Mapping research on evidence-based practice in education: a mixed analysis

Mapeo de la investigación sobre la práctica basada en la evidencia en educación: un análisis mixto

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Abstract

This work is a review approach to the scientific literature on evidence-based practice in teaching/learning processes carried out through a bibliometric study and a content analysis. A total of 1,868 documents extracted from the WOS database were analysed, from which the 100 most cited documents in the last twenty years were selected for an in-depth analysis of the topics addressed in the studies. This study made it possible to identify a growing trend in the number of studies carried out in recent years, the weight of different countries, including the USA, reference authors, sources to be consulted to learn more, and the existing collaboration and co-citation networks. In addition, the content analysis results show the diversity of methodologies, techniques, and resources endorsed for their effectiveness in improving education, professional development, and the effects on participants' performance. With or without technology, evidence-based practices are implemented in different contexts and with diverse populations, such as students with special educational needs. However, studies focused on the training of health professionals predominate.

Keywords: evidence-based practices, bibliometrics, content analysis, thematic evolution analysis.

Resumen

Este trabajo es una aproximación a la literatura científica sobre la práctica basada en la evidencia en los procesos de enseñanza/aprendizaje, realizada a través de un estudio bibliométrico y un análisis de contenido. Se analizaron un total de 1,868 documentos extraídos de la base de datos WOS, de los cuales se seleccionaron los 100 más citados en los últimos veinte años, para la profundización en las temáticas abordadas en los estudios. La realización de este estudio permitió identificar una tendencia creciente en el número de estudios realizados en los últimos años, el peso de diferentes países entre los que destaca EE. UU., autores de referencia, fuentes a las que acudir para saber más o las redes de colaboración y cocitación existentes. Además, los resultados del análisis de contenido muestran la diversidad de metodologías, técnicas y recursos avalados por su eficacia para la mejora de la educación, el desarrollo profesional y los efectos en el rendimiento de los participantes. Con o sin tecnología, las prácticas basadas en evidencia se

implementan en diferentes contextos y con poblaciones diversas, como estudiantes con necesidades educativas especiales. Sin embargo, predominan los estudios centrados en la formación de profesionales sanitarios.

Palabras clave: prácticas basadas en evidencia, bibliometría, análisis de contenido, análisis de evolución temática.

Resumo

Este trabalho oferece uma abordagem de revisão à literatura científica sobre a prática baseada em evidência nos processos de ensino/aprendizagem, efetuada através de um estudo bibliométrico e de uma análise de conteúdo. Foram analisados um total de 1,868 documentos extraídos da base de dados WOS, dos quais foram selecionados os 100 documentos mais citados nos últimos vinte anos para uma análise aprofundada dos temas abordados nos estudos. Este estudo permitiu identificar uma tendência crescente no número de publicações realizadas nos últimos anos, assim como o impacto de diferentes países, dentre os quais se destaca os EUA, autores que são referência na área, periódicos a que se deve recorrer para obter mais informações, bem como as redes de colaboração e cocitação existentes. Ademais, os resultados da análise de conteúdo mostram a diversidade de metodologias, técnicas e recursos aprovados por sua eficácia na melhoria da educação, o desenvolvimento profissional e os efeitos no rendimento dos participantes. Com ou sem tecnologia, as práticas baseadas em evidências são implementadas em diferentes contextos e com diversas populações, como alunos com necessidades educacionais especiais. No entanto, predominam os estudos voltados para a formação de profissionais de saúde.

Palavras-chave: práticas baseadas em evidência, bibliometria, análise de conteúdo, análise de evolução temática.

Resumo

Il presente lavoro rappresenta un approccio alla letteratura scientifica sulle pratiche basate sulle evidenze nei processi di insegnamento/apprendimento, realizzato attraverso uno studio bibliometrico e un'analisi del contenuto. Sono stati analizzati complessivamente 1,868 documenti estratti dalla banca dati WOS, da cui sono stati selezionati i 100 documenti più citati negli ultimi vent'anni per un'analisi approfondita dei temi trattati negli studi. Questo studio ha permesso di individuare un trend crescente nel numero di studi realizzati negli ultimi anni, il peso dei diversi Paesi, tra cui gli Stati Uniti, gli autori di riferimento, le fonti a cui rivolgersi per saperne di più e le reti di collaborazione e co-citazione esistenti. Inoltre, i risultati dell'analisi dei contenuti mostrano la diversità delle metodologie, delle tecniche e delle risorse approvate per la loro efficacia nel migliorare la formazione, lo sviluppo professionale e gli effetti sulle prestazioni dei partecipanti. Con o senza tecnologia, le pratiche basate sull'evidenza, sono implementate in contesti diversi e con popolazioni diverse, come gli studenti con bisogni educativi speciali. Anche se predominano gli studi incentrati sulla formazione dei professionisti della salute.

Parole chiave: pratiche evidence-based, bibliometria, analisi dei contenuti, analisi dell'evoluzione tematica.

1. Introduction

One of the great concerns linked to educational action is to find the way in which the methodological proposals are well founded, the resources used are relevant, the contextual variables favour the process and that the combination of all of these can result in an effective teaching and learning process.

In this process of reflection, inherent to the teaching role performance itself, evaluating one's own practice, as well as that of others, offers a fundamental opportunity to explore good practices that can guide decision-making on how to design and implement different proposals.

Evidence-Based Practice (EBP) provides a response to this process, as it makes it possible to identify strategies, behaviours, or guidelines that have been validated and that, therefore, turn them into proposals that can be used or adapted with greater prospects of success (Hederich et al., 2014; Sánchez-Martín, 2022). This approach aims to go beyond trends, attempting to systematise and give solidity to issues that, objectively, have given good results.

Traditionally, this proposal has been strongly based on health areas (Rodríguez-Soberado et al., 2023; Ruzafa-Martínez et al., 2016). However, other disciplines, such as social work (Rivera-Suazo and Ramos, 2017), sports science (Yaman, 2020), the environment (Carvajal et al., 2022), psychology (Borrueco et al., 2020) or education (Larraceta, 2018), are increasingly concerned with the identification of EBPs.

We must bear in mind, however, that both the design and the development of each training activity are subject to a series of variables that must necessarily be considered so that it responds to the needs that generate it. This is precisely one of the criticisms made of "evidence-based practice", considering that it focuses only on what works without investigating the reasons for it or considering the complexity of contextual or political variables (Biesta, 2010; Castañeda et al., 2020; Zhao, 2017).

From this perspective, this paper attempts to address, from a bibliometric and content-based perspective, the analysis of evidence-based practice in the field of education.

The bibliometric study aims to answer questions such as: how has the scientific production of this phenomenon evolved in recent years? Which authors have become a reference? In which disciplines and in which journals is it most common? What keywords are associated with its development? Which geographical contexts are most productive in terms of generating proposals?

Knowing that scientific publications are the safest forms of access to validated information in the most diverse areas of knowledge, it is logical to conclude that the dissemination of data contained in such documents can help both in reducing the gap between research and practice in approaching instructional proposals based on classroom evidence. Therefore, it is imperative to work towards systematizing publications in the EBPs area to facilitate the scientific dissemination of research with a more significant impact and reveal prominent results for application by teachers and researchers in the area.

Furthermore, although there are previous reviews considering evidence-based practices, none of them carry out the analysis of content and thematic evolution proposed in this research. Thus, we justify our efforts and the relevance of this research since we expand and update previous studies in temporal terms, as well as carry out a robust and summarized content analysis, facilitating the applicability of the proposals found and,

ultimately, identifying gaps for developing possible innovations or new research proposals.

On the other hand, the content analysis aims to find out, specifically, what methodologies, resources, and materials have proven to be beneficial for the design of training actions, as well as what role agents can play in their implementation or what contextual variables can influence the effectiveness of educational practice.

To describe the procedure and results clearly, the methodology was structured by initially defining the delimitation of the sample, as well as the bibliometric and content analyses that were used; subsequently, in the results section, quantitative data related to bibliometrics will be presented, and, in sequence, qualitative data related to content analysis of the most cited articles in the area. Finally, the discussion and main conclusions found are shown.

2. Methodology

The bibliometric approach provides quantifiable data about scientific activity. It allows 1) measuring the production and dissemination rates of scientific knowledge, 2) processing of large amounts of information, 3) identifying prominent authors and institutions, as well as research gaps for proposing innovations in a study area (Huang et al., 2019; Pereira & Barbosa, 2020; Barbosa & Galembeck, 2022).

In addition to the bibliometric approach, the article proposes a qualitative content analysis of the most cited articles from the past twenty years.

To conduct the research, we choose the WoS database since it contains a multidisciplinary collection of journals with high visibility and relevance in the academic community, reaching an authority status in identifying high-quality journals globally (Birkle et al. 2020; Suela et al., 2021). It is worth mentioning that although the Scopus database covers a more significant number of journals, the WoS has a greater depth of scientific citations, considered more precise and accurate than other databases (Mongeon & Paul-Hus, 2016; Hudson, 2016). Thus, since one of our objectives is to conduct a content analysis of the most cited articles in the sample, the choice of the database was also based on this objective.

2.1. Data Survey and sample delimitation

The first phase of this study consisted of establishing the search equation. The following descriptors were used to find the publications: 1) "evidence-based practice," 2) "education, "3) "teaching," and 4) "learning."

Regarding the search period, publications from 1945 (the first year available in the database) until May 2023 were searched and selected according to the following inclusion criteria: 1) only articles, reviews, early access, and proceeding papers, excluding letters, editorials, and book chapters; and 2) only publications included in categories related to education in the database, which were: education of scientific disciplines, education and educational research, special education, and educational psychology.

It should be noted that: (1) all publications without time filter were selected; and (2) the search was performed using the advanced search tool, so the addition of the abbreviation "TS" (topics) before the formula indicates that the descriptors can be found in the title, abstract or keywords of the article. Given the above, this was the used formula: TS = (("evidence-based practice*") AND (education OR teaching OR learning)).

2.2. Data Analysis

2.2.1. Bibliometrics

Once we had the files, we began the analysis using RStudio, version 4.1.3, with the bibliometrics package, a versatile and practical tool for bibliometric mappings (Aria & Cuccurullo, 2017). The data analysis made it possible to identify the most relevant journals, authors, and publications - based on the number of citations received - as well as affiliations, countries, and collaboration and co-citation networks.

Regarding historiographical networks, these perform a chronological tracking of the most prominent research, allowing the visualization of the publications that contributed to the development of the field, as well as the direct citation links between them (Batistič & Van Der Laken, 2019). These networks allow us to check which papers originated or inspired others and whether the conclusions of both remain the same or have changed over time, i.e., whether there are contradictions in the results. Thus, historiographical networks will be structured using the software, considering the most cited references by articles in the sample.

We also point out three thematic evolution maps, showing the area's niche themes, basic themes, emerging or declining themes, and possible motor themes in three periods: until 2000, until 2010, and until 2020. The thematic evolution maps, which include these different types of themes, are a visual representation of how research topics and areas of interest change over time within a specific field or discipline. They help researchers and practitioners to identify emerging trends, shifts in focus, and areas that require further exploration or investigation. In our case, these maps were made through the software RStudio, using the Walktrap Clustering Algorithm.

