http://dx.doi.org/10.18623/rvd.v23.n3.4663

THE RIGHT TO EDUCATION FOR STUDENTS WITH DISABILITIES DURING AND AFTER THE COVID-19 PANDEMIC: A BIBLIOMETRIC ANALYSIS (2020–2025)

O DIREITO À EDUCAÇÃO DE ESTUDANTES COM DEFICIÊNCIA DURANTE E APÓS A PANDEMIA DA COVID-19: UMA ANÁLISE BIBLIOMÉTRICA (2020–2025)

Article received on: 9/2/2025
Article accepted on: 12/1/2025

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The authors declare that there is no conflict of interest

Abstract
This study examines how the right to education for students with disabilities has been addressed in international scholarship during and after the COVID-19 pandemic by mapping research trends and concepts. Relevant English-language articles indexed in the Web of Science Core Collection were retrieved and analyzed using Bibliometrix/Biblioshiny for performance indicators and science-mapping techniques. Results reveal that publication output intensified during the pandemic period and was highly concentrated in a single specialized journal, while cited sources were dispersed across education, educational technology, special education, psychology, and health-related fields. A small set of authors and documents constituted a conceptual core in an otherwise fragmented knowledge base. Thematic analyses reveal that discussions clustered around digital and distance learning, accessibility, inclusive education, mental health, and support services, with a later shift toward higher education and specific student groups. Interpreted through the availability, accessibility, acceptability, and adaptability framework, these patterns point to systemic vulnerabilities in the continuity of services, digital and informational access, educational quality, psychosocial wellbeing, and the provision of individualized supports. Overall, this study provides a thematic map of this emerging field through a rights-based lens for future research and policy debates.

Keywords: Bibliometric Analysis. COVID-19. Inclusive Education. Right to Education. Students with Disabilities.

Resumo
Este estudo examina como o direito à educação dos estudantes com deficiência tem sido abordado na produção acadêmica internacional, durante e após a pandemia da COVID-19, por meio do mapeamento de tendências e de conceitos de pesquisa. Artigos relevantes em língua inglesa, indexados na Web of Science Core Collection, foram recuperados e analisados com o uso de Bibliometrix e Biblioshiny para a análise de indicadores de desempenho e de técnicas de mapeamento científico. Os resultados revelam que a produção científica se intensificou durante o período pandêmico e se concentrou fortemente em um único periódico especializado, enquanto as fontes citadas se distribuíram entre os campos da educação, da tecnologia educacional, da educação especial, da psicologia e de áreas relacionadas à saúde. Um conjunto reduzido de autores e documentos constituiu um núcleo conceitual sobre uma base de conhecimento fragmentada. As análises temáticas indicam que as discussões se agruparam em torno da aprendizagem digital e da distância, da acessibilidade, da educação inclusiva, da saúde mental e dos serviços de apoio, com um deslocamento posterior em direção ao ensino superior e a grupos específicos de estudantes. Interpretados à luz dos marcos da disponibilidade, acessibilidade, aceitabilidade e adaptabilidade, esses padrões apontam para vulnerabilidades sistêmicas na continuidade dos serviços, no acesso digital e informacional, na qualidade educacional, no bem-estar psicossocial e na provisão de apoios individualizados. De modo geral, este estudo oferece um mapeamento temático desse campo emergente, a partir de uma perspectiva de

direitos, contribuindo para futuras pesquisas e debates no âmbito das políticas educacionais.

Palavras-chave: *Análise Bibliométrica. COVID-19. Direito à Educação. Educação Inclusiva. Estudantes com Deficiência.*

1 INTRODUCTION

Education is a universal, inalienable human right (United Nations Children's Fund [UNICEF] & United Nations Educational, Scientific and Cultural Organization [UNESCO], 2007). This right was formally recognized in the Universal Declaration of Human Rights, first adopted in 1948 (Tomaševski, 2001). Provisions related to the right to education have been included in numerous global human rights treaties, such as the International Cove-nant on Economic, Social and Cultural Rights (1966), the Convention on the Elimination of All Forms of Discrimination against Women (1981), and the United Nations Convention on the Rights of the Child (1989) (Tomaševski, 2001; UNESCO, 2017; UNICEF & UNESCO, 2007).

According to Katarina Tomaševski (2001), the right to education is not merely an abstract ideal but a civil–political and economic–social right that must be considered together with corresponding state obligations, including removing legal, financial, and administrative barriers; ensuring adequacy of schools and teachers; preventing discrimination; maintaining minimum quality standards; and adapting the education system to meet the needs of different groups. Tomaševski's 4A (availability, accessibility, acceptability, adaptability) framework explains how these obligations should be fulfilled by requiring that the right to education be available, accessible, acceptable, and adaptable. The dimension of "adaptability," especially for students with disabilities and in alignment with national jurisprudence, highlights need to adapt the education system to serve the best interests of each learner. These obligations became binding for States Parties with Article 24 of the United Nations Convention on the Rights of Persons with Disabilities (CRPD), adopted in 2006 (Tomaševski, 2001), which requires States Parties to ensure an inclusive education system at all levels, as well as lifelong learning, without discrimination and on the basis of equal opportunity (Chirowamhangu, 2024; UNICEF &

UNESCO, 2007; United Nations, 2006). Inclusive education refers to the process of strengthening the capacity of the education system to reach all learners and help overcome the barriers limiting their presence, participation, and achievement (UNESCO, 2017).

According to the CRPD, disability is an "evolving concept" that "results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others." According to Article 2 of the CRPD (2006), a fundamental requirement is the provision of "reasonable accommodation," which involves making the necessary and appropriate modifications and adjustments to enable persons with disabilities to enjoy the right to education and fundamental freedoms on an equal basis with others. In contrast, "universal design" is an inclusive approach to ensure that products, environments, programs, and services are usable by all individuals (CRPD, 2006). This design seeks to prevent the stigmatization or segregation of persons with disabilities (Shakespeare, 2006; World Health Organization [WHO] & UNICEF, 2023).

The rights-based approach established by the CRPD has highlighted the vulnerabilities of education systems especially during times of crisis (Saldanha et al., 2021). The impact of the COVID-19 pandemic on education has been profound. More than 1.6 billion learners were affected by school closures, which, along with economic fragility have deepened inequalities in education (ILO & UNICEF, 2021; UNESCO, 2021; UNESCO, UNICEF & World Bank, 2021; UNICEF, 2020; UNICEF, 2021a). Although nearly every country in the world provided remote learning opportunities for students during this period, their quality and accessibility varied greatly (UNESCO, UNICEF & World Bank, 2021). Children from socioeconomically disadvantaged groups particularly experienced multiple barriers to continuing their education, including the lack of live interactions with teachers and peers, internet connectivity problems, and inadequate learning environments at home (Burkett & Reynolds, 2020; UNICEF Innocenti & Population Council, 2024). Engzell et al. (2021) revealed that even during an eight-week closure, students experienced a learning loss of 0.08 standard deviations, with losses being 60% greater among low socioeconomic status (SES) groups. Similarly, Blaskó et al. (2022) found that students whose parents had low levels of education scored, on average, 48 points lower on Trends in International Mathematics and Science Study,

while children without internet access experienced disadvantages ranging from 16 to 44 points.

