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Review Article

Knowledge mapping of translanguaging in education: A scientometric analysis using CiteSpace

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ABSTRACT: The study of translanguaging in education has drawn increasing attention from scholars, particularly in the past decade. The present research conducted a comprehensive scientometric analysis using the CiteSpace application to investigate the multifaceted phenomenon of translanguaging in the context of education. It addresses the pressing need for quantitative review efforts in the domain of translanguaging in education by employing visualization as an innovative means of presenting bibliometric data. This paper analyzes 680 relevant journal articles published between 2010 and 2022, identifies three phases in the development of translanguaging research, and highlights topics such as bilingual education, higher education, and language-in-education policy. The primary findings, presented through statistical analyses and succinct commentaries, are organized into four sections to address the research questions including 1) general situation, 2) leading geographical locations, 3) co-citation analysis, and 4) keywords co-occurrence analysis. The findings reveal the importance of exploiting students' linguistic repertoires and home languages in education to enhance learning and promote a sense of belonging. This review offers valuable resources for subsequent research in the domain of translanguaging in education that is founded on a better understanding of multilingualism and its significance in contemporary educational landscapes.

KEYWORDS: CiteSpace; education; multilingualism; scientometric analysis; translanguaging

1. Introduction

The advancement of communication tools and transportation in today's globalized world, driven by technology and science, has promoted the spread of languages in various domains. From this has emerged the creative and important phenomenon of multilingualism, which comes with pressures, conflicts, competition, differences, and changes between the past and present at all levels of ideology, policy, and practice (Creese and Blackledge, 2010; Li, 2018; May, 2014). People, languages, and cultures are becoming increasingly interdependent and interconnected, and individuals from diverse backgrounds are empowered to respond critically to this contemporary context by consciously constructing and continually adapting their sociocultural identities and values through translanguaging practices (Li, 2018). This is particularly evident in the classroom, where students are becoming more multilingual, posing challenges to teachers in both language and content teaching.

The study of translanguaging in education has consequently become increasingly pressing and necessary, attracting more attention from scholars, particularly over the past decade (Fang and Liu, 2020;

Li, 2018; Wang and Curdt-Christiansen, 2019). While the topic of translanguaging has become a major theme for both academic and social communication in applied linguistics, with an increasing number of studies published, a research gap remains regarding some concerns. First, the advancements of translanguaging make it challenging for scholars to stay abreast of emerging trends, and they may become overburdened by the amount of pertinent research. Second, nearly all previous reviews have adopted traditional qualitative research methods and are thus potentially less able to offer a systematic, more objective perspective on the vast proliferation of translanguaging research. The few bibliometric studies focus on translanguaging in general (Sun and Lan, 2021; Xin et al., 2021; Yu, 2022) rather than paying specific attention to translanguaging for educational purposes.

Given the significant need for quantitative review efforts in the field of translanguaging in education, this paper aims to narrow the current gap by employing visualization as a new means of presenting bibliometric studies (Chen, 2006). Visualization can effectively convey complex notions and connections through images, charts, and diagrams, thereby contributing to a better understanding of a vast amount of data (Brandes et al., 1999; Wheeldon and Åhlberg, 2012). Moreover, it facilitates the tracking and highlighting of evolving procedures and dynamic hotspots and, in a thorough, transparent manner, provides insights into future development trends and cutting-edge topics in the field of translanguaging in education. To provide resources for subsequent research and assist scholars in staying up to date, this paper addresses the following questions:

1) What is the current overall status of translanguaging in education?
2) Which are the representative journals, key authors, and influential references that have significantly contributed to the establishment and advancement of translanguaging research in educational contexts?
3) What are the popular themes at the forefront of translanguaging in education, and how do these topics evolve over time?

This paper begins by reviewing the concept of translanguaging and then comprehensively describes the study's methodologies, which take a descriptive statistical and bibliometric approach. The primary findings include statistical analyses and concise comments and are organized into four sections to address the research questions including 1) general situation, 2) leading geographical locations, 3) co-citation analysis and 4) keywords co-occurrence analysis (Chen, 2020). The first section uses publication trends to gauge the general situation of the field related to translanguaging research in education. In the second section, leading geographical locations are identified to highlight the research units at the forefront of translanguaging in education from both microscopic and macroscopic perspectives. In the third section, representative journals, key authors and influential references are selected to pinpoint the fundamental specialties that underlie the study in a broader disciplinary context. Specifically, highly cited, pivotal-point, and surge co-cited references are introduced to further the discovery of prominent documents. In the last section, keywords co-occurrence analysis is adopted to further unpack the possible future development of this field. The conclusion briefly summarizes the results and offers some suggestions for pedagogy using translanguaging.