The Walktrap clustering algorithm is a method used for community detection in complex networks. It is based on the concept of walks within the network to identify communities or clusters of closely connected nodes. As the walks are executed, the algorithm tracks how often two nodes co-occur within the identical random walk sequences. This information is used to construct a similarity matrix used for hierarchical clustering. Nodes within the same community have higher similarity values. The advantages of the Walktrap algorithm include its ability to detect communities of varying sizes and its resilience to noise in the data, also it is consistently among the most accurate and least biased overall (Yang et al., 2016).

To clarify, niche themes refer to specific or specialized topics that have a limited scope or appeal within the broader research domain. These themes are often focused on a particular subfield or methodology and may arise from emerging areas of research or from the exploration of unconventional or less-explored topics.

Emerging themes and decline themes are shown in the same graph quadrant. Emerging are those themes gaining prominence and attention within the research community. They are often associated with the latest trends, developments, or emerging challenges within a field. On the other hand, decline themes are those that have lost prominence over time and are receiving less attention compared to previous periods. These themes might be related to outdated theories, obsolete technologies, or areas that have been extensively explored and are now considered less relevant.

Motor Themes, in turn, are central or core topics that drive research activities and influence the direction of the field. They often represent fundamental concepts, theories, or areas of study that are widely recognized and significantly impact the advancement of knowledge within the field.

Basic themes, also known as foundational themes, are fundamental concepts or principles that underpin a specific research domain. These themes encompass core ideas, theories, or methodologies that are considered essential for understanding and conducting research in the field.

Also, to further identify the most addressed themes, we analyzed the frequencies of words in titles and keywords of the total sample. This analysis provided more objectivity in identifying the contents of the papers (Pollack; Adler, 2015). Thus, as for the analyses of the total sample main themes, the trending topics or most frequent terms in titles, keywords, and keywords plus were surveyed and discussed.

2.2.2. Content analysis of the most cited articles

The last step will consist of a content analysis. A flowchart summarising all the methodology steps is available in Figure 1.

The content analysis is carried out from a qualitative research approach with an interpretative and non-experimental design (Vain, 2012) since the aim is to understand reality from the narratives, visions, and meanings given by the participants and the researchers. In this case, the authors of other research reinterpret and reconstruct their reality as a basis for generating knowledge (Gibbs, 2012). Therefore, the results of this research are shaped by studies that collect polyphonic voices that weave together to form evidence from practice. The choice of this approach stems from the intention to look at the topic under study in its complexity and breadth.

The research design combines narrative enquiry as a methodology for collecting information with critical discourse analysis for the subsequent interpretation.

In order to identify the teaching methods with the highest impact, we selected the 100 most cited articles. For the interpretation, the selected texts were subjected to an exhaustive reading by two researchers, to carry out the coding based on their semantic content and the study's objective. In addition, Cohen's Kappa was calculated to measure the level of inter-judge agreement in the assignment of documents to each category, thus ensuring a high degree of agreement in the validation of the process. The content analysis process was inductive, with categories emerging in a three-phase process (Mejía, 2011): 1) reading and identification of ideas and codes, 2) descriptive analysis and grouping of

codes into categories, and 3) interpretation and elaboration of the final analysis of the categories.
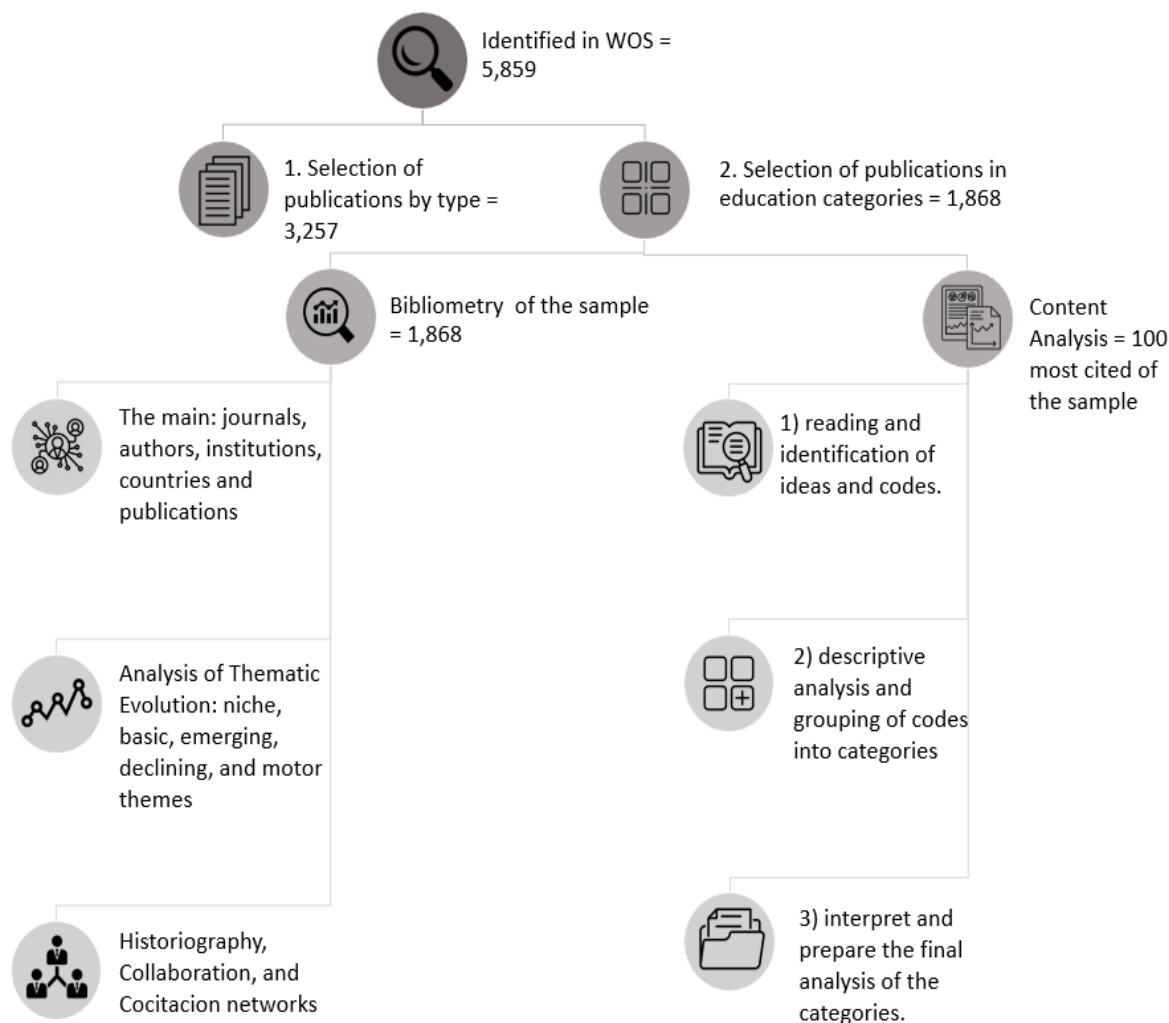

Figure 1. Summary of each stage of the research methodology development.

To develop the analysis, according to Miles et al. (2014), double-entry matrices were used in which, based on a table designed ad hoc, a series of variables were used to interrelate and group the information extracted from the documents.

After a first reading of the summaries of the documents, the main themes mentioned in each of the articles were coded and grouped into broader categories that finally correspond to the categories of this analysis. The categories were emerged from the content of the documents themselves.

Four main categories have emerged from the 100 primary documents, among which we distinguish: 1) attention to diversity, which encompasses all those evidence-based

practices focused on the development of learners with special educational needs of any kind, and most especially on ASD; 2) technology-mediated learning, which includes those documents that employ digital, interactive or networked media in relation to EBPs; 3) professional development, which includes articles focusing on initial and in-service training based on effective practices and pedagogical models, as well as mechanisms for professional collaboration; and 4) performance-enhancing practices, which includes papers on effective teaching and learning strategies and assessment techniques in different contexts and at different stages.

3. Results

3.1 Growth of research in the area and key stakeholders

With the search, we found 1,868 documents published in 364 sources. As shown in Figure 2, the documents were published over 28 years; in other words, the research field is recent since the first publication registered in the database is from 1995, and the document's average age is less than seven years.

The two years with the highest production of this theme occurred in 2021 and 2022, with 178 and 182 publications, respectively.
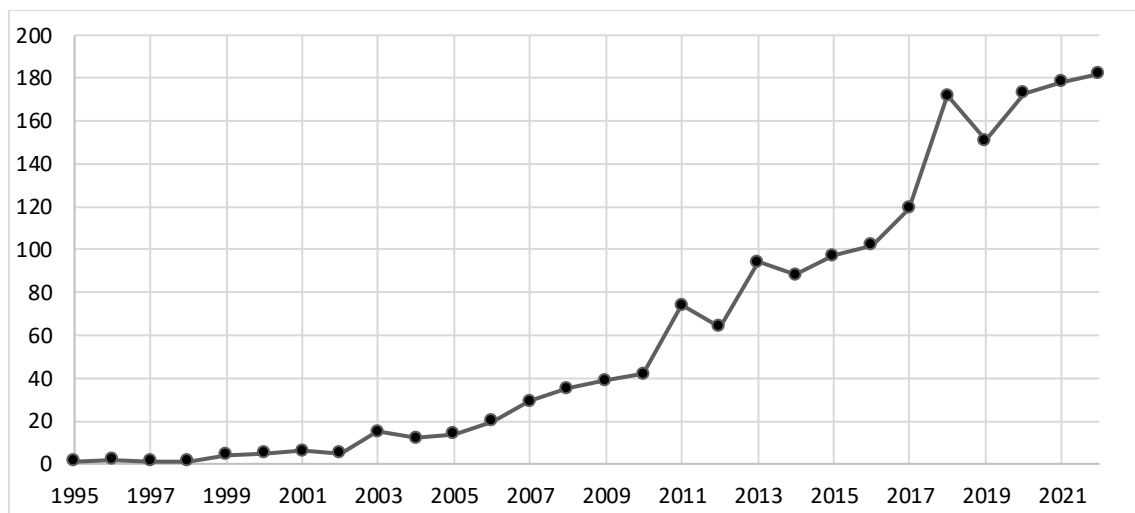

Figure 2. Annual production in evidence-based practice in education from 1995 to 2022.

Regarding the most relevant journals, from the 364 sources found, the 10 with the largest number of publications are mentioned in Table 1. Together they hold almost 30% of the total number of articles found in the research. If we only consider the number of publications, the journal Nurse Education Today would be the most relevant in the area. However, when taking into consideration the impact factor of the journals, the two journals that stand out are Exceptional Children and BMC Medical Education.

Table 1.

The top 10 journals according to the volume of publications, their h-index, and impact factor.