Adapting to remote learning is directly affected by household income (Merello, 2021). Bozdağ (2024) found that students living in a socioeconomically disadvantaged neighborhood in Bremen experienced difficulties in terms of not having their own computers to complete school-related tasks; although they accessed the internet through mobile phones, the quality of these devices significantly shaped their ability to use them. Similarly, Subur (2021) found that economically disadvantaged students had low participation rates, those without mobile phones could not complete assignments, and that parents—preoccupied with livelihood struggles—were unable to provide consistent support. Additionally, students were deprived of other essential supports typically offered by schools (e.g., meals, social protection, safety, psychosocial support) (UNESCO, 2021; UNICEF, 2021a; UNICEF, 2021b). Hartas (2024) reported that parents experiencing food insecurity were 17–18% less likely to support their children's learning at home. Wistoft and Qvortrup (2024) found that 92.6% of students missed their friends, 44.8% were not happy, and children from low-SES backgrounds reported higher rates of "feeling lost" at home.

Children with disabilities were disproportionately affected by COVID-19 and quarantine measures. Pre-existing challenges intensified during the pandemic (Majnemer et al., 2021; Rosencrans et al., 2021), and they faced additional difficulties (Schiariti, 2020). Interruptions to services such as schooling and therapy negatively affected their health and well-being, leading to regressions in their development (Saldanha et al., 2021). Jeste et al. (2020) revealed that nearly three-quarters (74%) of parents reported that their children lost access to therapy and educational services, while 36% reported losing access to healthcare provider. Sonnenschein et al. (2022) also revealed that 60% of parents reported that their children received fewer special education hours after school closures. Additionally, parents highlighted a significant reduction in services such as physical, occupational, and speech/language therapies. Zahaika et al. (2021) found that the pandemic negatively impacted children's mobility owing to the lack of access to health and rehabilitation services. Similarly, Karnas et al. (2023) reported a regression in the walking abilities of a student with cerebral palsy who could not receive the necessary physical therapy during school closures. They found that children deprived of social

interactions because of remote education experienced a decline in their social–emotional skills. Previously extinguished challenging behaviors re-emerged, with increased tantrums and aggressive behaviors. Asbury et al. (2021) and Iovino et al. (2021) also found that caregiving burdens had increased and that emotional difficulties—such as anxiety, challenging behaviors, and low mood—had become more common among children. Garbe et al. (2020) revealed that expected one-hour learning sessions often extended to 3–4 hours or even 7–8 hours because parents had to assume the role of teachers for their children, particularly those with learning difficulties.

With education shifting to digital environments during the COVID-19 pandemic, socio-digital inequalities became even more pronounced (Davis, 2021). Throughout the pandemic, students with disabilities were the least likely to have access to remote learning opportunities (United Nations, 2020). Möhlen and Prummer (2023) indicated that students with special needs could be systematically excluded from digital device distributions. Similarly, Alnaım and Alsarawı (2023) reported that low-income families struggled to afford the necessary technological equipment for remote education, creating additional access barriers for students with learning disabilities. Supratiwi et al. (2021) found that teachers found it difficult to impart online instruction owing to technical and pedagogical inadequacies. Moreover, Averett (2021) and Sakarneh (2021) identified common problems such as content accessibility, misunderstandings, low motivation, and instructional misalignment and reported that parents struggled to provide additional support.

Students in higher education also experienced similar challenges. Dube and Baleni (2022) revealed that students with physical and visual disabilities in South Africa preferred online learning during the pandemic owing to mobility constraints on campus (e.g., steep ramps or vision problems in sunlight). Students reported not receiving extra time during online examinations because many instructors were unaware that they had students with disabilities in their classes or had limited knowledge and skills to make the necessary accommodations. Moreover, personalized learning support for students with disabilities was almost never provided by institutions. Ali (2021) highlighted the need for adequate educational resources and appropriate software and hardware for e-learning to be effectively implemented for students with special needs in universities, reporting that e-learning did not contribute to the general development of disabled students' learning

processes and interaction skills. Aquino and Scott (2023) noted that the challenges faced by university students with disabilities during the pandemic were not limited to technological access but included difficulties pertaining to accessing healthcare services (82.2%), financial support resources (81.4%), and basic necessities—housing and food (80.2%). Reports from disability support units identified the requirement to document disabilities (65.8%), use of assistive technologies in new learning environments (62.1%), and access to accommodations during online exams (61.9%) as key problem areas. These challenges negatively affected students' mental health, increased levels of stress and anxiety, and reduced their overall quality of life, consistent with prior findings.

Despite the growing body of empirical studies and reviews examining the impact of COVID-19 on students with disabilities, existing research has largely focused on specific outcomes, existing research has largely focused on specific outcomes, such as distance learning and e-learning (Petretto et al., 2021), barriers and facilitators (Merello, 2021), and a systematic review addressing the effects of the pandemic on mental health and well-being (Castle et al., 2024). A scoping review was also conducted during the early months of the pandemic examining the general situation and rights (health, education, transportation) of persons with disabilities (Saldanha et al., 2021). Unlike systematic or scoping reviews, bibliometric analysis enables a quantitative examination of the intellectual structure, keyword co-occurrence networks, thematic evolution, and research dynamics of a field, offering insights that cannot be obtained through qualitative synthesis alone. To date, there is no comprehensive bibliometric analysis that maps the global scientific production on the right to education for students with disabilities during the COVID-19 period, nor one that examines how this literature has evolved, clustered, and interconnected over time. Therefore, the primary aim of the current study is to bibliometrically examine the international scientific production on the right to education for students with disabilities since the onset of COVID-19 and to map research trends in this field. This study is particularly critical to understand the extent to which the right to education has been addressed in the scientific literature at a time during which persons with disabilities, as a historically marginalized group, experienced intensified pre-existing inequalities, were exposed to deprivation, and faced increased social protection gaps (ILO, UNICEF, & Learning for Well Being Institute, 2024; Saldanha et al., 2021; United Nations, 2020). Because governments were slow to develop response plans for

this vulnerable population during the pandemic (UNESCO, UNICEF & World Bank, 2021) and because primary studies on the effects of the pandemic were limited (Saldanha et al., 2021), this bibliometric analysis can provide a comprehensive framework to guide future research and policy efforts by quantitatively revealing the existing knowledge base, intellectual structure, thematic patterns derived from keyword co-occurrence analysis, and the temporal development of the field. The secondary aims of the study are to analyze the annual scientific production on COVID-19 and the right to education of students with disabilities during the 2020–2025 period; to examine the relationships among the most productive authors, keywords, and journals through a three-field plot; to identify the most productive journals and sources with the highest local citations; to analyze periodical conceptual intensities and emerging themes based on trending topics; to identify thematic clusters by analyzing the co-occurrence network based on authors' keywords; and to examine the conceptual transformation of the field through thematic map and evolution analyses.

2 MATERIALS AND METHODS

This study adopted the bibliometric analysis approach systematized by Donthu et al. (2021), who define bibliometric analysis as a method that enables the evaluation of the development, dissemination, and impact of scientific knowledge over time through large-scale datasets. This approach enables a quantitative examination of the structural and thematic characteristics of research fields by combining performance analysis and science mapping techniques.

2.1 Data source and search strategy

Data were obtained from the Web of Science Core Collection database. The search was conducted on November 16, 2025, and the query used was ((“students with disabilities” OR “children with disabilities” OR “special education” OR “inclusive education” OR “special needs” OR “special educational needs” OR “learning difficulties” OR “learning disabilities” OR “access to education” OR “educational access” OR “educational equity” OR “education inequality” OR “equal opportunity” OR “education

for all" OR "educational rights" OR "right to education" OR "education as a human right" OR "human rights in education" OR "social justice in education" OR "inclusive policy" OR "inclusive practices") AND ("COVID-19" OR "pandemic" OR "coronavirus" OR "school closure" OR "lockdown" OR "remote learning" OR "distance education" OR "online learning" OR "emergency remote teaching")) in the topic (TS) field. The initial search yielded a total of 3,559 records. After considering the inclusion/exclusion criteria, removing duplicate records, and applying the Web of Science subject categories filter, 436 records included in the final analysis.

