbia (United States), a significant decrease was observed in the identification of African American students with intellectual disabilities and a moderate decrease in Hispanic students, although there was an increase in the classification of Hispanic students with learning disabilities. Overall, racial and ethnic representation trends remained stable compared to those a decade earlier [38]. Another study highlighted a nationwide shortage of qualified teachers to teach students with all disabilities, including a particularly disproportionate shortage in the area of emotional and behavioral disorders between 1993 and 1994 [34]. It also presents an emerging need to examine and address the representation of English learners in special education [39].

Jahnukainen [35] compared the perceptions of stakeholders on inclusive education in Finland and Canada [35, 40]. He highlights the importance of national contexts in the implementation of inclusive education policies and offers valuable lessons (importance of national context, flexibility vs. uniformity, preventive approach, role of teachers and continuous training, administrative impact, and monitoring and evaluation) for other countries seeking to improve their educational support systems for individuals with disabilities [41].

Norwich [36] focuses his studies on inclusive education in the United Kingdom. He investigated placement trends in special schools, issues regarding teacher preparation in initial teacher training, and practical models of inclusive teaching Norwich [36]. He analyzed the impact of academization in England on the inclusion of students with special educational needs (SEN). The findings show an increase in the number of academies, especially in the secondary sector, and a decrease in the percentage of students classified as SEN was more pronounced in sponsored academies. Although no direct negative impact of academization on inclusion has been concluded, the study suggests the need to review identification and support policies for students with SEN within the framework of more inclusive education [42].

Cooc [37] studied the academic outcomes of English learners with disabilities [43]. He also indicated the need for teacher development to teach students with special needs [37]. In contrast, Shevlin focuses on the effectiveness of public policies in European countries, particularly Ireland [33]. Shevlin, et al. [28] study reveals that the current system still operates in a parallel model that is not fully aligned with Ireland's obligations under the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD). This suggests the need for a thorough review of policies to achieve true inclusive education [44].

Figure 3 shows a collaboration map between authors in the field of research, highlighting not only co-authorship relationships, but also collaboration patterns and the structure of the most active research networks. Schieve became a key component in this network, serving as a conduit between various working groups. Her well-known status implies that her work is essential to combining different research streams, including "Utilization of Special Education Services" Boulet, et al. [45] and "Inclusive Education for Children with Neurodevelopmental Disorders and Neuromotor Disabilities" [23]. Key figures include authors like Christensen, et al. [46] who not only serve as leaders in their respective fields but also foster communication across many groups, highlighting their significant contribution to the advancement of this field's knowledge.

Subgroups of writers that work closely together in particular fields of study are indicated by the clusters shown in blue, green, and red. With writers like Boyle, et al. [23] the blue cluster exhibits regular cooperation, most likely on specialized subjects. A unified concentration on a certain topic, like autism, is suggested by the extensive network of links presented by the green cluster, where Durkin, et al. [47] stand out [48]. Authors like Maenner [49] are part of the red cluster, which is equally related and suggests a reputable team working on a different pertinent study topic.

Strategically positioned in the graph's core, Newschaffer, et al. [50] serves as an integrator, encouraging cooperation amongst these many clusters and advancing the coherence and cross-cutting advancement of research. All things considered, the figure depicts a very vibrant and varied network of collaborations, where some writers are helpful in bridging and advancing the boundaries of knowledge, suggesting a strong and dynamic framework in the field of study.

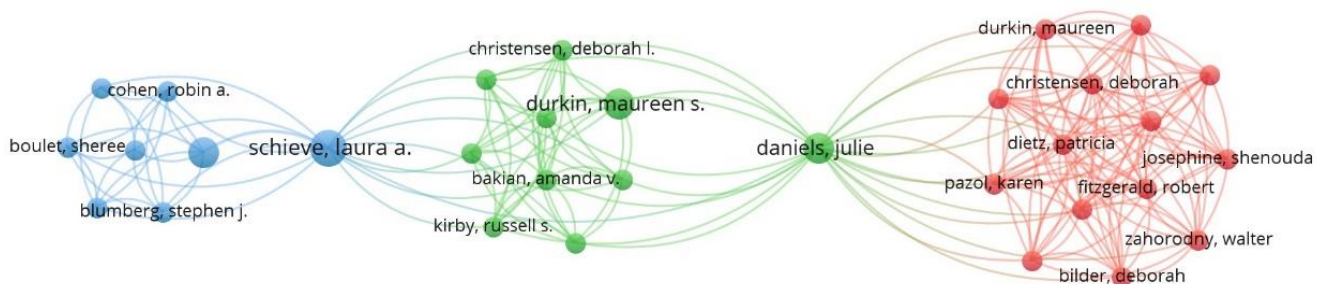


Figure 3.