Journals	Number of Articles	Impact Factor
Nurse Education Today	119	2.499
BMC Medical Education	87	2.667
Remedial and Special Education	62	2.3
Intervention in School and Clinic	49	1.026
Journal of Social Work Education	43	1.613
Focus on Autism and Other Developmental Disabilities	41	1.450
Psychology in the Schools	33	1.552
Topics in Early Childhood Special Education	33	2.036
Journal of Continuing Education in the Health Professions	31	2.019
Exceptional Children	30	3.670

As for the authors, 5,372 were found, with an average of 3.58 co-authors per document. Thus, only 193 are authors of single-authored documents. Described in Figure 3 are the ten researchers with the highest number of published papers. The authors with more publications in the area are Bryan Cook (22), from the University of Virginia in the United States, and Matthew Brock (18), from Ohio State University.
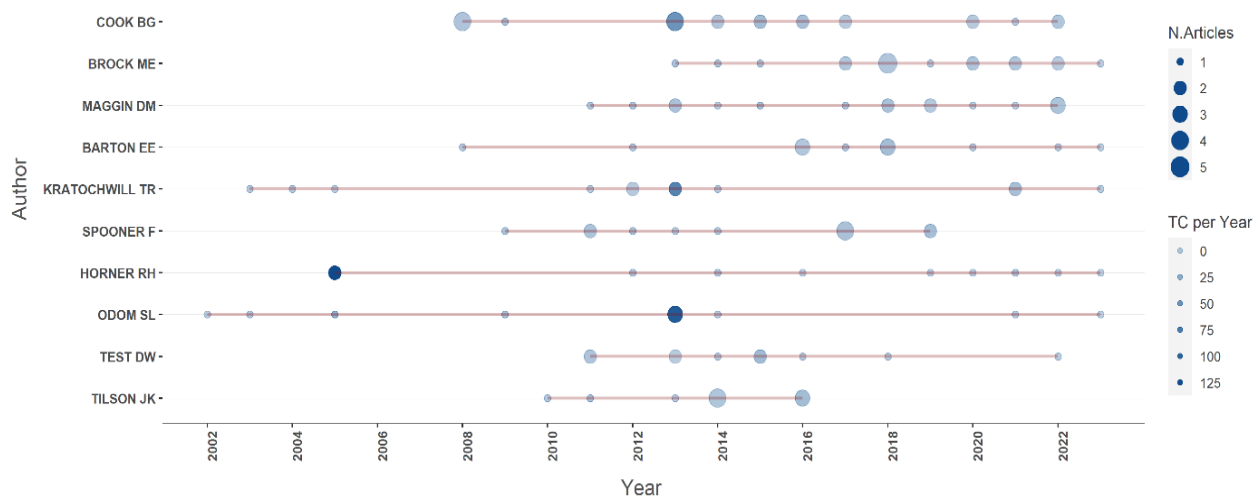

Figure 3. Scientific production of the 10 authors who published the most over the analyzed period. The circles' size indicates the volume of publications, and the color intensity indicates its impact, i.e., the darker the color, the higher the number of citations.

Regarding affiliations, 25 universities have researchers involved in the publications of papers in the area, three of them from Australia, one from Canada, and all the others from the United States. The University of North Carolina (USA) has the highest number of publications (136). The University of Kansas (USA) is the second one, with 116 articles. It is possible to notice that the publications in the area are still concentrated in a select

group of institutions and authors, especially in the United States, which may limit the dissemination and application of the practices in other locations and contexts, such as emerging countries.

Given the above, naturally, the United States is the country with the highest production on the subject, with 1,173 publications, followed by Australia (149), the United Kingdom (133), Canada (89), Spain (29), Germany (27), Turkey (26), China (23), Ireland (16), and Norway (14). Figure 4 shows these and other countries with at least one publication in the area during the analyzed period.

Although the United States emerges as the country with the highest number of publications, regarding international cooperation, only 5.6% of the research carried out by American authors has the participation of researchers from other countries. Among the ten countries that publish the most, Ireland leads the ranking with the most significant international cooperation, with 38% of its publications having the participation of foreign researchers, followed by China (34%), Norway (29%), Australia (24%), Germany (22%), Canada (15%), Spain (14%), Turkey (12%) and the United Kingdom (11%).
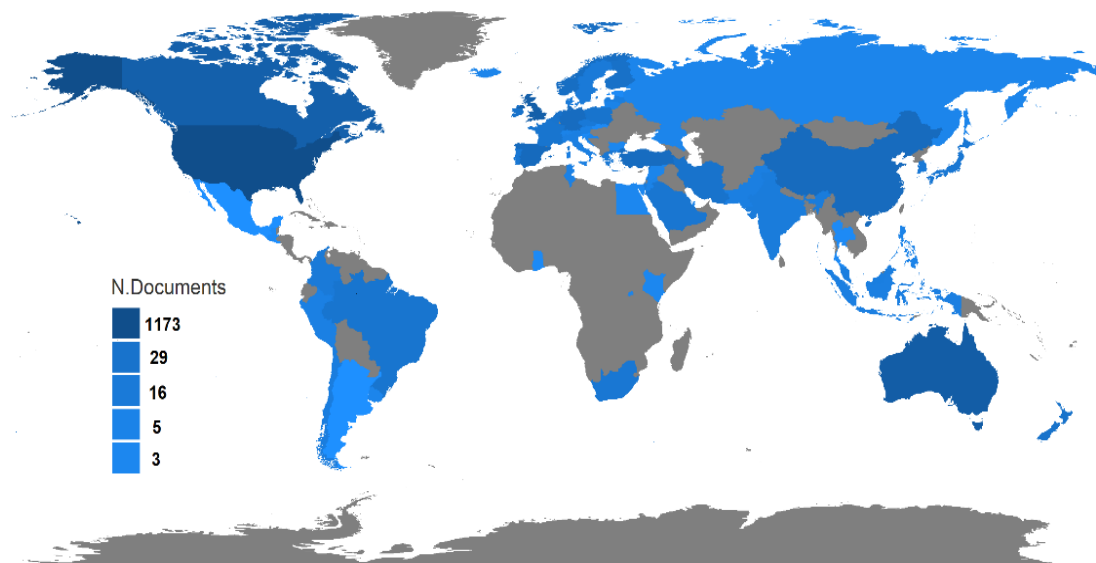

Figure 4. Countries that have published at least one article over the analyzed period. The United States and Australia are at the top in publishing.

3.2 Collaboration and co-citation networks

Figure 5 shows the collaboration networks among authors with at least two collaborations, considering all the years of our search. These criteria revealed 47 authors. In the figure, the size of the node represents the number of publications associated with that author. Larger nodes indicate higher productivity. Links between nodes represent co-authorship relationships. The thicker the link, the more co-authored publications exist between the connected nodes.

Analyzing the largest cluster in Figure 5, the blue one, it is possible to identify 18 authors in collaboration. This network especially covers authors from universities in the United States. Bryan Cook again stands out in the center of the largest cluster, revealing that, in addition to being the author with the highest number of publications, he has the most connections in the area. This fact may seem like a natural conclusion. However, many authors have high productivity rates, such as Matthew Brock, who is second in the number of publications, but has fewer connections, as seen in the green cluster.

Regarding the most robust connections in the blue cluster, the most current publications are two articles with Bryan Cook as the first author (Cook et al., 2020; Cook et al., 2015). The first provides an overview of one set of evidence standards used in special education and describes important caveats and considerations related to evidence-based reviews. The authors conclude that evidence-based reviews are a trustworthy approach for identifying generally effective instructional practices but reinforce that no practices, not even evidence-based practices, are effective for all learners (Cook et al., 2020).
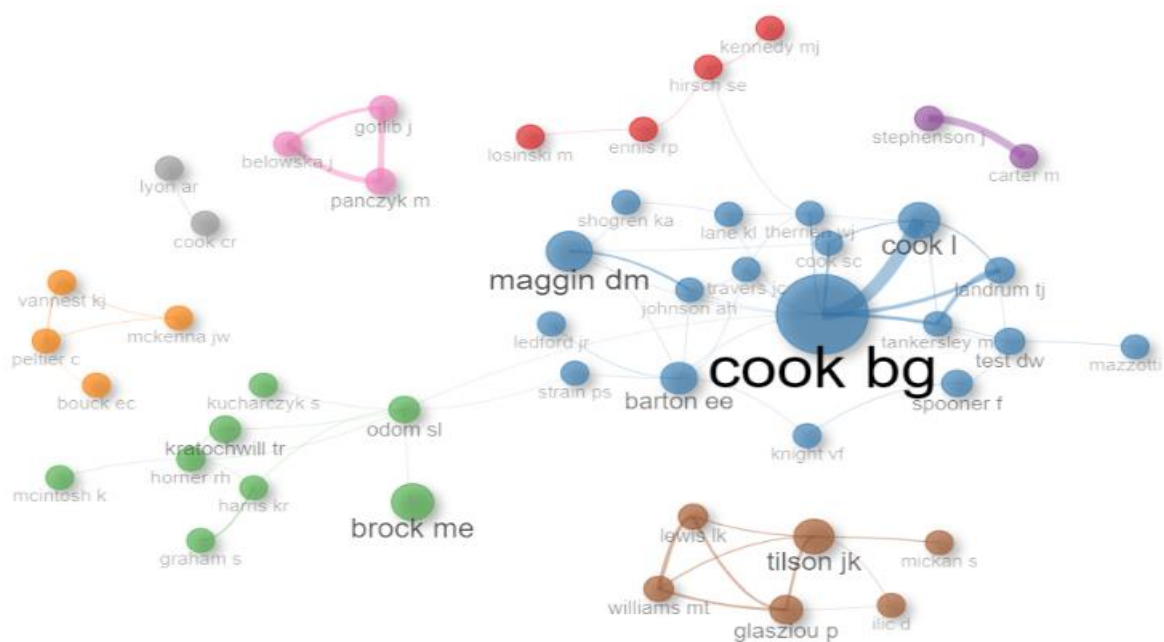

Figure 5. Collaborations network among the most relevant authors, with at least two collaborations.

The second paper highlights the need for clarity regarding evidence-based practices' meaning and potential applications in special education (Cook et al., 2015). It points out that rather than changing the nature of teaching or limiting teachers to following prescribed methods, some efforts should be made to prioritize evidence-based practices that allow teachers to maximize the impact of their instructional efforts (Cook et al., 2015). In summary, the focus of the research group appears to be centered on how EBP are systematically identified and some practical considerations in special education EBPs.

Despite being smaller, the pink and purple clusters present authors with strong publication relationships with each other. The pink cluster's authors are from the Medical University of Warsaw in Poland. The most current article published by this cluster describes the difficulties in using EBP in clinical practice in the Polish nursing care system (Belowska et al., 2020). In general, the research of this group of authors focuses on emphasizing that a life-long updating of knowledge in EBP by participating in various forms of postgraduate education can improve nurses' knowledge, behaviors, and attitudes in creating a favorable EBP profile.

In the case of the purple cluster, the authors are from Macquarie University Special Education Centre in Australia. In the most current article published by the group (Carter et al., 2015), final-year teacher education students were surveyed on their understanding of the strength of evidence for 14 instructional strategies and their intended frequency of use of the strategies following graduation. They were also asked to rate the critical factors in instructional decision-making. Empirical evidence was crucial in selecting instructional practices, but personal preference and practicum experiences were considered more important. General topics of interest to this research group include educational issues in autism spectrum disorder, evidence-based practice in special education, controversial practices, alternative and augmentative communication, and teacher education.

Despite being only the third largest, the brown cluster has stronger connections than the second. This cluster also contains authors from Australia, Canada, and the United States, representing a solid international collaboration in the field. The group's most recent article proposes developing and validating the guideline for reporting EBP educational interventions and teaching (Phillips et al., 2016). Some of the main topics of interest to the group's researchers are EBP in physiotherapy practice, especially in acute care, integrating scientific research, clinical expertise, and patient perspectives into clinical decision-making, as well as identifying and removing the barriers to using high-quality research in everyday clinical practice.