2.2 Inclusion and exclusion criteria

The inclusion criteria were: (i) studies addressing topics related to students with disabilities/special needs, special education, inclusive education, learning difficulties, or special educational needs; (ii) studies examining the COVID-19 pandemic, school closures, remote education, online learning, or emergency remote teaching processes; (iii) studies related to at least one rights-based concept such as the right to education, accessibility, inclusiveness, equity, the digital divide, or digital inclusion; (iv) studies covering all levels of education, including higher education; (v) studies published in peer-reviewed academic journals indexed in the Web of Science Core Collection; (vi) studies classified as an "Article"; (vii) studies published in English; and (viii) studies published between 2020 and 2025.

The exclusion criteria were: (i) non-peer-reviewed articles, such as books, book chapters, conference proceedings, editorials, letters, and notes; (ii) studies published in languages other than English; (iii) research not directly related to COVID-19 or not examining the educational impacts of the pandemic; (iv) publications not related to rights-based concepts; (v) grey literature (reports, policy documents, and technical papers from institutions such as UNICEF, UNESCO, and WHO); and (vi) Web of Science subject categories belonging to clinical health sciences, pediatrics, psychiatry, neuroscience, pharmacology, nursing, and similar clinical fields. However, the Web of Science "Rehabilitation" category was included because it intersects with education, developmental support, and social sciences.

2.3 Data cleaning and pre-processing

The records obtained from the initial search underwent a detailed preprocessing to ensure alignment with the scope of the study. In this process, only the 10 Web of Science subject categories directly related to education and the social sciences were retained, resulting in a final dataset of 436 articles directly connected to the study's central themes—education of students with disabilities, inclusive education, right to education, and pedagogical inequalities during and after the COVID-19 period.

Before conducting the bibliometric analysis, standard data-cleaning steps involved removing duplicate records, filtering for "Article" document types, selecting only English-language publications, correcting spelling inconsistencies in author names and keywords, and harmonizing synonymous/similar concepts. These procedures were performed using Microsoft Excel in combination with outputs from Bibliometrix/Biblioshiny.

2.4 Bibliometric analysis tools

The bibliometric analyses were conducted using the Bibliometrix R package (Aria & Cuccurullo, 2017) and its web-based interface, Biblioshiny. Bibliographic records downloaded from the Web of Science Core Collection were merged and imported into the software through the Biblioshiny interface within the RStudio environment.

Through Biblioshiny, fundamental descriptive indicators of the dataset were identified and source-, author-, and document-level impact analyses were performed. Additionally, three-field plots and visualizations of trending topics were generated as part of the conceptual analyses based on author keywords.

To examine the conceptual structure and thematic patterns, a co-occurrence network analysis based on author keywords, a thematic map analysis, and a thematic evolution analysis were implemented. All visualizations were produced by Biblioshiny. Web of Science category distributions and descriptive tables were organized using Microsoft Excel. No other visualization software was used during the analysis process.

2.5 Bibliometric analysis procedure

Annual scientific production and conceptual relationships were analyzed using Biblioshiny. As part of bibliometric visualization, a three-field plot—including authors, author keywords, and source journals was generated; in each field, the top 20 contributing items (n = 20–20–20) were automatically selected by Biblioshiny. The connections between the fields were calculated based on co-occurrence frequencies among authors, keywords, and journals.

To examine the distribution of publication outlets within the dataset, the most productive journals and those with the highest local citations were analyzed. In this context, source-based productivity was calculated and local citation indicators were identified.

To investigate contributions at the author level, author-level productivity and local citation patterns were examined.

To examine conceptual trends between 2020 and 2025, an analysis of trending topics was conducted using the Biblioshiny interface, with parameters set to Word Minimum Frequency = 5 and Number of Words per Year = 3 to identify the most frequently used author keywords in each year.

To analyze conceptual patterns, a co-occurrence network analysis based on author keywords was performed considering the top 50 most frequently used keywords and excluding isolated nodes from the network. The automatic layout was used for network visualization, and the Walktrap algorithm was applied to identify conceptual clusters. To establish relationships between concepts, a minimum of two co-occurrences was required, and the repulsion force was set to 0.1.

To examine the centrality and density characteristics of conceptual clusters, a thematic map analysis was performed, including only author keywords. The keyword count was set to 150, the minimum cluster frequency to 5 per 1000 documents, and the clustering algorithm to Louvain. Using a more limited keyword set aimed to reduce uncertainties that low-frequency concepts could introduce into the analysis.

To examine the development of the conceptual structure over time, a thematic evolution analysis was conducted. The keyword count was set to 250, minimum cluster frequency was 5 per 1000 documents, weighting index was the Inclusion Index (word-

occurrences weighted), minimum weight was 0.1, and the Louvain algorithm was used for clustering. Setting the keyword count to 250 enabled the examination of transitions between themes over two periods and captured patterns of strengthening or weakening among relatively marginal themes over time, thereby including concepts with medium-level frequencies. The dataset was divided into two periods, with 2022, the year with the highest annual scientific production, as the cutoff point, which served as an operational starting point for the thematic evolution analysis.

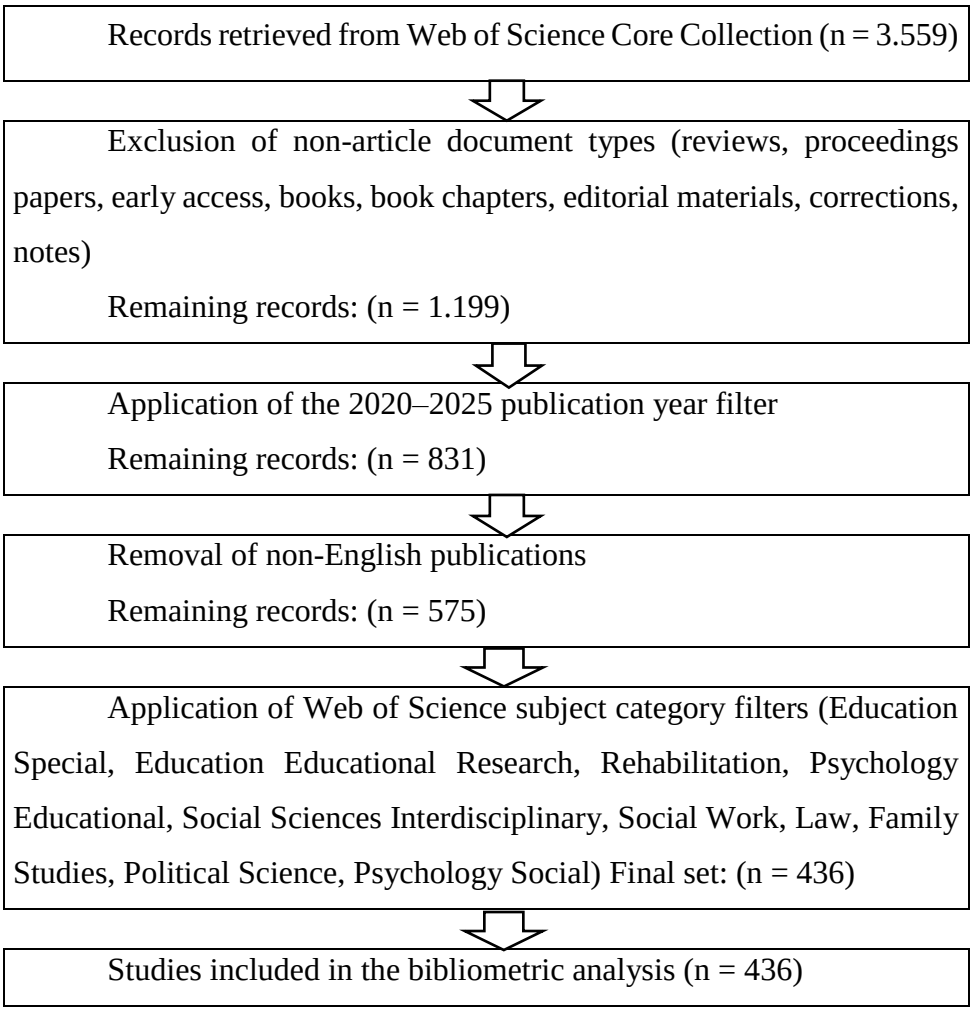
Additional author- and document-level outputs are provided as supplementary material for transparency and completeness.