Collaboration Map Among Authors in the Field of Inclusive Education.

Source: Boulet, et al. [45]; Boyle, et al. [23]; Durkin, et al. [47]; Maenner [49]; Cooc [37]; Shevlin, et al. [28]; Newschaffer, et al. [50]; Christensen, et al. [46].

A network of academic divisions and institutions working together on inclusive education research is depicted in Figure 4. The nodes in the graph correspond to different institutions, whereas the links indicate the co-authorship and collaboration relationships among them. The network was highly dense, suggesting a strong collaborative work environment with numerous interactions between the various entities involved. The presence of institutions such as oncology, psychology, pediatrics, and neurology within the network reflects an interdisciplinary approach to research on inclusive education that integrates diverse areas of knowledge to address inclusion from multiple perspectives. Figure 4 illustrates the intense interconnections and cooperation among the main academic players in inclusive education research.

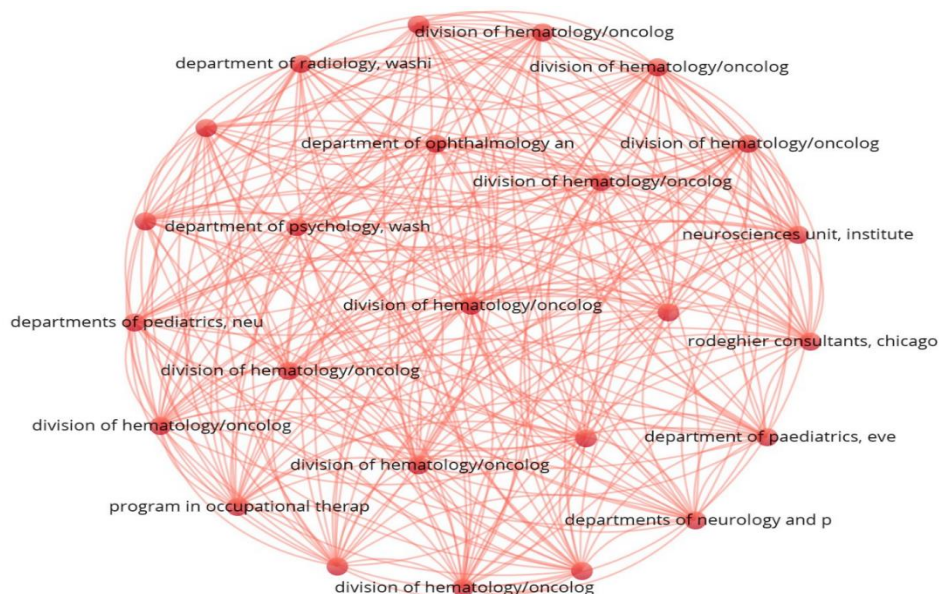


Figure 4.

Interdepartmental Collaboration Network in Inclusive Education Research.

Figure 5 shows a network graph representing international research collaborations within the field of inclusive education. Each node in the graph represents a country, and the size of the node indicates the influence or number of collaborations that the country has within the network. The links between nodes indicate active collaborations between researchers from different countries, with the thickness of the lines representing the intensity or frequency of these collaborations.

The largest and most central node is "United States," indicating that the United States is the primary hub of international collaboration in this field. This country is the largest contributor to global research in inclusive education, with multiple connections to other countries worldwide. With several connections to other nations, "United Kingdom" also holds a significant place in the network, highlighting its significance in global research.

Additionally, regional clusters that tend to work together more closely were noted, such as the group of European nations (Italy, Spain, Sweden, and the Netherlands). Significant transcontinental partnerships, such as those between the US and nations in Asia (China, India, and Taiwan) and Latin America (Brazil and Colombia), are also included in the network. This demonstrates how inclusive education research is genuinely worldwide, with partnerships spanning borders to tackle shared problems.