Figure 6 indicates the co-citation networks in the area. Through them, it is possible to identify the studies and authors who form the knowledge base in the area, and even possible lines of more consolidated research (Castanha; Bufrem; Bochi, 2020).
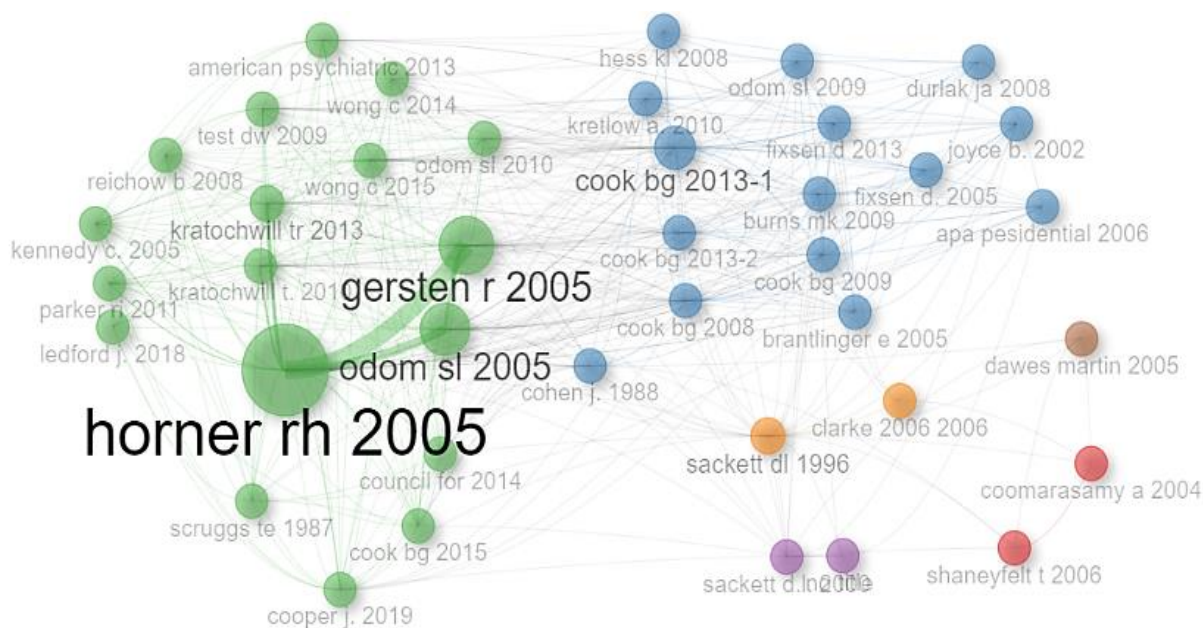

Figure 6. Co-citation networks considering the 40 most cited documents in the references of this research sample. The circles' size indicates the number of times the document was cited, and the lines indicate their co-citation relationship.

Two clusters stand out in the image. In the green cluster, three papers are the most cited. The first is the article by Horner et al. (2005), in which the authors present criteria for defining whether a practice will be identified as evidence-based in single-subject research. Given the relevance that evidence-based practices have begun to acquire in Special Education, the article reveals early efforts directed toward obtaining parameters to define such practices.

The second most cited article in the cluster is from Gersten et al. (2005). The authors proposed a three-tiered classification, organizing the proposals into evidence-based, promising, and non-evidence-based. The third most cited article sets the context for the development of research quality indicators for evidence of effective practices provided by different methodologies (Odom et al. 2005). The foundation of the research is the fact that the current conceptualization of scientific research in education and the complexity of conducting research in special education settings demand the development of quality indicators.

Cook & Odom (2013) have the most cited and centralized paper in the blue cluster. In it, the authors state that establishing a process to identify EBP in EE was a significant advance for the field, as it allowed the structuring of more effective educational programs with more objective results for students with disabilities. However, the same authors reinforce that 1) just because a practice is not considered an EBP does not necessarily

mean it is ineffective, and 2) not all EBPs will work for all students in the same way; it is necessary to consider the context and individuals involved.

Other cluster papers reinforce that the gap between research and application in the classroom remains, despite the systematic identification of evidence-based practices and that identification alone is insufficient; it is necessary to work actively for implementation and support for its use in the classroom (Odom, 2009; Burns & Ysseldyke, 2009).

3.3 Historiographical networks

Figure 7 shows the historiographical networks found in the sample. Regarding the red network, the articles that compose it are concerned with the widespread adoption of EBP in professional education, especially in the health area, a fact that requires valid and reliable measures for learning verification (Johnston et al., 2003; Ruzafa-Martínez et al., 2013; Tilson, 2010). However, the authors present that limited tools exist, and thus there is a need to provide guidance and develop validated instruments for assessing EBP learning. In other words, most of the articles in the network are focused on developing, validating, or evaluating these instruments.

For example, Tilson et al. (2011) is the most cited article in the red historiography network and identifies fundamental principles for creating evidence-based practice learning assessment tools. In the article, the authors recommend a common taxonomy for new and existing tools and present the Classification Rubric for EBP Assessment Tools in Education structure to classify them.
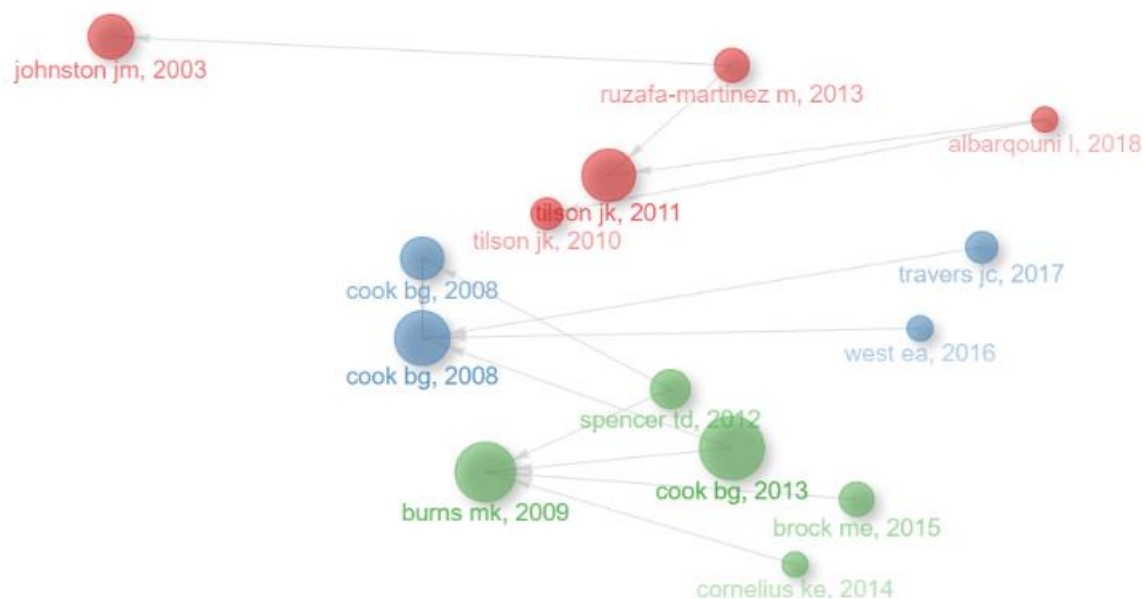

Figure 7. Historiographical networks found in the sample.

In the same network, the study conducted by Johnston and collaborators (2003) describes the development and validation of a knowledge, attitude, and behaviour questionnaire

designed to assess the teaching and learning of Evidence-Based Practice in an undergraduate medical curriculum. Along the same line, the work of Ruzafa-Martínez and collaborators (2013) also mentions the development and validation of a questionnaire on competency in evidence-based practice, but with nursing students as the target audience.

Tilson (2010), in turn, follows the same argument of the other articles that served as a basis by stating that health educators need valid and reliable tools to assess knowledge and skills of evidence-based practice. However, they present that these instruments still need to be developed among physical therapists. The study aimed to develop and validate a specific test, called the Fresno test, modified to assess knowledge and skills of evidence-based practice more relevant to the practice of physiotherapists. The modified test was a valid and reliable assessment of physiotherapists' knowledge and skills of evidence-based practice.

Despite many efforts being directed in the same direction, the most current paper in the network, written by Albarqouni et al. (2018), reveals through a literature review that the evidence on how best to teach and assess EBP remains weak.

Concerning the green historiographical network, the articles are directed towards defining EBPs in special education, differentiating the term from other related ones, as well as presenting recommendations to facilitate the understanding and application of EBPs by teachers who are working with special education (Cook & Cook, 2013; Burns & Ysseldyke, 2009). They also point to a gap between research and classroom practice, given that many practices with little empirical support continue to be applied by teachers (Burns & Ysseldyke, 2009; Brock & Carter, 2015).

The most cited work in the network is that of Cook & Cook (2013). In it, the authors: 1) define EBPs and discuss how they are identified; 2) discuss the importance of clear understanding and communication about EBPs and what works in special education; 3) differentiate EBP from related terms such as research-based, best, and recommended practice; 4) consider the scope of EBPs; and finally, 5) present relevant caveats related to EBPs.

In the second most cited article in the network, Burns & Ysseldyke (2009) examined the frequency with which evidence-based practices are used in the education of students with disabilities. Although some EBPs are applied regularly, some practices with little empirical support are used somewhat frequently, and special education teachers reported using ineffective approaches as frequently as approaches with a solid research base.

The most current article in the network is that of Brock & Carter (2015). In it, the authors state that most professionals working in special education need more training in evidence-based instructional strategies, meaning that the scenario continues to demand research efforts, especially given that the number of students with special educational needs has increased over the past few years. Thus, the authors focus on professional training and offer recommendations to refine opportunities for effective professional development further.

About the blue historiographical network, papers are focused on identifying what evidence-based practices are, what cannot be defined as such, i.e., ineffective, and pseudoscientific practices, as well as the importance of adapting EBPs to students' needs and contexts (Cook et al., 2008a; Cook et al. 2008b).

The most cited work in the network is that of Cook et al. (2008). In it, the authors state that one of the main principles of the Individuals with Disabilities Education Act and the No Child Left Behind Act, both US laws, is the identification and use of instructional techniques that research shows are most likely to improve student outcomes significantly. They point out the need for clarification regarding the meaning and possible applications of such practices in special education. Thus, the authors highlight the need to prioritize applying evidence-based practices, which will allow teachers to maximize the impact of their instructional efforts while clarifying how and when they can be employed.

The second most cited paper, which has also given rise to others on the web, is that of Cook et al. (2008a) and brings to the centre of the discussion the fact that the identification of evidence-based practices is only the beginning of the process of implementing evidence-based special education. The authors present three aspects that special educators will need to apply their professional wisdom to accomplish: (a) selecting and adapting evidence-based practices to the needs and learning goals of their students and teaching environments; (b) evaluating the effects of the practices; and (c) integrating effective teaching techniques into the application of these practices.

The most current blue net paper is that of Travers (2017). Like the most current green net paper (Brock & Carter, 2015), the author points out that despite being charged with using evidence-based practices, many special education professionals still use several unproven, disproven, and pseudoscientific interventions. Rather than identifying EBP, the article aims to improve recognition of potentially ineffective interventions by shedding light on aspects of science, pseudoscience, and some mistakes often made in evaluating claims of intervention effectiveness.