3 RESULTS

To finalize studies to be included in the bibliometric analysis, the records obtained from the search conducted in the Web of Science Core Collection database were subjected to a multi-stage data refinement process, as illustrated in Figure 1.

Figure 1

Data Refinement Process in the Web of Science Core Collection



The descriptive characteristics of the articles included in the bibliometric analysis are presented in Table 1.

Table 1

Descriptive Characteristics of the Articles

Main Information	Results
Timespan	2020–2025
Sources	121
Documents	436
Annual Growth Rate	14.87%
Authors	1.225
Single-Authored Documents	71
International Co-Authorship	8.95%
Co-Authors per Document	2.97
Author's Keywords	1.409

References	14.352
Average Age of Documents	2.71
Average Citations per Document	2.812

The annual scientific production related to the right to education for students with disabilities during and after the COVID-19 pandemic is presented in Figure 2.

Figure 2

Annual Scientific Production

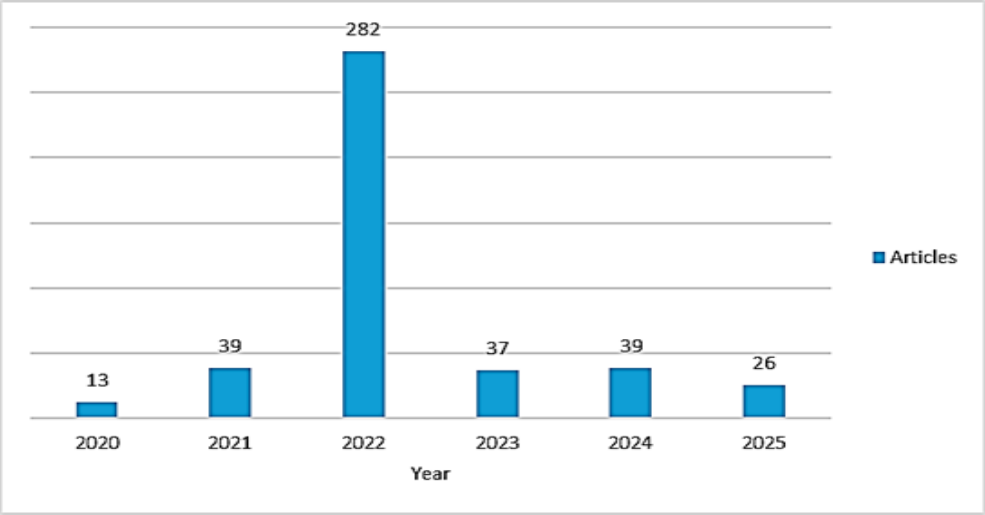
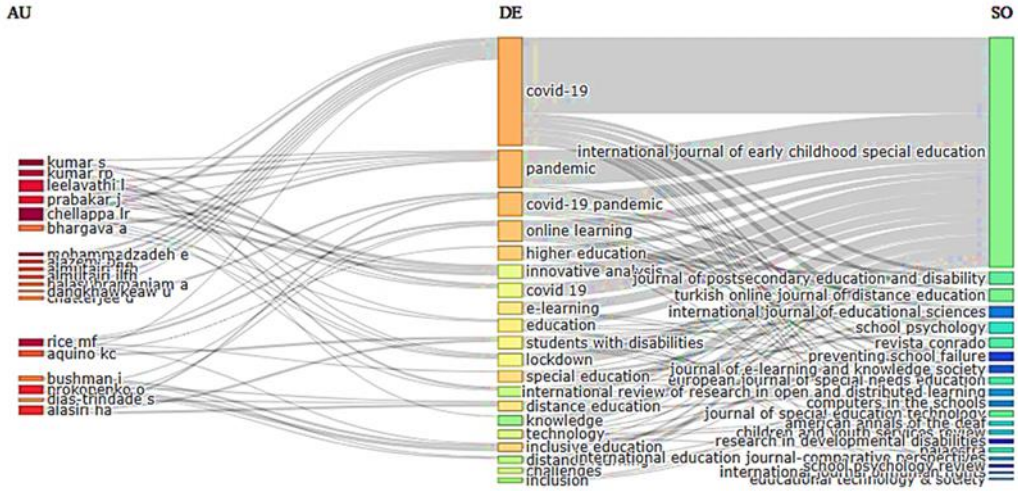


Figure 2 reveals a marked increase in publication output from 2020 to 2022, reaching its highest level in 2022. In 2023, theses number declined substantially, while in 2024, production exhibited more limited change and remained close to the level of the previous year, indicating a fluctuating publication trajectory across the years. The three-field plot presented in Figure 3 visualizes the relationships among authors, keywords, and journals.

Figure 3

Three-Field Plot (Authors–Keywords–Sources)



Authors including Kumar, Chellappa, Prabhakar, Leelavathi, and Aquino were linked with keywords such as “covid-19,” “pandemic,” “online learning,” “distance education,” “students with disabilities,” “higher education,” and “inclusive education,” which are linked to journals such as the *International Journal of Early Childhood Special Education*, *Turkish Online Journal of Distance Education*, *Educational Technology & Society*, *Revista Conrado*, and the *Journal of Postsecondary Education and Disability*. This indicates that, during the COVID-19 period, the right to education for students with disabilities was addressed in the scientific literature predominantly within the contexts of distance education, inclusive education, and higher education. Figure 4 presents the distribution of publications across journals.