2. Translanguaging as a practical theory of language

2.1. The concept of translanguaging

The concept of translanguaging originated in the Welsh term *trawsieithu*, which Williams (1994) coined on the basis of his observations of bilingual language acquisition practices during the Welsh

language revival movement of the 1980s. Baker (2001) translated the word as *translanguaging* and introduced it into bilingual education, linking it to the construction of meaning, the shaping of experience, and the acquisition, understanding, and digestion of knowledge through the use of two languages. García (2009) further explains translanguaging as dynamic multilingual practices in which bilinguals use various language patterns to maximize their communicative potential. Similarly, Canagarajah (2011) connects it to the ability of multilingual speakers to integrate multilingual practices into their repertoires as they move through different languages.

Translanguaging is a research area that encompasses multiple disciplines, including pedagogy, sociology, and linguistics, as well as fields such as language and identity, language teaching, and learning. According to Li (2018), translanguaging not only offers a descriptive label but also provides an analytical framework. From a descriptive perspective, multilingualism is viewed as an integrated sociolinguistic resource rather than a separate system (García, 2009). Translanguaging breaks down the boundaries between different socially constructed languages and other symbolic systems, going beyond mere language switching to encompass a more holistic approach (Li, 2011). From the analytical perspective, scholars in translanguaging argue that bilinguals' linguistic skills derive from a unitary, nonlinear linguistic repertoire that integrates all interdependent linguistic features (García and Li, 2014). Translanguaging enables speakers to fully exploit their entire linguistic resources without being constrained by socially and politically defined limitations of named languages in translanguaging practices (Otheguy et al., 2015), which emphasizes the equality between languages and between language users.

Language is a collaborative, dynamic, and fluid social behavior that is closely associated with interactions in a social context (Li, 2018). Therefore, to language can be employed as a verb through the practice of languaging in action (Becker, 1991). Translanguaging in its multisensory and multimodal nature (including speaking, listening, reading, and writing) encompasses the full range of linguistic performances of multilingual language users for purposes that 'transcend the combination of structures, the alternation between systems, the transmission of information and the representation of values, identities, and relationships' (Li, 2011, p. 1223). To further explain this, Li (2011) introduced the concept of the translanguaging space, which comprises the translanguaging practices of multilingual individuals and the communicative interactions using translanguaging skills between them. Translanguaging is a fluid language communication practice that multilingual individuals strategically employ to make sense of their multilingual world and communicate effectively and flexibly, drawing upon the multimodal resources in their repertoires (García and Otheguy, 2020).

2.2. Translanguaging in education

It is noted that the application of translanguaging is not limited to language education. Although previous studies have focused on language practice through translanguaging, it has been widely applied in content learning and in education in general (Fang, Jiang, and Yang, 2023; Fernández, 2019; Tai and Li, 2020). At the individual level, the ability to mix and switch between different linguistic resources has been associated with higher levels of cognitive empathy, which can be seen as a sign of multi-competence (Dewaele and Li, 2012). Furthermore, bilinguals' active engagement with both language systems by using their diverse knowledge base in both their native language and second language not only contributes to their identity construction (Creese and Blackledge, 2010; Creese et al., 2011) but also benefits their brain function, enabling them to perform intellectual activities quickly, flexibly, and effectively, which aids in the process of knowledge acquisition, comprehension, and absorption.

Therefore, the mother tongue should be valued as a powerful teaching resource and used as an important learning tool in the classroom and learning communities (Barac et al., 2014; Lewis et al., 2012a; Martin-Beltrán, 2014).

Dewaele and Li (2013) discovered that multilingual individuals exhibit higher tolerance of ambiguity scores than monolinguals and bilinguals, suggesting that the act of switching and mixing languages aids in coping with ambiguity, and using multiple languages as communicative resources in a critical, integrated, creative, and strategic manner facilitates the development of multilingual repertoires (García-Mateus and Palmer, 2017; Hornberger and Link, 2012). Similarly, linguistically diverse peers who employ translanguaging practices as cultural and psychological devices create mutual learning opportunities that aid in co-constructing knowledge and facilitate language acquisition (Martin-Beltrán, 2014). These findings are supported by García and Li (2014), who challenge the notion that language is a system of discrete structures and argue that learners acquire new linguistic skills when newly obtained language practices engage and integrate with the existing interconnected resources in their variable linguistic repertoires in an open, cooperative, interactive, and dynamic manner. Additionally, translanguaging teaching methods can enhance students' literacy in content-learning classrooms (García et al., 2017).