3.4   Thematic evolution and word frequency of the global sample

Analyzing the terms in Table 2 makes it possible to identify that the research is centered on special education. In particular, children with autism seem to be the focus of much of the research. Nursing students are also a highly represented audience, which is to be expected since the journal with the most significant number of articles in the area is Nurse Education Today.

Professional development is often highlighted in the works. Another relevant aspect is the use of methodologies such as meta-analysis and systematic review, which are also frequent in the texts.

Table 2.

The most frequent words in the abstracts, in the author's keywords, and in the keywords-plus. We removed from the table the descriptors used in the search, such as evidence-

based practice, education, teaching, and learning, since they are naturally common terms.

Abstract	Freq.	Keywords	Freq.	Keywords-Plus	Freq.
Special Education	317	Autism	127	Children	258
Professional Development	208	Professional Development	58	Knowledge	151
Future Research	186	Intervention	55	Implementation	150
Autism Spectrum	159	Special Education	44	Intervention*	269
Nursing Students	141	Research	41	Instruction	128
Mental Health	130	Assessment	40	Skills	127
Health Care	127	Inclusion	38	Special-Education	102
Systematic Review	106	Training	38	Metanalysis	96
Spectrum Disorder	102	Implementation	37	Behaviour	89
Clinical Practice	100	Disabilities	36	Impact	84

Although word frequency analysis offers insight into the most frequent themes, it is essential to verify whether these themes are present in current research or are part of already saturated and declining themes in the area. Emerging and driving themes may indicate paths for new research proposals since it helps researchers and practitioners to identify emerging trends, shifts in focus, and areas that require further exploration or investigation. In this sense, Figures 8, 9, and 10 indicate the result of the analysis of thematic evolution in three periods: until 2000, 2001 - 2010, and 2011 - 2020.

The chart in Figure 8 allows us to identify that nurses' clinical competence was among the emerging themes at the beginning of the research. As seen in the frequency of words, nursing students appear much more in publications, so this theme began to rise during this period.

The niche themes of this period that refer to a specific or specialized topic are "educational stuttering treatment", "treatment outcome", and "professional competence". As is expected in this region of the graph, those topics have a limited scope or appeal within the broader research domain.
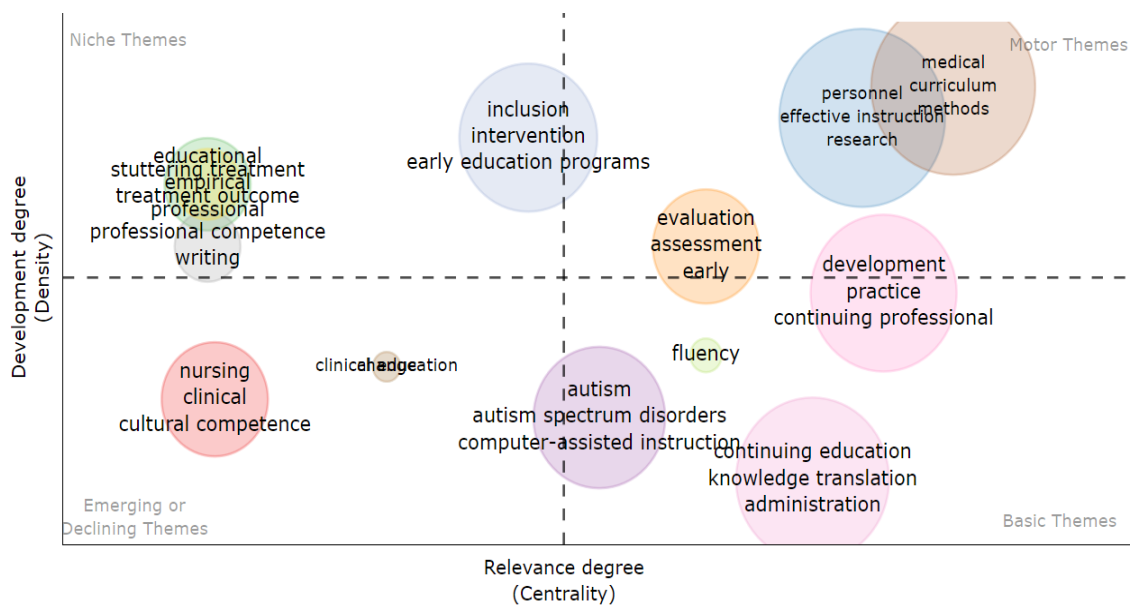
Figure 8. Thematic evolution map of all the publication years until 2000.

In this same quadrant, but migrating to the center, it is possible to find the terms "inclusion", "intervention", and "early education programs". This movement is joint in research because niche themes may arise from emerging research areas or from exploring unconventional or less-explored topics. Knowing that evidence-based practices emerge in the health area and only after a while migrate to the field of education, it is natural that the theme occupies this position. It is also important to note that, in terms of relevance and centrality, the topics of inclusive education and autism were closer to the center until then.

Motor themes provide a solid foundation for further research and can shape the overall trajectory of a research area. In this specific period, the motor themes "medical curriculum", "effective instruction", "assessment methods", and "professional development", are the main ones. They seem to reveal a concern in training physicians to routinely use evidence-based practices, which should also be imported into the teacher training field. In addition, they reveal a concern to evaluate whether knowledge has been effectively learned and to invest in constant professional development.

The undergraduate emerges as a potential research target in the second slice of time (Figure 9). The niche themes are focused on two subfields, writing engagement methods and the implementation of Positive Behavior Interventions and Supports (PBIS). Disabilities and early intervention, in turn, are centralized, suggesting high relevance at this point of the research period. Nursing education, practice assessment, and autism migrate to basic themes.
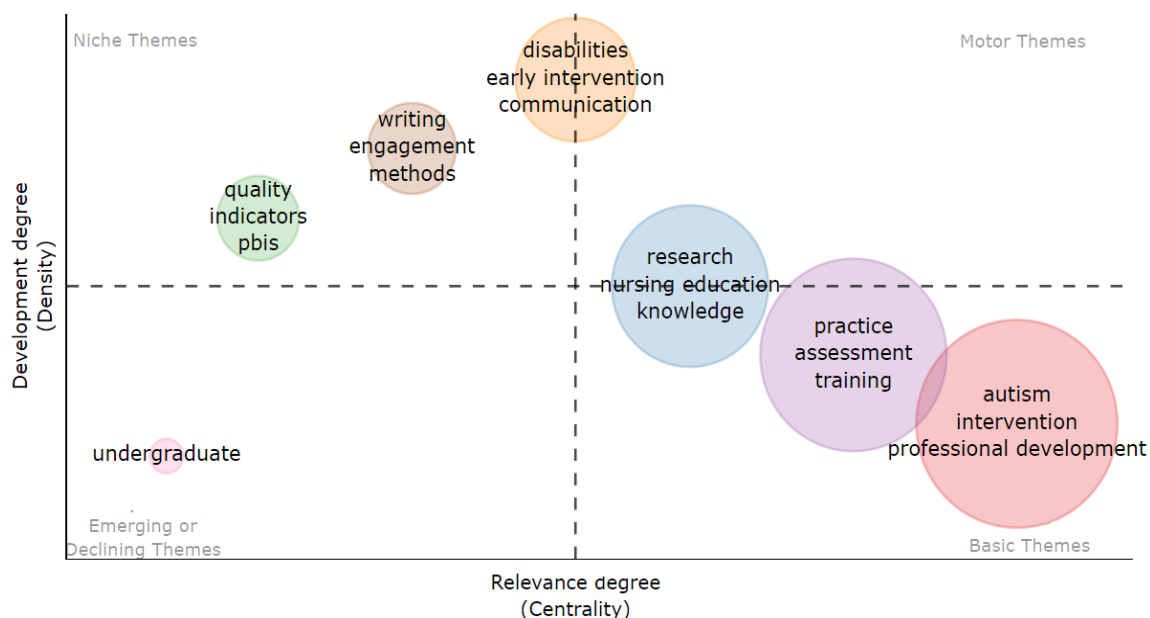
Figure 9. Thematic evolution map of all the publication years from 2001 until 2010.

Knowing that the number of children with autism grows yearly, especially in the United States, the country with the most research in our sample, it is natural that the topic becomes a foundational theme, underpinning a specific research domain. Thus, the theme is until now considered essential and timeless in evidence-based practice educational areas. This can be seen in the graph in Figure 10, as studies related to autism remain as basic themes.
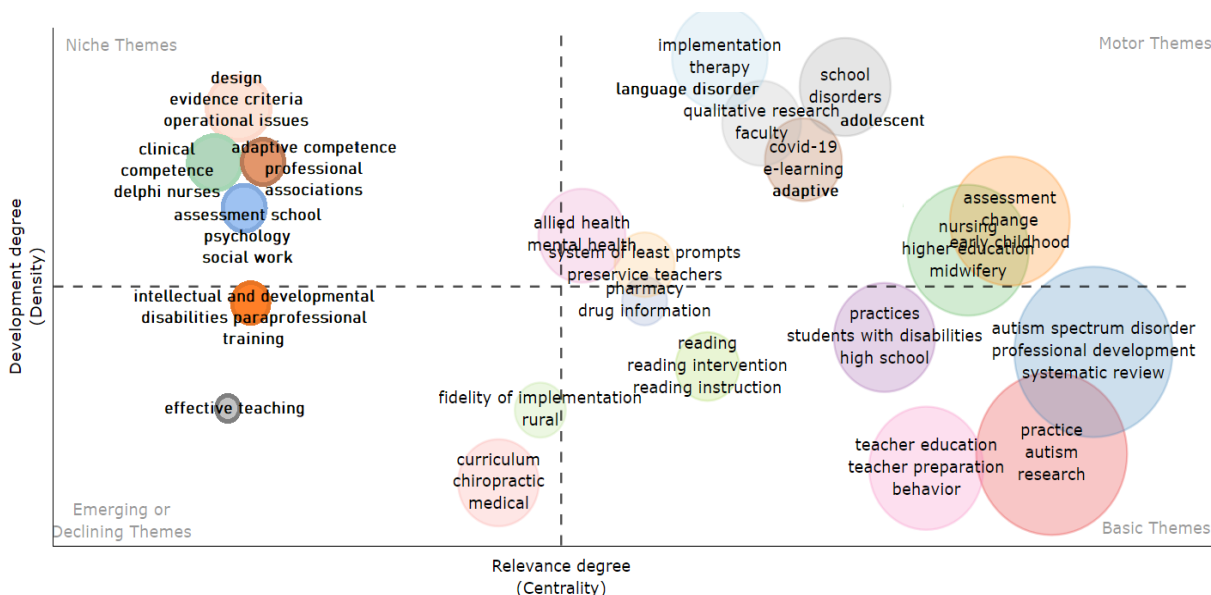

Figure 10. Thematic evolution map of all the publication years from 2011 until 2020.

Teacher training also emerges as a basic theme today. It is possible to verify that there is a recurring concern with using evidence-based practices in the classroom, not only with

students with special needs but with all students. A particular focus seems to be given to high school students.