Figure 4

Most Relevant Sources

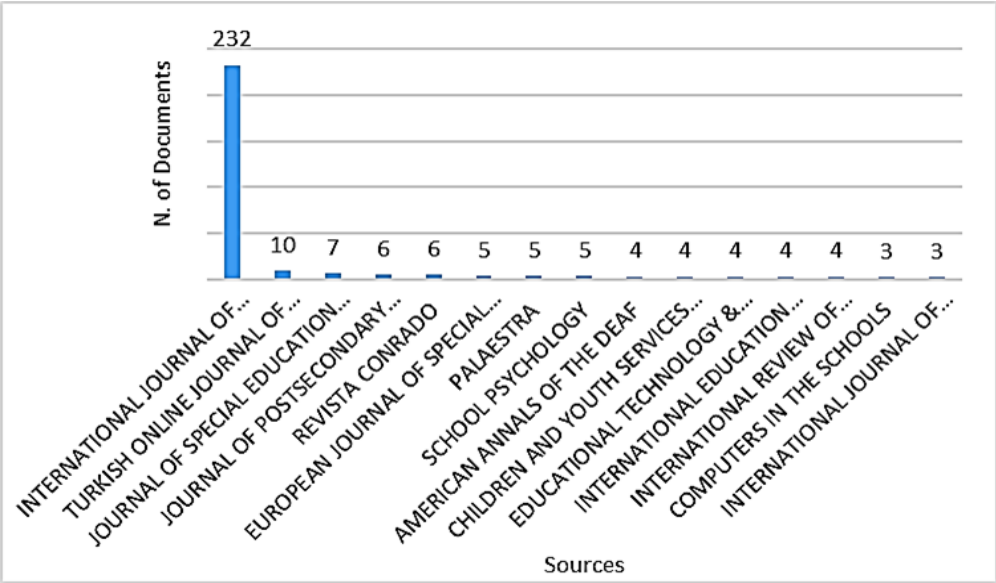


Figure 4 reveals a highly asymmetric structure. The *International Journal of Early Childhood Special Education* constitutes an overwhelming proportion of the dataset with the highest number of publications (n = 232), indicating that studies on students with disabilities during the COVID-19 period were predominantly concentrated in a single specialized publication outlet. The *Turkish Online Journal of Distance Education* (n = 10), the *Journal of Special Education Technology* (n = 7), and the *Journal of Postsecondary Education and Disability* (n = 6), along with various other sources with five or fewer publications suggest that the literature has a scattered, interdisciplinary publication structure spanning different fields (special education, distance education, psychology, and social work) and is characterized by high source diversity but low publication intensity per source. It also indicates that disciplines focusing on early childhood special education, distance education, and accessibility were highlighted in the literature. Figure 5 presents the most frequently cited journals ranked according to their relative levels of contribution.

Figure 5

Most Cited Sources

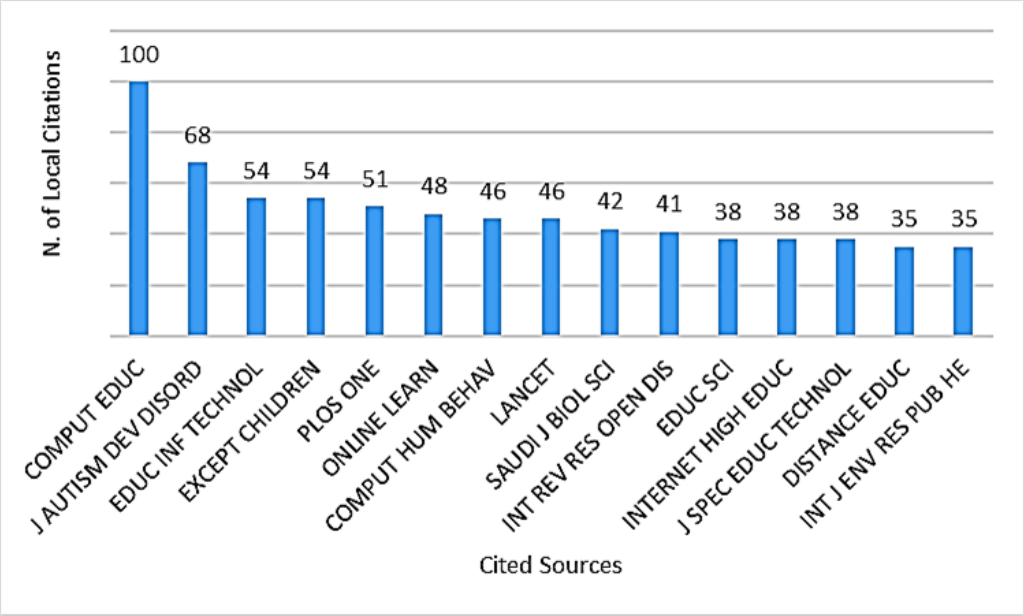


Figure 5 reveals that *Computers & Education* had the highest number of local citations (n = 100), followed by the *Journal of Autism and Developmental Disorders* (n = 68), *Education and Information Technologies* (n = 54), and *Exceptional Children* (n = 54). *PLOS ONE* (n = 51), *Online Learning* (n = 48), *Computers in Human Behavior* (n = 46), *The Lancet* (n = 46), *Saudi Journal of Biological Sciences* (n = 42), *International Review of Research in Open and Distributed Learning* (n = 41), *Education Sciences* (n = 38), *Internet and Higher Education* (n = 38), *Journal of Special Education Technology* (n = 38), *Distance Education* (n = 35), and the *International Journal of Environmental Research and Public Health* (n = 35) were also notably cited. This distribution reveals high source diversity and a multidisciplinary citation structure, including the fields of educational technology, special education, psychology, biomedical sciences, and public health. This indicates that discussions on the right to education for students with disabilities addressed pedagogical, technological, and psychosocial dimensions. Figure 6 presents the authors with the highest number of local citations in the literature.

Figure 6

Most Cited Authors Locally

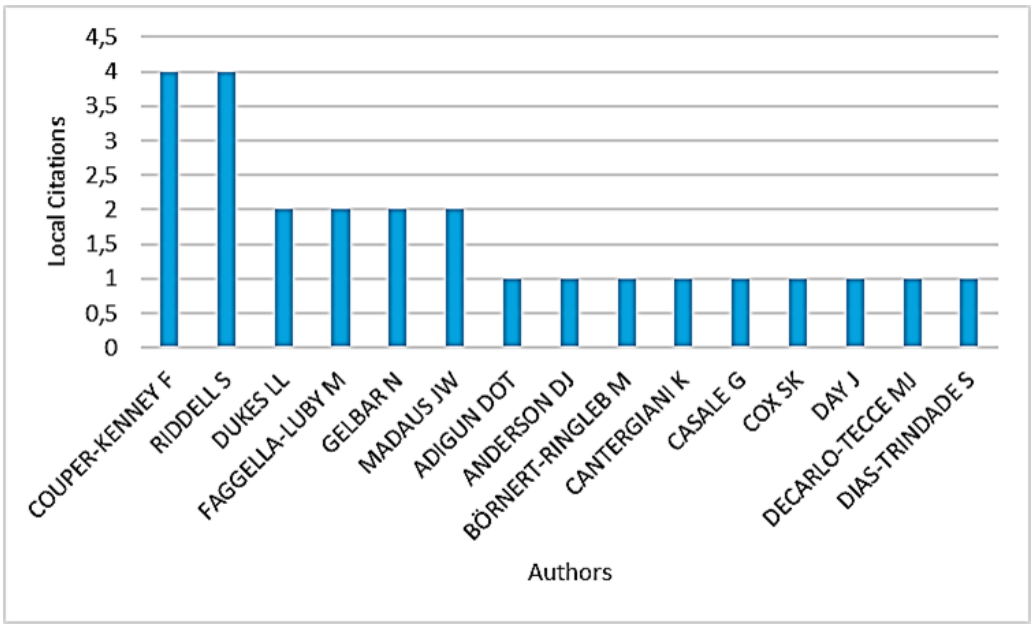


Figure 6 reveals that Couper-Kenney (n = 4) and Riddell (n = 4) had the highest number of citations and highest intra-field visibility within the dataset, followed by Dukes, Faggella-Luby, Gelbar, and Madaus. This distribution highlights certain studies and researchers that emerged as key intra-field reference points. Figure 7 illustrates the changes and trends in prominent keywords over the years.