The United States and the United Kingdom serve as the primary centers of activity in the intricate and varied network of international cooperation depicted in Figure 5. This network plays a crucial role in the growth and development of the subject since regional and transcontinental ties represent a collaborative, international effort to further inclusive education research.

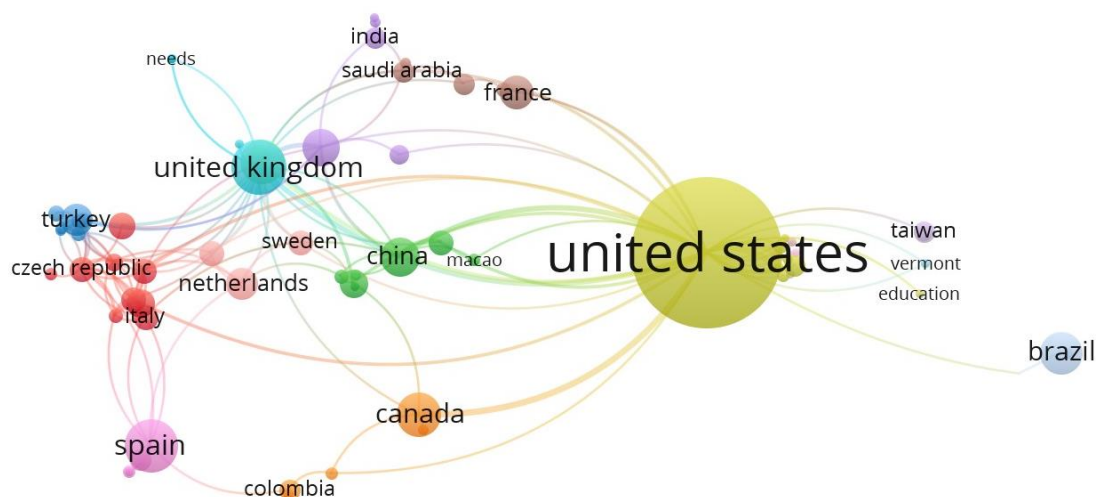


Figure 5.
Global Network of Collaborations in Inclusive Education Research.

3.4. Analysis of the Intellectual Structure

The author keywords' co-occurrence is displayed in Figure 6. "Special Education" and "Inclusion," two key phrases, are prominently shown at the heart of the map. These concepts hold a prominent place in inclusive and special education research, demonstrating their significance and applicability. Other keywords that stand out as some of the most researched topics in this sector are "Disability," "Autism," "Special Needs Education," "Teacher Education," and "Higher Education."

Groups of similar phrases are represented by nodes of various colors on the map. The subtopics within the field of study are frequently reflected in these groups. For instance, concepts like "Education Policy," "Social Justice," "Teacher Education," and "Diversity" are associated with inclusive education and education policy, as is the red-colored group. With phrases like "Special Educational Needs," "Disabilities," and "Exclusion," the green group is linked to special education and special educational requirements. With names like "Assistive Technology" and "Children with Disabilities," the blue group is associated with assistive technology and disabilities. The orange category, which includes phrases like "Autism," "Autism Spectrum Disorder," and "Early Intervention," finally focuses on autism.

The co-occurrence of terms in the examined literature is indicated by the links between the various nodes on the map. The more often these terms occur together in publications, the thicker the line is between two nodes. In this instance, the strongest associations were found between "inclusion" and "special education," indicating that both subjects are frequently discussed together in scholarly works.

The red cluster, labeled "Inclusive Education and Education Policy," focuses on several key points.

- Studies on how national and local education policies affect the inclusion of students with special needs.
- Research on teacher training in inclusive competencies and how this affects teaching practices.
- Analysis of social justice in education, examining how inclusion can contribute to greater equity in educational opportunities.
- Exploration of classroom diversity and management within inclusive education frameworks.

According to Flood and Banks [51] research, while Ireland's national policies show a dedication to inclusive education, its actual application—particularly with regard to UDL—is still in its infancy. The authors contend that a clearer commitment to inclusive practices in both initial teacher training programs and continuing professional development opportunities is necessary for UDL to have a meaningful impact. In order to guarantee that every student, regardless of their requirements, has access to an equitable and high-quality education, this analysis emphasizes how crucial it is to match educational policies with successful inclusive practices.