Another relevant target audience is higher education, particularly nursing graduation, which appears in the quadrant of motor themes. Teachers in initial training appear with much centrality and are also included in motor themes. In addition, topics related to qualitative research, covid-19, e-learning, and adaptive teaching also point out as core topics that will drive field research activities in the next few years.

3.5 Content analysis of the most cited publications in the area

Of the total number of documents selected and included in the bibliometric study, the 100 articles with the most citations were prioritised for the content analysis. The articles were grouped into four categories of analysis that emerged after independent reading by the researchers.

3.5.1 Attention to diversity

The central category, which accumulated the largest number of documents, focuses on attention to diversity.

On the one hand, a global deficit-based approach can be observed in works from the beginning of the 21st century, using terminology such as special education. The work of Horner et al. (2005) aims to analyse the contribution of single case studies to design interventions based on scientific evidence in this field. In the same monographic issue, Odom et al. (2005) discuss quality indicators for research in education with a special education population, concluding that methodologies vary according to the predominant research approach. Burns & Ysseldyke (2009) focus on the gap between research and practice in this field and conclude that the perception of teachers and counsellors coincides in pointing to direct instruction as the most frequently used methodology in special education. However, others that do not have scientific support are also pointed out. Almost a decade after the first studies mentioned above, Cook & Odom (2013) continue to support evidence-based practices in special education, concluding the effectiveness of reinforcement of positive behaviours.

On the other hand, other studies in this category focus specifically on students with specific educational support needs, i.e., those with special educational needs arising from disability, severe behavioural, communication, or language disorders; high abilities; late entry into the education system; socio-educational vulnerability; attention or learning disorders; maturational delay or lack of knowledge of the language of learning. Of these, a considerable number of articles focus on students with Autism Spectrum Disorder (ASD). An example of this is the work of Stahmer et al. (2015) on the inclusion of students with ASD in community settings, concluding the need for teacher training and time to implement school-based interventions with fidelity based on correcting errors, improving attention, and establishing routines. Another example is the work of Lerman et al. (2004), which describes the training of teachers to assess preferences and implement direct and incidental teaching, whose classroom practice had results on student learning and communication.

Nevertheless, it is not only papers focusing on ASD that have been found. Other researchers, such as Browder et al. (2006), have focused on students with intellectual disabilities, analysing the teaching/learning process of reading by using frequent words with visual support, favoring the literacy process. Like Chard et al. (2009), the focus was on reading, but in this case, the sample was composed of students with learning difficulties, concluding the effectiveness of repeated reading.

Figure 11 summarises the key aspects of this category of content analysis.
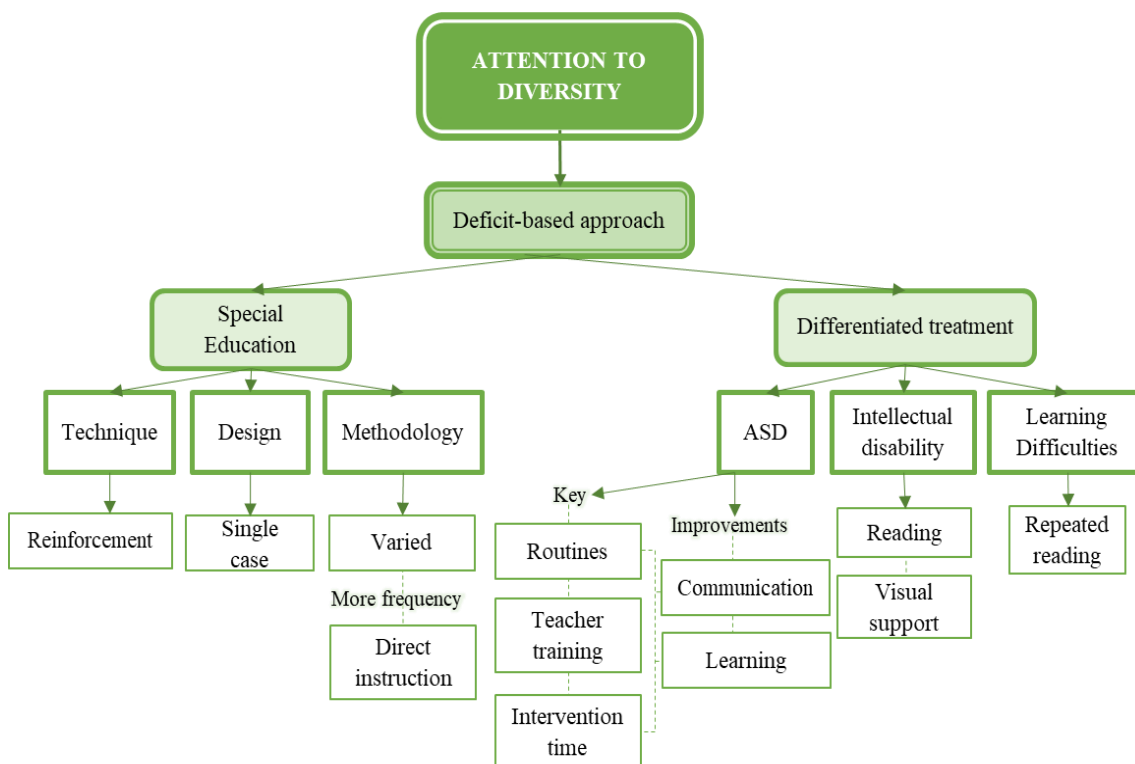

Figure 11. Attention to diversity category. Source: own elaboration.

3.5.2 Technology-mediated learning

The second emerging category is the role of technology as a mediator of learning, with studies concentrating on samples made up of parents, health professionals, or students in this branch of knowledge or mainly used in attention to diversity.

Most of the papers in this category are literature reviews and meta-analyses in which practice-based evidence is sought by comparing the findings of various studies.

On a general note, Hall & Bierman's (2015) work analyses the emergence of emerging technology-assisted practices for use by families of young children, including a review of work using websites, forums, videoconferencing systems or mobile applications, concluding the high potential of technologies to inform and intervene with families and improve parenting in early childhood, transcending geographical boundaries and promoting accessibility.

The work of Chan et al. (2020) aims to analyze how health personnel educators take advantage of social networks to improve knowledge. In this same area, Ladyshewsky & Gardner (2008) explored the possibilities of the blog as a resource to promote reflective practice, concluding the need for clear indications for its effective use and considerable group size to achieve learning through the interactions generated in the blog environment. Hegland et al. (2017) focused their attention on evaluating the effect of simulation training on nursing professionals. They concluded that the use of simulation training appears to be an effective strategy for skills improvement. Another example along the same lines as the previously mentioned studies is the work of Gorbanev et al. (2018). This paper aims to evaluate the effectiveness of serious games as teaching tools in the medical field and thus provide practical and functional guidelines for designers.

Specifically focused on attention to diversity, examples include the work of Shukla-Mehta et al. (2010), which analyses the potential of using videos for learning social and communication skills in students with ASD due to their visual component. Alternatively, Meadan et al. (2016), which analysed naturalistic teaching strategies carried out in the family context to improve the communication skills of students with ASD, concluded that using the Internet was critical to the fidelity of implementation and the effectiveness of the intervention.

Figure 12 shows the key themes that have emerged with regard to technology-mediated learning.
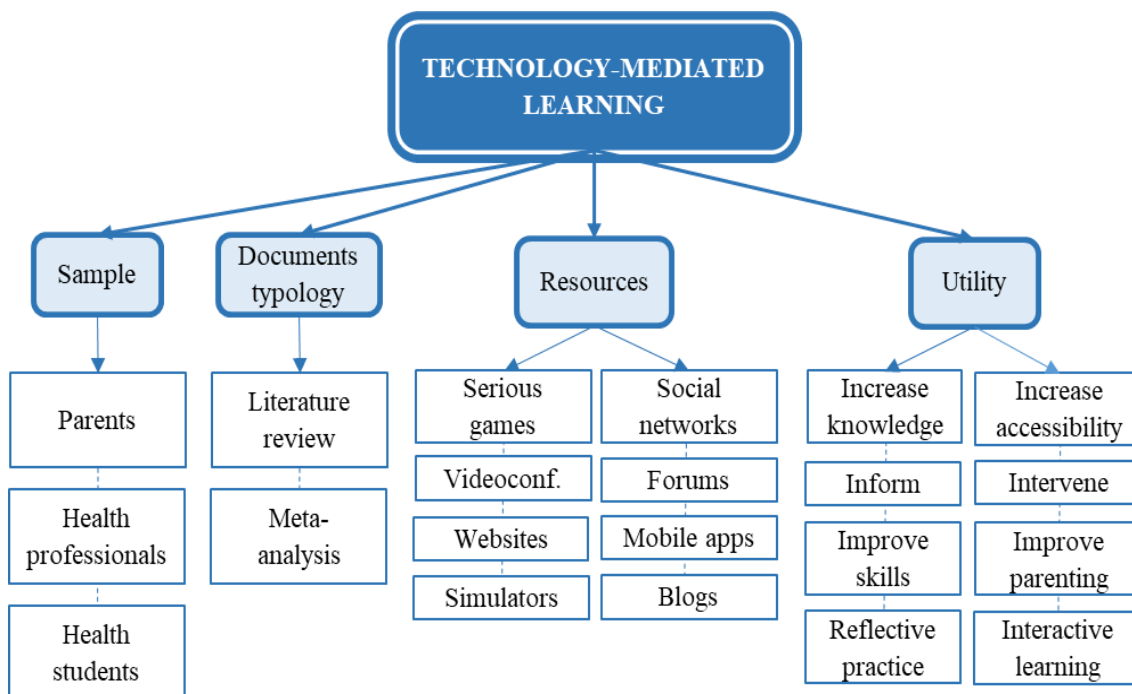

Figure 12. Technology-mediated learning category. Source: own elaboration.

3.5.3 Professional development

The third of the emerging categories in the resulting articles relates to professional development.

Evidence-based practice undoubtedly fosters the continuing professional development of teachers and many other professionals, who can access up-to-date research, use evidence to improve their practice, explore new pedagogical strategies, and collaborate with other professionals to share knowledge.

Some of the papers focus on initial and in-service training; in most cases, they are aimed at health-related groups. An example of this is the work of Holmboe et al. (2011), which proposes improvements in teacher training through pedagogical models based on the principles of competency-based medical education (CBME), or that of Hegland et al. (2017), which aims to evaluate the effect of simulation-based training in the continuing education of already qualified nursing staff. Its results seem positive, although more research is needed in this regard. Some also target other groups, such as engineering students. In this respect, the work of Atman et al. (2007) aims to detect training deficiencies in higher engineering studies through the analysis of the work practices of expert engineers, aiming to contribute to improving their initial training. Finally, others focus on educational staff, such as the work of Fox et al. (2011), which proposes the implementation of initial training based on the Teaching Pyramid Model so that future teachers contribute to the promotion of social competence in young children; or that of Urban (2008), which proposes a paradigm shift in the training of future teachers towards relational and systemic professionalism that fosters the dialogical co-construction of knowledge and professional practices.

In line with the last article, some research focuses on interprofessional collaboration and the creation of professional learning communities, such as the work of Zwarenstein and Reeves (2006), who, through interventions in training and collaboration between health professionals, aim to improve healthcare processes and, thus patient satisfaction. Similarly, Williams and Coles (2007) examine the extent to which teaching staff uses evidence-based practices by assessing how they consult research conducted by other professionals and use it in their daily practice and how its use could be increased and improved.