Figure 7

Trending Topics Based on Author Keywords

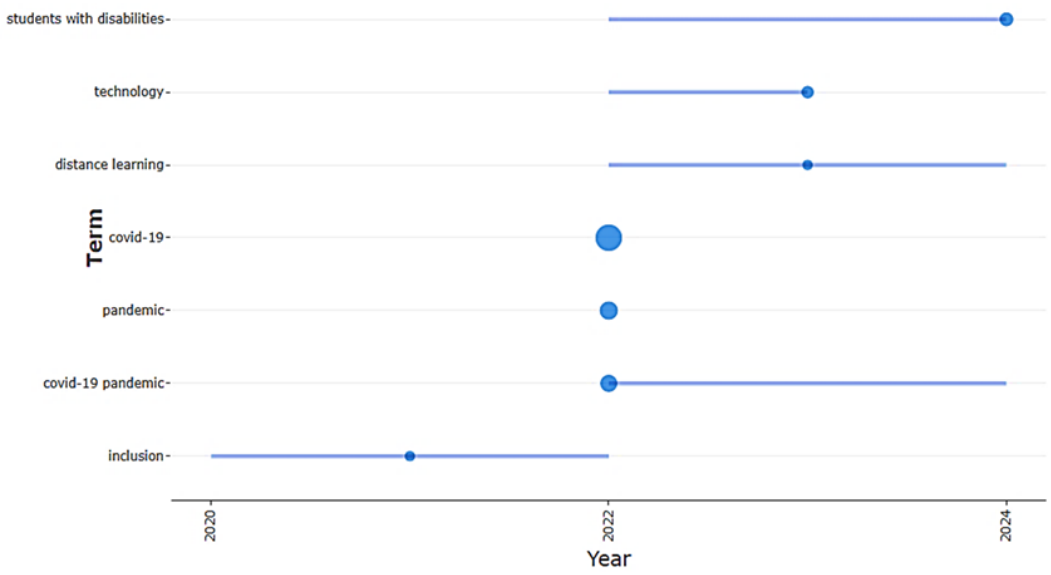


Figure 7 reveals that terms emerged at different periods, with their usage varying by year, suggesting that the focus shifted from general crisis-related concepts toward digital access and target group–specific issues. Figure 8 visualizes the co-occurrence relationships among author keywords, revealing the thematic structure of the literature.

Figure 8

Keyword Co-Occurrence Network

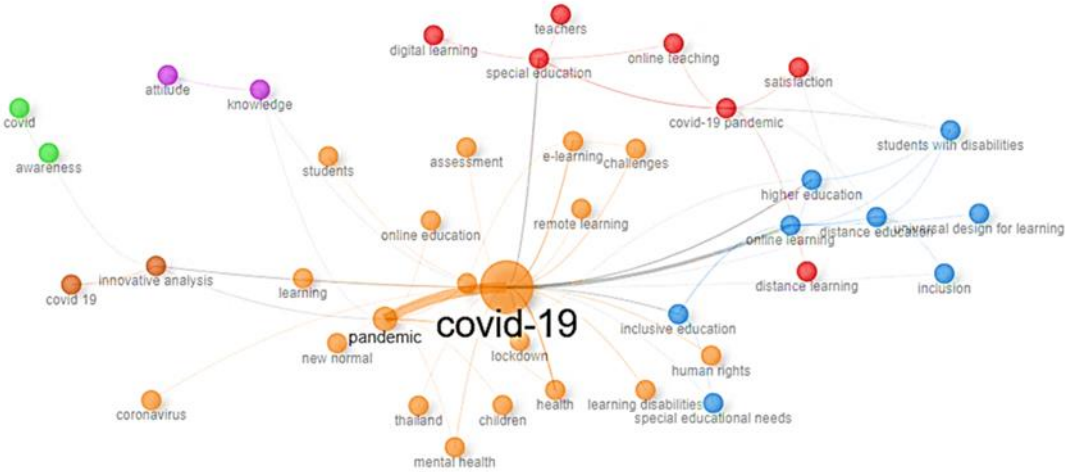


Figure 8 reveals that the terms “covid-19,” “pandemic,” and “covid-19 pandemic” had the highest number of connections, exhibiting dense co-occurrence relationships with other terms. The clustering of educational technology–related concepts (“online learning,” “distance learning,” “educational technology,” and “higher education”) indicates a high frequency of co-use. Special education–related terms (“students with disabilities,” “special education,” “inclusive education,” “developmental disabilities,” and “learning disabilities”) form a separate cluster, while health-related concepts such as “health” and “mental health” appear as more peripheral but thematically connected nodes. Overall, the network structure reveals that discussions were concentrated around the pandemic context, digital learning, and special education axes. Figure 9 presents the thematic map with key concepts clustered according to their levels of centrality and density.

Figure 9

Thematic Map

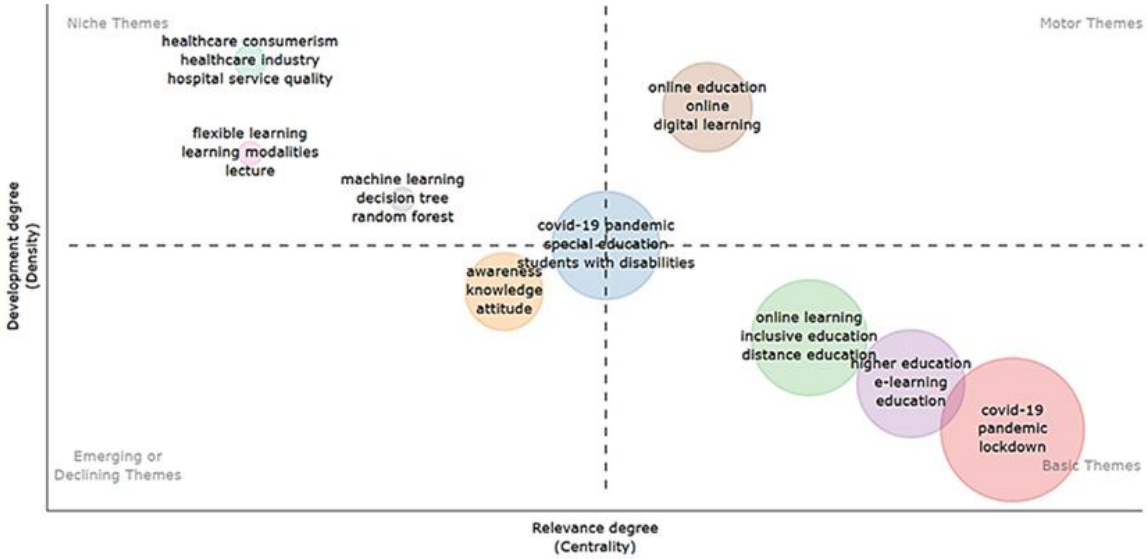


Figure 9 reveals that the terms in the basic themes quadrant constitute the core themes owing to their high centrality, while those in the motor themes cluster, exhibit high centrality and density, indicating that they are well developed and structurally mature. Terms in the niche themes quadrant, are characterized by high density but lower centrality, pointing to a more limited positioning within specific subfields. Terms in the

emerging or declining themes quadrant, display low centrality and density. This thematic distribution indicates that themes related to digital education and distance learning occupied a central position in the literature, while individual- and awareness-based concepts remained relatively peripheral. Figure 10 presents the conceptual continuity and transformation of key concepts between the 2020–2022 and 2023–2025 periods.

Figure 10

Thematic Evolution

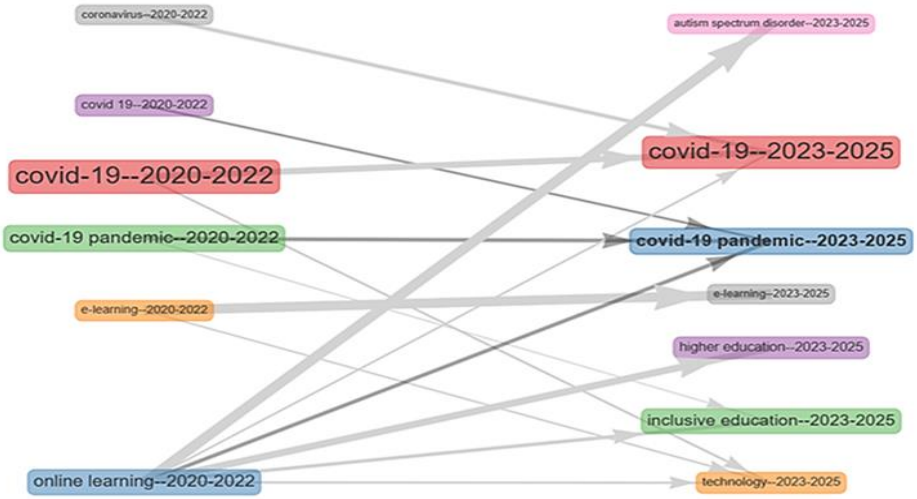


Figure 10 reveals that most of the prominent themes between 2020–2022 continued into the next period, with “covid-19” and “covid-19 pandemic” exhibiting strong linkages. Between 2023–2025, new concepts including “inclusive education,” “higher education,” “technology,” and “autism spectrum disorder” were added. The thematic evolution map reveals a shift from general crisis-related concepts toward more inclusive, technology-based discussions on specific student groups.