This study examines the evolution of inclusive education policies in Austria, focusing on special education as a more inclusive model, and analyzes the implications of these policies for teacher training and school organization [52].

Although considerable attempts have been made to make the Austrian educational system more inclusive, Buchner and Proyer [52] found that because of the historical legacy of disability-centered educational approaches, major problems still exist. The authors emphasize how changes in teacher preparation and school administration were sparked by the 2008 ratification of the UN Convention on the Rights of Persons with Disabilities, which brought fresh vitality to the conversation around school inclusion. The coexistence of special and inclusive schools, they pointed out, continues to be a barrier to Austria's full adoption of inclusive education.

Gonzalez-Castellano, et al. [53] analyzes how continuing teacher education in diversity impacts the training demands that teachers themselves request. The authors point out that while university campuses' accessibility and inclusivity directly affect teachers' desire for diversity training, this effect is positively buffered by the amount of ongoing training in this area. In other words, as university campuses become more inclusive, teachers who have received continuous training in diversity show a greater interest in further training, suggesting that training in inclusive competencies is crucial for promoting more inclusive and effective teaching practices.

The green cluster, labeled “Special Education and Special Educational Needs,” explores several key points.

- Development of methodologies to more effectively identify and address special educational needs in inclusive classrooms.
- Evaluation of intervention and support models for students with special educational needs in inclusive and segregated settings.
- Research on exclusion practices and how to prevent students with disabilities from being marginalized in education systems.
- Studies on the effectiveness of special schools versus inclusive educational environments.

In order to promote inclusive education, Muñoz-Arteaga, et al. [54] has presented an agile learning technique based on scrum. Students with dyscalculia were the subject of this methodology's testing at a Mexican elementary school. The study showed that the scrum-agile methodology fosters collaboration between educators, parents, and technology specialists, which is crucial for the successful execution of individualized educational interventions, in addition to facilitating the quick adaption of instructional materials. Furthermore, this model made it possible to use technical tools that were tailored to each student's unique needs, which led to notable advancements in their foundational math abilities.

Thomas, et al. [3] examined the increase in the use of private special schools in England and its negative impact on inclusive education. The authors highlight how this trend has led to a significant increase in spending by local authorities without necessarily translating into better outcomes for students. Furthermore, it has been argued that the lack of regulation and oversight in these private institutions can jeopardize students' well-being and exacerbate segregation. This article suggests that funds currently allocated to these schools could be better used to promote inclusive solutions within regular schools.

The blue cluster, labeled “Disability and Assistive Technology,” explores several aspects.

The impact of assistive technology on improving access to education for disabled students

Research on the barriers children with disabilities face in education and how to overcome them through technological interventions.

Studies on perceptions and attitudes towards disability in the educational context and how these influence inclusion.

Evaluation of programs and policies that support the integration of students with disabilities into the general education system.

Assistive technology, defined as any equipment, software, or system that helps individuals with disabilities perform tasks that would otherwise be difficult or impossible, has shown considerable potential in breaking down educational barriers and promoting inclusion. According to reviewed studies, technologies such as machine learning, natural language processing, and computer vision are increasingly being integrated into educational systems to personalize learning and provide specific support to students with special needs [55].

In addition, assistive technology has demonstrated efficacy in enhancing accessibility. In addition to making educational content easier to access, technologies like screen readers, automatic transcription, and sign language translation systems also provide students more agency and enable them to engage more fully and fairly in class [55]. The orange cluster, labeled “Autism and Autism Spectrum Disorders,” focuses on the following:

- Development and evaluation of early intervention programs for children with autism spectrum disorders.
- Research on best practices for integrating students with ASD into inclusive educational environments.
- Longitudinal studies on the academic and social development of children with ASD compared to their neurotypical peers.
- Analysis of the impact of specialized educational support on the academic performance and well-being of students with ASD

The study by Schneider, et al. [56] investigates how the degree of adaptive behavior, psychiatric comorbidities, and the severity of ASD affect the behavior, school adjustment, and quality of life of children with ASD in an adapted school setting. The findings of the study show that while psychiatric comorbidities are linked to worse outcomes in this area, adequate adaptive behavior is linked to better progress in school adjustment. Children with severe ASD demonstrated superior improvements in school adjustment, which defied the basic hypothesis. This suggests that school inclusion programs may be especially helpful for people with more severe types of autism. This finding underscores the importance of designing interventions that consider the heterogeneity of ASD and tailored educational support in a personalized manner to optimize both academic and quality-of-life outcomes [56].