Finally, work such as that of Cooke et al. (2013) focuses specifically on the professional development of practicing Australian doctors in terms of burnout, satisfaction, and resilience, finding that 14% of doctors are at risk of experiencing burnout, resulting in low job satisfaction and poorer quality patient care.

Figure 13 shows the key issues that have emerged from the analysis of the Professional Development content.
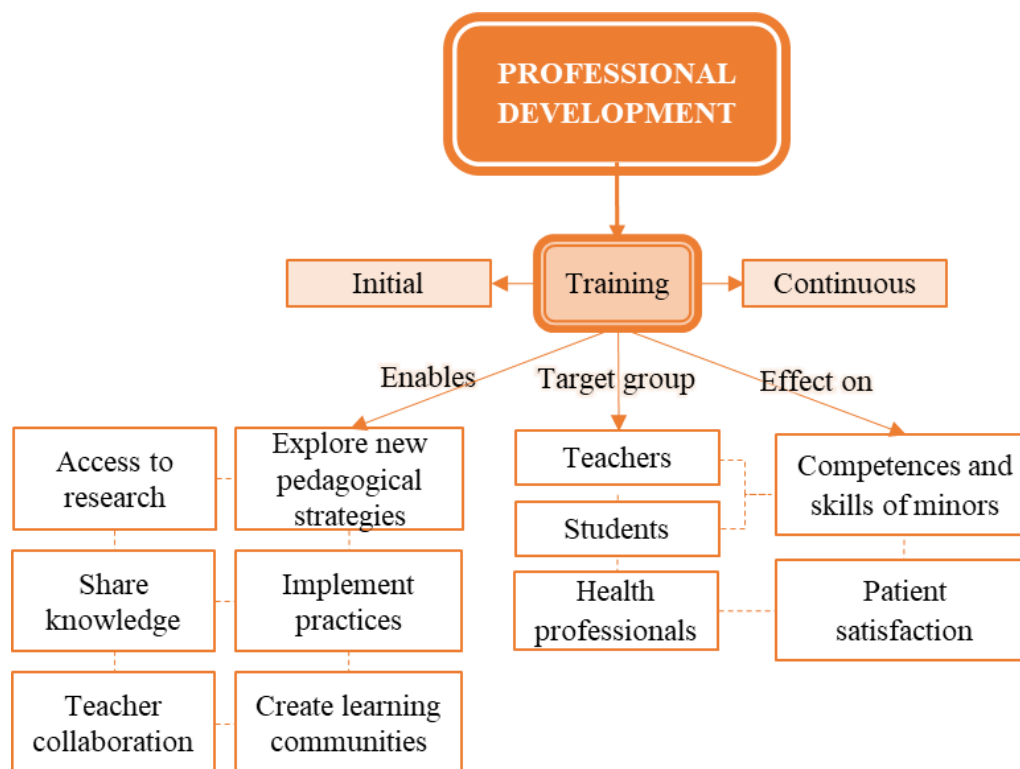
Figure 13. Professional Development category. Source: own elaboration.

3.5.4 Performance-enhancing practices

The fourth category that emerges from the search results relates to the different practices employed to improve academic achievement.

The implementation of evidence-based practices (EBP) in classrooms at different educational levels has often been associated with significant improvements in academic achievement in different areas. In this regard, most papers discuss or employ, in one way or another, effective teaching and learning strategies. However, some focus their attention on the analysis of the agents involved in them, and others on the assessment and feedback techniques used in EBPs.

In terms of educational strategies, support for positive student (Sugai & Horner, 2006) and teacher (Coffey & Horner, 2012) behaviour stands out as a good way to implement and maintain effective interventions. Intervention through mindfulness (Hwang et al., 2017), mathematical problem-solving from the analysis of its structure (Jitendra et al., 2005), interactive and application-based strategies (Horntvedt et al., 2018) are also highlighted.

Regarding the figures, the paper by Snyder et al. (2015) discusses coaching and the figure of the coach as an agent who drives and even ensures that evidence-based practices are implemented as intended, i.e., with a high degree of fidelity, specifically as an advisor to preschool teachers. In the same vein, Kratochwill and Shernoff (2003) highlight the school psychologist's role in developing and disseminating such practices.

In relation to evaluative practices, Fallon et al. (2015) focus on the feedback provided to students as a way of ensuring improved academic performance. Seidel et al. (2015) focus on teachers' norms, practices, and values when interpreting tests and handling student assessment data, specifically in mathematics, finding that accountability policies end up limiting secondary school students' learning even if their performance improves. Brindle et al. (2016) evaluate the quality of the techniques and methods used to teach literacy to 157 teachers, and the results raise concerns among researchers about the quality of the programmes, teacher training, and the time devoted to their implementation. Finally, Johnston et al. (2003) developed and validated a tool to assess the teaching and learning processes of EBP in terms of attitude, knowledge, and behaviour.

Finally, Figure 14 refers to the terms and relationships with respect to performance-enhancing practices.
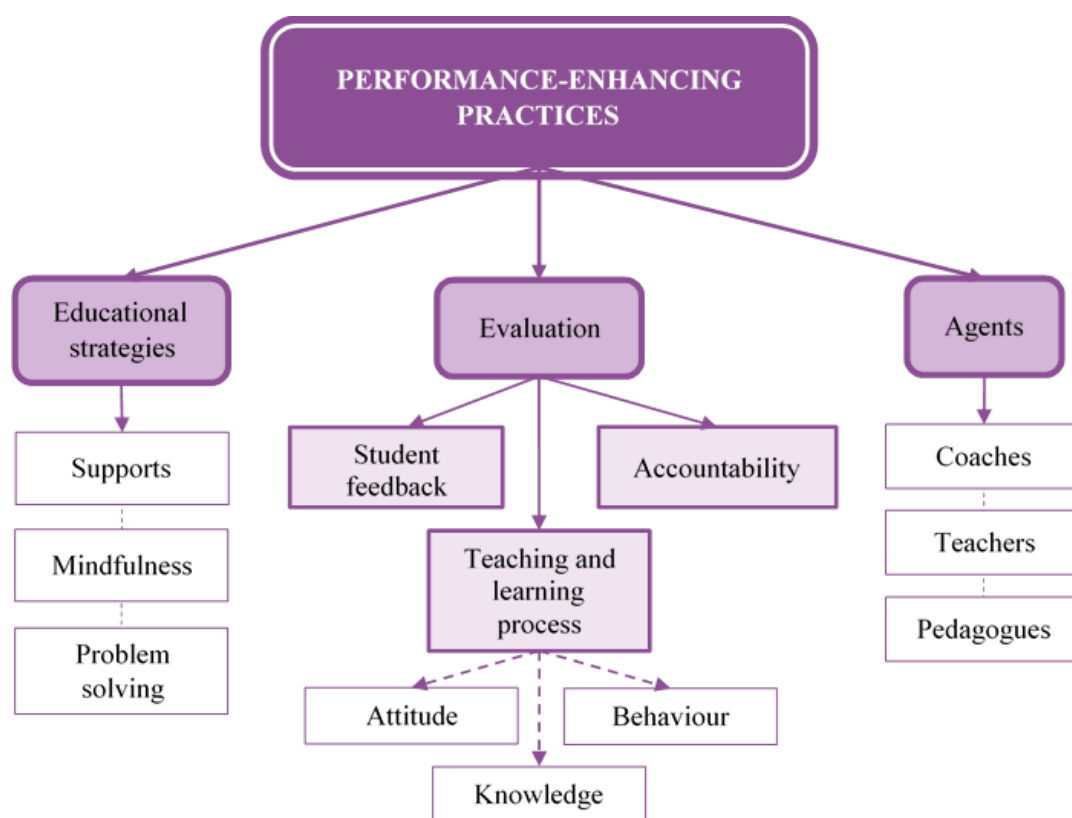

Figure 14. Category of performance-enhancing practices. Source: own elaboration.

4 Discussion and Conclusion

The first objective of this study was to carry out a bibliometric analysis of evidence-based practices in the field of education. Specifically, verification of annual production and the main contributors (most important authors, institutions, and countries) was carried out, collaboration and joint citation networks were analyzed, and thematic evolution maps were analyzed. On the other hand, a content analysis on evidence-based practices was carried out, which allowed us to know substantial aspects of topics such as attention to

diversity, technology-mediated educational processes, professional development or performance-enhancing practices.

Regarding production, the data in Figure 2 shows that interest in the subject seems to be rising more consistently since 2004. Knowing that a large part of the production related to evidence-based practices in education is closely associated with special education, it is worth noting that this, both as a field of research and as an area of practice, was in significant turbulence in the 2000s (Gallagher, 2004). After years and years of research carried out, articles published, and claims of effective practices made, serious questions have been raised about the knowledge generated by special education researchers; and, in response to criticisms that they were not achieving their goals, they responded with numerous publications in leading special education journals across the United States (Gallagher, 2004). This fact justifies the significant increase in the number of publications in the area since then.

Regarding the most relevant journals, the two that stand out are Exceptional Children and BMC Medical Education. By the way, of the ten journals that published the most in the area, three of them focus on education in the health area, and five are journals dedicated to special education. The scope of those journals directs us to the two areas where research on evidence-based practices is most centralized. Of course, this analysis also allows us to identify gaps; for example, there is not much focus on the search for evidence-based practices in youth and adult education or for primary and secondary school audiences.

Furthermore, knowing which journals have the most impact in the area directs the researcher's or the professor's gaze towards better-consolidated publications, which can generate research based on a solid referential, besides stimulating the development of innovations or the expansion of previously tested proposals (Chavarro et al., 2017).

Regarding the stakeholders, American researchers and universities stand out based on the main actors and affiliations. However, despite the prominence of the United States in the research area, its international collaboration proportional is the smallest among the ten countries that published the most. Researchers point out that internationally coauthored papers received twice the average citation (Adams, 2013; Nguyen et al., 2017). In this sense, it is worth noting that the United States papers citations dropped by about 3% between 1993 and 2002; in contrast, the United Kingdom's, and Germany's, which have more scientific collaboration in our results, have each increased (King, 2004).

Samuel L. Odom from the University of North Carolina is the earliest author to publish in the area and stands out with the line of research that has been consolidated for the longest time. His research has explored themes surrounding early childhood inclusion and preschool readiness, although most of his current research primarily centers on autism spectrum disorder. Furthermore, considering only the publications of the ten most relevant authors, the second most cited article in the area has Odom as one of the co-authors and describes single-case intervention research design standards (Kratochwill et al., 2013).

Matthew Brock, from Ohio State University, the latter notable for being the author to start in the field of research more recently, with his first article published in the area in 2013,

and already configured as the second with the highest number of publications. He conducts two research projects with a shared focus on students experiencing significant or multiple disabilities. His research has two primary focuses, which include inclusion and peer-mediated intervention. Additionally, he has a keen interest in preparing teachers and paraprofessionals to implement evidence-based practices, topic that emerge as current driving theme in the thematic evolution presented in our research.

We highlight that the author with the most cited article is Robert Horner, from the University of Oregon, and he is also among the ten authors who have published the most (Horner et al., 2005). However, he has yet to produce articles with the same impact since then. His research has focused on applied behavior analysis, positive behavior support, multi-tiered instructional systems, equity in education, and systems change.