4 DISCUSSION

4.1 Bibliometric profile and intellectual structure of the literature

The study findings elucidate the overall production dynamics and intellectual orientations of the literature on the right to education for students with disabilities during

and the COVID-19 pandemic. The findings reveal that academic output intensified rapidly during certain periods, following a more fluctuating trajectory in subsequent years, with publication volume increasing markedly from 2020 to 2022, reaching its highest level (Figure 2). Thus, the literature reflects a production pattern that is highly sensitive to crisis conditions, with knowledge production largely shaped around rapid and intensive responses to issues specific to the pandemic context (Asbury et al., 2021; Schiariti, 2020). The disproportionate negative impacts and service disruptions experienced by vulnerable, at-risk groups (Davis, 2021; Quinn, 2021; Saldanha et al., 2021; United Nations, 2020) made this a critical issue requiring urgent attention (Saldanha et al., 2021; Watson et al., 2025).

The relative decline in publication output from 2023 suggests that the field has moved beyond the acute phase of the crisis, with the focus shifting toward examining more comprehensive long-term effects. In the bibliometric evolution map, the emergence of more specialized themes indicates a shift away from emergency response–oriented studies toward more in-depth analyses of specific subgroups.

The three-field plot reveals that prominent authors predominantly produced articles on the pandemic, remote learning, and students with disabilities, concentrated in specific journals, highlighting thematic specialization and interdisciplinary diffusion. The concentration of the majority of publications within a single journal indicates that a substantial portion of research outputs focuses on niche and specialized areas of special education. This concentration may reflect the specialized nature of disability education research, the limited number of journals prioritizing rights-based educational studies, and the early-stage development of this research field in response to the pandemic. In contrast, journals with the highest local citations (Figure 5) demonstrate that the focus is not confined to special education but attracts attention from and is informed by a broad scientific spectrum. Simultaneously, this pattern indicates that the educational experiences of students with disabilities were intertwined with health-related vulnerabilities, highlighting a multidimensional problem involving psychosocial impacts, access to services, and disruptions in support mechanisms. Existing studies emphasize that the experiences of students with disabilities during the pandemic encompass multilayered issues such as the digital divide, mental health, social justice, and access to healthcare services (Castle et al., 2024; Davis, 2021; Majnemer et al., 2021; Quinn, 2021).

The concentration of authorship suggests that the field is still being shaped by a relatively small core of researchers. Citation patterns further indicate that a limited number of studies and authors function as conceptual reference points for subsequent research and form the foundation of knowledge production in the field (see Supplementary Figures S1–S3). The concentration of local citation levels around a small set of studies suggests that the scientific community has not yet converged around an integrated theoretical or methodological framework.

4.2 Thematic structure of the right to education literature

The thematic analyses (Figures 7–10) reveal prominent conceptual patterns and their transformation over time. These thematic patterns are not treated as direct classificatory outcomes but are interpreted through a rights-based analytical lens using Tomaševski's 4A framework.

The availability dimension refers to the state's obligation to provide educational services in a continuous and adequate manner (Tomaševski, 2001). The literature's strong focus on digital solutions during the pandemic indicates that educational provision was largely maintained through online tools. However, for students with disabilities, these solutions were temporary, fragile, and unequal (Saldanha et al., 2021), and the continuity of special education and support services could not be ensured (Jeste et al., 2020; Majnemer et al., 2021; Möhlen & Prummer, 2023; Sonnenschein et al., 2022). Thus, although availability may have appeared to be preserved in quantitative terms, it failed to provide a qualitative and sustainable guarantee of the right to education.

The accessibility dimension requires the elimination of discrimination and the assurance of equal opportunities in education, including not only the removal of physical and economic barriers but also the provision of reasonable accommodation in accordance with the CRPD (CRPD, 2006; Tomaševski, 2001). The thematic patterns suggest that discussions on inclusive education and accessibility are often framed within broader concerns related to the digital divide. Studies reveal that access to online education for students with disabilities was severely constrained due to limitations in technical infrastructure and appropriate equipment (Aquino & Scott, 2023; Blaskó et al., 2022), inadequacies in support mechanisms, financial difficulties (Alnaım & Alsarawı, 2023;

Subur, 2021), and food insecurity (Hartas, 2024). During the pandemic, accessibility gained meaning not merely through the existence of technological tools but through the ability to access and use them effectively and on equal terms (Davis, 2021). These findings align with earlier systematic reviews on the impact of COVID-19 on students with disabilities (Castle et al., 2024; Petretto et al., 2021), which similarly highlighted the digital divide and inequitable access. However, unlike previous reviews, the bibliometric analysis reveals the temporal evolution of these themes and identifies a growing focus on higher education and specific disability subgroups. The obligation—mandated under the CRPD—to provide information in accessible formats was also disrupted during the pandemic (Saldanha et al., 2021). Studies indicate that persons with disabilities were unable to adequately access information related to education and public services through sign language, easy-to-read texts, and accessible digital formats. Thus, accessibility was structurally violated in terms of the provision of information, which constitutes a prerequisite for de facto access to education.

The acceptability dimension requires that the content, pedagogy, and learning environments of education be considered appropriate and safe by students, families, and society, and that discrimination, violence, and the erosion of pedagogical quality be prevented (Tomaševski, 2001). The bibliometric analysis reveals that concepts such as “mental health” and “health” cluster prominently within the co-occurrence networks. Research demonstrates that remote education was insufficient in sustaining pedagogical quality for students with special needs (Ali, 2021; Bozdağ, 2024; Sakarneh, 2021; Supratiwi et al., 2021). Additionally, school closures and the loss of face-to-face interaction led to decreased emotional well-being (Asbury et al., 2021; Iovino et al., 2021; Karnas et al., 2023; Wistoft & Qvortrup, 2024), learning loss and lower academic achievement (Engzell et al., 2021), creating a significant psychosocial burden on caregivers (Asbury et al., 2021; Iovino et al., 2021), and imposing teacher roles on parents (Garbe et al., 2020).

The adaptability dimension requires the education system to be flexibly organized in accordance with the best interests of each learner and to respond to individual needs (Tomaševski, 2001). This entails the continuity of individualized instruction and support arrangements for students with disabilities, and their protection even under crisis conditions (CRPD, 2006). The thematic evolution analysis shows that, during the 2023–

2025 period, the literature focused on “inclusive education,” “higher education,” and “autism spectrum disorder.” The shift toward higher education and autism-specific studies likely reflects both the prolonged disruptions in education and the research community’s recognition of the need to address heterogeneous experiences among students with disabilities over time. This trend suggests that, as the limitations of generalized solutions implemented during the initial phase of the pandemic became visible, the literature increasingly reflected a search for flexible educational arrangements sensitive to individual differences.