The study by Alatifi, et al. [57] looks at the knowledge and reported application of evidence-based procedures by Saudi Arabian early intervention specialists who work with autistic children. This shows that several of these evidence-based treatments are utilized infrequently, less than once a week, even though early intervention providers report using them more frequently than emerging or unsupported techniques. Furthermore, it was discovered that professionals who knew more about these techniques were more likely to employ them, particularly when mandated by educational authorities. In order to guarantee that children with ASD receive successful evidence-based interventions at a young age, our research emphasizes the significance of continuous training and institutional support.

The brown cluster, labeled "Assessment and Special Educational Needs," suggests the following.

- Research on assessment and diagnosis methods to identify special educational needs.
- Studies on the effectiveness of various educational interventions to improve academic and social outcomes for students with special needs.
- Analysis of how continuous assessment can guide the adaptation of educational strategies to better meet individual students' needs.

The study by Abdalla, et al. [58] examines the development of education for students with special education needs in Spain from the Salamanca Declaration to 2020 and offers a thorough description of these pupils. The authors stress how discrepancies in how SEN individuals are identified and educated highlight the need for educational institutions to enhance their diagnostic and evaluation practices.

In terms of the efficacy of educational interventions, Abdalla, et al. [58] study from 2022 shows how Spain's existing policies and practices have impacted the education and general well-being of pupils with special education needs. Although the number of SEN diagnoses has increased, the authors pointed out that regional variations in the educational response have had a direct impact on the academic and social results of these students.

The study concludes by emphasizing the value of ongoing evaluation in directing the modification of instructional tactics. Abdalla, et al. [58] highlighted the need for a more inclusive approach that permits greater adaptation to the individual needs of students with SEN throughout their analysis, emphasizing how the development of education policies and resource distribution in Spain shaped both special and regular education. The following are the main topics of the purple cluster, "Inclusion and Academic Performance":

- Studies exploring the impact of inclusion on the academic performance of students with and without disabilities.
- Research on how exclusion affects students' academic performance and self-image.
- Evaluation of the effectiveness of different inclusive models in improving academic outcomes for all students.

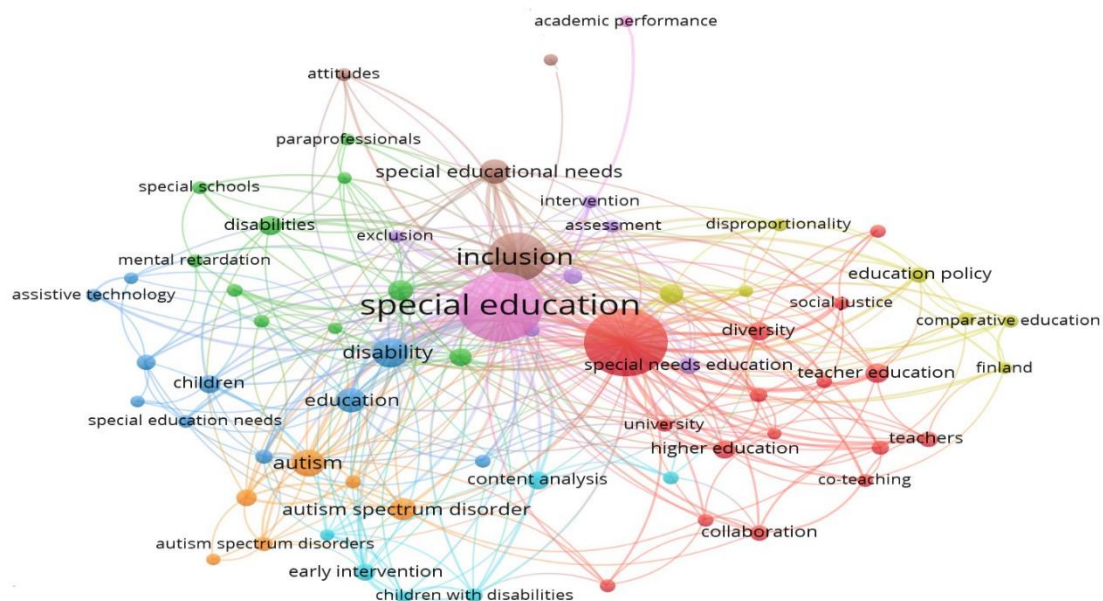


Figure 6.
Co-occurrence of Author Keywords.