Still talking about the authors, most of the documents were signed by two or more authors, which indicates that the collaboration structures and networks on the subject are relatively high. In this sense, our analyses of the collaboration network provide a visual representation of the co-authorship relationships between researchers, which can be used to identify potential collaborators, research trends, and solid networks in the area (Aria & Cuccurullo, 2017).

In our case, Bryan Cook, from the University of Virginia, Julie Tilson, from the University of Southern California, and the above mentioned, Samuel Odom, from the University of North Carolina, emerge as leaders of probable research groups since they have a more significant number of connections in their specific clusters. It is worth highlighting that Bryan Cook's work focuses on identifying and implementing EBPs for students with disabilities, and Dr. Tilson, in turn, teaches EBP to students in a Doctor of Physical Therapy Program and clinicians nationally and internationally. Her research emphasizes active learning and integrating scientific research, clinical expertise, and patient perspectives into decision-making.

These authors were also identified as potential leaders in previous research on special and inclusive education (Pereira & Barbosa, 2020). This data shows that, once again, evidence-based practices have been methods more strongly used in the context of students with special educational needs. This research gap must be filled with other proposals that aim to reach other educational audiences.

Regarding the cocitation clusters, two clusters stand out in Figure 6. The publications on the blue cluster are older and reinforce that the gap between research and application in the classroom remains. The articles are part of the response movement of researchers during the early 2000s, whose publications in leading US special education journals addressed a description of the scientific efforts of researchers in the field, combined with deliberations about why so little progress had been made in the special education field (Gallagher, 2004).

They also bring to the discussion the fact that professors should not necessarily be guided on when and how they can or not use particular teaching practices but when knowing the proposal, the professional seeks the best ways to apply it in their context in search of good

learning outcomes for students with special educational needs (Odom, 2009; Burns & Ysseldyke, 2009; Cook & Odom, 2013).

The green cluster has more current productions and is interested in establishing parameters for evidence-based practices in special education, as well as formulating guidelines for effective practices supported by various methodologies (Kratochwill et al., 2013; Wong et al., 2015; Odom et al., 2005; Gersten et al., 2005; Horner et al., 2005). These systematic efforts are crucial, because in education, research is often neglected and little applied, whether due to lack of time to update, in the case of teachers, or the devaluation of science by policymakers and the public (Gallagher, 2004).

Thus, this proposal is current and meets the need pointed out by the literature to reduce the gap between research and practice in the classroom (Lawlor et al., 2019). After all, as researchers in the area point out today, efforts to make knowledge practical and applicable concerning evidence-based practices in education, are urgent and necessary (Mitchell & Sutherland, 2020).

Although collaborative and co-citation networks offer some directions that research in the area has taken, it is a small sample of the whole survey. Thus, to further identify the most addressed themes, we analyzed the frequencies of words in titles and keywords of the sample. The most frequent terms

Special education, inclusion, children, and autism were the most frequent words. This may be justified given the increased prevalence of autism identified globally in recent years (Zeidan et al., 2022). Professional development is also often highlighted in the works and justified because many teachers and pedagogical staff need adequate training to apply evidence-based practices (Peebles & Mendaglio, 2014).

In addition, the gap between research and classroom application is more significant than in other contexts (Lawlor et al., 2019). This fact can be justified either by the teachers' lack of time or by undergraduate training that does not encourage the search for evidence in the literature to apply teaching techniques in the classroom (Gallagher, 2004). Thus, although evidence-based research and practices are frequently published, many teachers still do not meet its contents, so there must be refresher and continuing education programs to help teachers exercise their role reasonably and consistently (Peebles; Mendaglio, 2014; Barbosa et al. 2021).

Other relevant terms are meta-analysis and systematic review, which are also frequent in the texts. These methods allow a survey of relevant references and identifying good practices, with solid educational evidence of success with students that can be used in other contexts (Mitchell & Sutherland, 2020).

In addition to the most frequent terms, we also point out three thematic evolution maps, which visually represent how research topics and areas of interest change over time. Observing the data in figures 6, 7, and 8 is possible to identify that the training of health professionals, such as nurses, appeared as an emerging theme around the year 2000 and gained space, establishing itself as a fundamental theme in the area. Publications in the

journal Nurse Education Today were likely influential in establishing this theme in the quadrant.

Moreover, it is possible to find several studies of this period pointing to the movement seen on the thematic evolution maps (Pravikoff et al., 2005; Fineout-Overholt et al., 2005; Stevens, 2013). For example, Fineout-Overholt et al. (2005) highlight strategies to promote evidence-based practice in nursing education, including curriculum development, faculty development, and student engagement. A few years later, the article by Stevens (2013) already discusses the challenges and opportunities of implementing evidence-based practice in nursing education, explores its impact, and highlights the need for ongoing research and innovation in the field.

Research related to Autism and inclusion also evolved from emerging themes and specific niches to basic themes in the second time frame of analysis (until 2010), revealing themselves more consolidated as research lines in the area, as also pointed out by the current literature (Zeidan et al., 2022).

Considering the last and most current period, until 2020, it is possible to perceive that the motor themes, i.e., those that are driving research activities and can influence the direction of the field, are no longer related to children but adolescents and students in higher education. As research on a given target audience becomes saturated, it is natural for new audiences to assume the center of research interest. Furthermore, many children who are followed up in single-case studies continue to be research participants throughout the school term (Wong et al., 2015).

The assessment and qualitative research also occur in motor themes as a consequence of special education researchers seeking quality indicators to assess qualitative research in the area (Kozleski, 2017). This is because, according to Brantlinger et al. (2005), although this type of research is not conducted for generalization purposes, qualitative studies can produce scientifically sound evidence that informs policies and practices, producing evidence based on the exploration of specific contexts and private individuals. For this reason, there is a growing interest in applying and evaluating such proposals in education.

Finally, the use of adaptive technologies and e-learning are also mentioned as motor themes. The terms appear in a context close to the pandemic period, a fact that justifies the increase in research on the use of technologies in teaching. Adaptive e-learning is viewed as stimulation to support learning and improve student engagement, so designing appropriate adaptive e-learning environments contributes to personalizing instruction to reinforce learning outcomes for students with special needs or not (Sabbagh, 2021).

About the historiographical networks, the red network is concerned with defining instruments that assess learning through evidence-based practices in health care (Johnston et al., 2003; Ruzafa-Martínez et al., 2013; Tilson, 2010). The network authors point to the scarcity of validated resources to ascertain learning for this specific audience and the literature corroborates the assertion (Jafari et al., 2021; Flores-Mateo & Argimon, 2007). Although a more recent systematic review identified unique tools to assess learning through BPS, most of these tools still have limitations in carrying out the process

accurately, indicating that new efforts should continue to be implemented in this direction (Kumaravel et al., 2020).

Concerning the green and blue networks, it was possible to notice that the papers that gave rise to the others describe efforts directed to clarify how to apply and the existing types of evidence-based practices to be implemented in special education (Cook & Cook, 2013; Burns & Ysseldyke, 2009). Although specific standards may vary, the literature reveals some standard guidelines for teaching practice to be considered EBP: it should be supported by multiple, high-quality, experimental or quasi-experimental studies (including single-case research), demonstrating in detail how it was conducted and revealing outcomes with significant impact for students with SEN (Cook et al., 2009; Horner et al., 2005; Gersten et al., 2005; Odom et al., 2005).

However, it is worth noting that the most recent work of both historiographic networks points out that despite the efforts in identifying and evaluating EBP, many practices without evidence of effectiveness are still applied in the classroom (Brock & Carter, 2015; Travers, 2017). Moreover, they also point out that it is essential to continue training teachers to be better prepared to deal with the target audience with special educational needs (Cook et al., 2008; Travers, 2017).

The literature points out that in the field of attention to diversity, the focus on deficit stands out, with a differential treatment far removed from the principle of inclusion and practices based on the application of the SAD or learning communities (Gallegos, 2021; Soriano et al., 2022). It means that, although there is an increasing interest in inclusion, initial training courses are only beginning to implement proposals in this direction (Sharma et al., 2011). Thus, it is imperative to have refresher and continuing education programs to help teachers exercise their role (Peebles & Mendaglio, 2014). After all, teachers are crucial elements in building schools with inclusive proposals, and these, in turn, are the most effective means to reduce prejudice, combat discriminatory attitudes and, ultimately, lead to the creation of a more receptive society (De Boer et al., 2011; Booth & Ainscow, 2011). More than just adapted methodologies and resources, students with disabilities also need a team that has adequate professional training to accompany them (Colomo-Magaña et al., 2022; Glat & Blanco, 2007; Kassar, 2014).

It is also evident from the study that the effective integration of technology in training processes offers greater possibilities of generating meaningful learning spaces, adjusted to the characteristics of today's society (Gabarda et al., 2021; Vidal et al., 2019). In this way, both the tools, devices and resources (computers, tablets, video games, etc.) and the methodologies that use technology as a basis as flipped classroom or gamification (Marín et al., 2021; Marín et al., 2020; Mielgo-Conde et al., 2022; Prieto-Andreu et al., 2022) generate multiple opportunities to extend learning, making it more participative and individualized (Bartolomé, 2020).

In addition, the professional development of teachers and the construction of a professional identity have proved to be crucial in the identification of good practice. In this way, both initial and in-service training, as well as the experiences and experiences that are generated in the development of the teaching role, allow them to have a more complete vision of what contributes quality to the training processes (Chan & Canto,

2022; Donaire et al., 2022). Thus, reflection on one's own practice, awareness of how knowledge is socially constructed, the identification of substantial elements for improvement or awareness of the complexity associated with the design, implementation and evaluation of training have an impact on the way in which teachers approach training and position themselves in relation to it (García-Rubio, 2022; Hernández-Ramos et al., 2021).

In addition, it is worth noting that although the ultimate aim of education is the integral development of pupils, the results of this work are focused on improving the results. From this perspective, it would be necessary to consider what indicators are currently associated with educational quality, both from international organizations (Martínez-Usurralde, 2021) and within the framework of each of the education systems (García-García et al., 2019; Garrido-Yserte et al., 2019). In this way, we understand that aspects such as equity, inclusion, accessibility or equal opportunities should be considered as basic principles of education and that aspects such as performance or employability should be considered as secondary elements (Navarro-Montaño et al., 2021).

Finally, it is also important to emphasize that, despite recognizing that the identification and evaluation of EBPs in Special Education or health education is a significant advance, it is essential to reinforce that just because a practice is not considered evidence-based does not necessarily mean that it is ineffective and that not all EBPs will work equally well for all students; the context and the individuals involved need to be considered (Cook & Odom, 2013). For this reason, research must continue to move forward to develop new EBPs, new tools to evaluate these practices, and the effectiveness of learning achieved or not through them.

Although almost two thousand articles were analysed, the main limitation of our study was the use of only one database (WOS). Future research proposals could include productions published in more databases. Regarding a possible research agenda, a current concern with using EBPs with all students, not just students with special educational needs, a particular focus on the secondary school audience and pre-service teachers, as well as on the use of e-learning and adaptive teaching proposals, all those topics appear as driving themes in the coming years. In our case, as future research proposals, we intend to verify the knowledge and applicability of EBPs by pre-service teachers and teachers based especially on the categories identified in this article.

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