In the context of higher education, adaptability emerges as a critical testing ground. The literature highlights structural and pedagogical difficulties in transferring reasonable accommodations to online learning environments (Aquino & Scott, 2023; Dube & Baleni, 2022), as well as growing debates about the inability to sustainably provide individualized academic and support practices owing to limitations in institutional capacity and instructional competence (Ali, 2021).

The thematic patterns indicate that the general educational solutions developed during the pandemic were only limitedly problematized in the literature in terms of their capacity to address individualized developmental and learning needs. This suggests that adaptability was reconsidered as a fragile rights dimension, thematically overlapping with previous studies in which limitations related to individualized development (Karnas et al., 2023; Sonnenschein et al., 2022; Zahaika et al., 2021) and learning arrangements (Alnaım & Alsarawı, 2023; Averett, 2021; Supratiwi et al., 2021) were raised across different contexts.

In conclusion, bibliometric evidence reveals that the pandemic generated systematic vulnerabilities for students with special needs across all rights dimensions of education. Applying Tomaševski’s 4A framework allows for a rights-based interpretation of bibliometric patterns, highlighting not only which themes are most frequently studied but also the extent to which each dimension of the right to education—availability, accessibility, acceptability, and adaptability—remains vulnerable under crisis conditions. However, considering thematic concentration and the centrality of co-occurrence networks, structural problems—particularly in the dimensions of accessibility and acceptability—strongly support the need for future policy and research efforts to focus on building crisis-resilient, rights-based, and inclusive education systems.

4.3 Limitations

This study provides a strong quantitative framework for the literature on the right to education for students with disabilities during and after the COVID-19 pandemic, despite the following limitations: First, the analysis was limited to peer-reviewed articles indexed in the Web of Science Core Collection, resulting in the exclusion of reports published by international organizations and policy documents produced by disability organizations.

Second, owing to the research design, studies published in clinical disciplines such as pediatrics, neurology, and psychiatry were excluded from the analysis, potentially omitting certain conceptual dimensions related to the intersections between the medical aspects of disability and social and educational barriers in bibliometric maps.

Finally, the concentration of publications during the early phase of the pandemic (2020–2022) may have limited the visibility of long-term adaptation and restructuring strategies developed by education systems from 2023 onward in the thematic analyses. Thus, the findings more strongly reflect literature trends related to the acute phase of the crisis.

4.4 Implications and directions for future research

4.4.1 Policy and practice implications

The right to education requires not only access to education but also an inclusive education system that maximizes the development of persons with disabilities through individualized support and reasonable accommodations based on equal opportunities (CRPD, 2006; UNICEF & UNESCO, 2007). The disruptions experienced during the pandemic in therapies, support services, and individualized instructional practices (United Nations, 2020) demonstrate that these services should not be treated as optional practices but as essential public services. Thus, ensuring the continuity of educational services at the legal and administrative levels should be redefined as a core state obligation (Tomaševski, 2001).

Accessibility is a fundamental requirement for persons with disabilities to make informed decisions and benefit from services on an equal basis (United Nations, 2020). However, bibliometric analyses indicate that digital inequalities were among the primary structural barriers limiting de facto access to education during the pandemic. Thus, the provision of appropriate devices, affordable and high-quality connectivity, and sustained support—particularly for low-income households—should be addressed as priority policy areas. Such interventions need to be holistic and integrated to mitigate the educational consequences of digital exclusion (Bozdağ, 2024). Integrating universal design principles into educational technologies at an early stage (CRPD, 2006) may contribute to reducing the exclusionary effects of remote learning environments for students with disabilities (UNICEF & UNESCO, 2007).

The pedagogical and psychosocial vulnerabilities that emerged during the pandemic have revealed that acceptability is directly linked to students' academic needs as well as mental health and social–emotional needs (United Nations, 2020). Thus, teachers should be provided with systematic professional development in psychosocial support, behavior management, and trauma-sensitive pedagogical approaches (Slee, 2011). Simultaneously, learning environments should be child-friendly, safe, and protective, and institutional mechanisms that enable the monitoring of student well-being should be integrated to ensure that children are protected from physical or degrading punishment (Slee, 2011; UNICEF & UNESCO, 2007).

The pandemic revealed that institutional capacity to safeguard individualized education plans and academic accommodations under crisis conditions is limited (UNESCO, UNICEF & World Bank, 2021). To strengthen adaptability, priority intervention areas at the policy and practice levels should include providing teachers with continuous professional development opportunities tailored to specific types of disabilities and to remote/blended learning contexts, as well as institutionalizing mechanisms for individualized support and reasonable accommodation so that they also encompass online learning environments (UNICEF & UNESCO, 2007). Accordingly, inclusive return-to-school programs, including accelerated, remedial, and catch-up programs aimed at mitigating learning loss should target disadvantaged students and those who were unable to access e-learning (Reimers & Schleicher, 2020; United Nations, 2020). Curriculum priorities should also be reviewed to ensure a balance between cognitive, social, and

emotional domains. Twenty-first-century skills acquired during periods of remote learning, such as autonomy, self-regulation, and independent learning, should be intentionally fostered (Reimers & Schleicher, 2020).

4.4.2 Implications for future research

Future studies should prioritize comparative research designs. In particular, the question "Which intervention is effective for which student group, under which conditions?" constitutes a central research axis for evidence-based policy development.

To highlight inequalities related to the right to education, data should be disaggregated according to variables such as type of disability, socioeconomic status, age, and geographic context to identify which rights dimensions and student groups are more exposed to violations within Tomaševski's 4A model. Future research that develops evaluation models combining this framework with measurable indicators will enable more systematic monitoring of rights violations and facilitate comparative analyses.

5 CONCLUSIONS

This study examined the international scientific literature on the right to education for students with disabilities during and after the COVID-19 pandemic through bibliometric analysis. When annual production dynamics, citation patterns, and co-occurrence structures of key concepts are considered together, the literature appears to have intensified rapidly in the early years of the pandemic, exhibiting a more fluctuating and thematically differentiated structure subsequently, indicating that the education of students with disabilities became a central area of debate in academic production in the context of COVID-19.

The thematic analyses reveal that the literature was shaped predominantly around concepts such as digital education, access-related challenges, mental health, and individualized supports. The distribution of themes and their transformation over time indicate that not only the continuity of education but also issues related to its accessibility, acceptability, and adaptability became increasingly visible. The thematic evolution

analysis reveals that, in the later stages of the pandemic, a shift emerged toward a focus on more specialized student groups and educational contexts.

The bibliometric findings of the study were interpreted through a rights-based analytical lens using Tomaševski's 4A framework, encompassing the dimensions of availability, accessibility, acceptability, and adaptability. This approach systematically highlights how thematic emphases and vulnerabilities across different rights dimensions of education have been addressed in the literature on the education of students with disabilities during the pandemic period. The findings are important to understand the extent to which education remained inclusive under crisis conditions, with the concentration of discussions around access and acceptability providing meaningful insights in this regard.

In conclusion, this study offers a comprehensive framework that maps the literature on the education of students with disabilities during and after the COVID-19 pandemic through quantitative and thematic dimensions, while also evaluating this literature through a rights-based analytical lens. By highlighting the vulnerabilities created by pandemic conditions across different rights dimensions of education, this approach demonstrates how the right to education of students with disabilities has been reopened for critical discussion in crisis contexts.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Satiroglu, F. (2026). THE RIGHT TO EDUCATION FOR STUDENTS WITH DISABILITIES DURING AND AFTER THE COVID-19 PANDEMIC: A BIBLIOMETRIC ANALYSIS (2020–2025). *Veredas Do Direito*, 23(3), e234663. https://doi.org/10.18623/rvd.v23.n3.4663