Lockwood, et al. [59] investigate academic performance assessment practices in the context of special education in the United States. This study looks at how curriculum-based assessments and academic performance exams are used to

establish eligibility for special education services. It is based on a nationwide survey of special education administrators from 725 school districts. According to the report, school psychologists are largely in charge of giving standardized tests, however special education teachers are also heavily involved in these evaluations in many areas, particularly in Western states. Furthermore, it is underlined that accurate identification of kids with special educational needs—which in turn affects their academic performance and well-being—requires ongoing and appropriate assessment.

This essay also addresses how current assessment procedures affect teacher preparation, arguing that in order to guarantee the validity and efficacy of educational decisions based on these tests, more in-depth instruction in subjects like psychometrics and test interpretation is required.

Several important areas of focus overlap, demonstrating the strong connections between inclusive and special education research, according to this co-occurrence map. Furthermore, the predominance of phrases pertaining to social justice, teacher preparation, and education policy indicates a strong interest in how these elements affect the success and implementation of inclusive education. Finding the areas of most interest and the important linkages between the themes in your study on the development and trends in inclusive education research can be greatly aided by this approach.

4. Discussion

The data revealed a notable increase in inclusive education research output, particularly since 2013. This rise is indicative of a broader global emphasis on developing learning environments that are fair and accessible to all students, irrespective of their talents or limitations. The UN Convention on the Rights of Persons with Disabilities and other national and international policies may have contributed to this rise in awareness of the value of inclusion in education [52].

Citation data show that the impact of these papers has varied, despite the increase in research production. The impact has not increased proportionately in the most recent years, despite a peak in citations in 2016. This could indicate that current research has not had enough time to impact the field or that its novelty and significance have not been appropriately emphasized.

According to a mapping of the field's intellectual structure, the most investigated subjects are education policy Smyth, et al. [60] assistive technology [55] and autism [33, 48]. These subjects highlight the multidisciplinary and intricate character of inclusive education research since they not only reflect the most important fields of study but are also related to one another.

This study emphasizes that despite notable progress, there are still considerable obstacles to overcome before inclusive education can be implemented effectively [6]. These include institutional barriers that prevent inclusion in various educational environments, inadequate teacher preparation, and a lack of sufficient resources [9]. These challenges are in line with those identified in the literature Balasubramanian and Banerjee [8] indicating that policies and procedures that address these constraints must be developed going forward.

Authors and institutions from various locations have made major contributions to the growth of inclusive education, according to an examination of international cooperation and geographical variety in research. Researcher collaborations throughout the United States, Europe, and other regions have been essential to the global development of inclusive policies and practices.

5. Conclusion

The landscape of inclusive education research during the last 20 years is complicated and constantly changing, according to this bibliometric analysis. Since 2013, there has been a noticeable rise in scientific production, indicating a rise in interest in this area worldwide. The impact of publications, as indicated by citations, has, nevertheless, displayed a fluctuating tendency in spite of this productivity boost, indicating that the caliber or applicability of more recent research may not have attained the same degree of influence as that of previous publications. The analysis emphasized the significance of specific publications and writers who have spearheaded inclusive education research. Despite notable variations in the influence of their publication, these sources have been essential in spreading concepts and influencing research trends. Additionally, the intellectual structure of the field, mapped through the co-occurrence of keywords, identified the most researched thematic areas, such as special education, inclusion, autism, assistive technology, and education policies, showing a high degree of interconnection among these topics.

Despite these advances, the study also underscores the persistence of significant challenges such as the lack of resources, insufficient teacher training, and structural barriers that hinder the full implementation of inclusive education. These challenges highlight the need for a continuous and renewed focus on research to develop strategies and policies to overcome these barriers and promote effective and equitable inclusive education.

In conclusion, this study provides a comprehensive view of the evolution of and trends in research on inclusive education, offering a solid foundation for future research. Identifying underexplored areas and the need for greater attention to the practical implementation of inclusive education suggest clear directions for future research, to continue to advance towards the construction of more inclusive and accessible educational systems for all.

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