3. Methodology

3.1. Data collection: Web of Science

The study aimed to establish a robust library of research data related to translanguaging in education, which was then subjected to bibliometric analysis. The study employed bibliometric analysis to address its specific objectives and research questions. The choice of bibliometric analysis was based on the study's objectives and the nature of the research questions. To comprehensively explore and analyze the phenomenon of translanguaging in education, a bibliometric analysis was chosen as the methodology for this study. A bibliometric analysis is a systematic approach that involves the quantitative examination of patterns, trends, and relationships within a body of scholarly literature (Aria and Cuccurullo, 2017). It involves using bibliographic data to assess the impact, productivity, and interconnections among authors, journals, keywords, and other bibliometric elements (Moed, 2005).

The Web of Science Core Collection database was chosen as the primary source of data due to its inclusion of high-impact journals focused on language education and multilingualism. Additionally, the database provides access to essential bibliometric information such as citation counts, publication years, keywords, document types, abstracts, journals, and authors. It provides access to a wide range of peer-reviewed journals, covering a diverse array of disciplines, including education and language studies. The search was conducted on 15 January 2023 and used the retrieval configuration outlined in **Table 1.**

Table 1. Search configuration.

From Web of Science Core collection	
Topic	Translanguaging & language: English
Refined by	Web of science categories—Education educational research
Timespan	2010–2022

We examined the period from 2010 to 2022 to gain insights into translanguaging in education. Our analysis focused on the past decade, which enabled us to gain a deeper understanding of recent developments and trends in translanguaging in education. Our analysis was designed to encompass relatively recent research conducted within the past decade. This approach ensured a comprehensive

understanding of current trends, developments, and shifts within the field of translanguaging in education. The selection criteria included 'topic relevance', 'publication date', and 'language of the publication'. We have made sure that our selected publications were related to 'translanguaging' and 'language education' during the timeline. Studies conducted in the English language were included, as indicated by the search query's focus on English language topics.

3.2. Statistical analysis: CiteSpace

Duplicate entries were eliminated using CiteSpace, a free Java program for data visualization, yielding 680 valid documents. In this study, the clusters were identified and labelled automatically using CiteSpace's selection mechanism (Chen, Ibekwe-SanJuan, and Hou, 2010). It is worth noting that the figures presented in this study depict the clusters based on the labels determined through the log-likelihood ratio test method, which is widely recognized as the most effective approach for displaying the clusters.

Various metrics were used to describe and analyse the composition and behaviour of clusters and, most importantly, to more closely investigate the prominent references using text summarization, including structural metrics, such as modularity Q, mean silhouette, and betweenness centrality, as well as dynamic ones, including burstiness (Chen, Ibekwe-SanJuan, and Hou, 2010).

Specifically, CiteSpace's modularity Q and mean silhouette were used to create an average profile of the network, which provided a basis for judging the effectiveness of the mapping (Newman, 2006; Shibata et al., 2008). Modularity Q is a metric that ranges from 0 to 1 and represents the strength of relationships within clusters. Higher values indicate stronger connections. Acceptable modularity Q values range from 0.4 to 0.8. Mean silhouette values assess the consistency of content within clusters and range from—1 to 1 (Chen, Ibekwe-SanJuan, and Hou, 2010). Values closer to 1 indicate high similarity among articles. Burst detection analyses keywords and co-cited references and was used to track the trend of topic development in translanguaging in education over a decade. This method assesses whether the citation frequency of a specific journal displays statistically significant variation within a brief time frame, which could suggest the emergence of a new field for further investigation (Chen, Hu, et al., 2012).

3.3. Reliability and validity

In comparison to other review methods, such as narrative reviews, systematic reviews, or scoping reviews, a bibliometric analysis of translanguaging in education offers distinct advantages, including visualization of trends and relationships across the articles published. Furthermore, a comprehensive scientometric analysis can also address aspects such as key authors, influential references, and evolving themes, providing precise insights.

To ensure the reliability and validity of data analysis, we only focused on the Web of Science Core Collection database. We acknowledge that the application of the CiteSpace visualization tool for scientometric analysis ensures methodological consistency in tracking citation patterns and co-occurrence relationships, thereby enhancing the reliability of our analytical process. Furthermore, the research design, data collection procedures, and analytical methods are transparently documented, allowing for the replication of our study by other researchers. This is a hallmark of scientific rigor.

4. Results and analysis

4.1. General situation

As depicted in **Figure 1**, the study of translanguaging in education has exhibited three distinct stages

over the past decade: (1) the initial stage, spanning 2010–2016, characterized by a relatively scarce and slow development as evidenced by the fluctuating trend in publication counts; (2) the rising stage, spanning 2016–2021, which saw a steady growth in interest as indicated by the upward trajectory from 14 to 116; and (3) the rapid progression stage, spanning 2021–2022 and marked by a noticeable surge in publications, with the number doubling in only one year after having taken two years to grow from 50 to 102 in the rising stage.

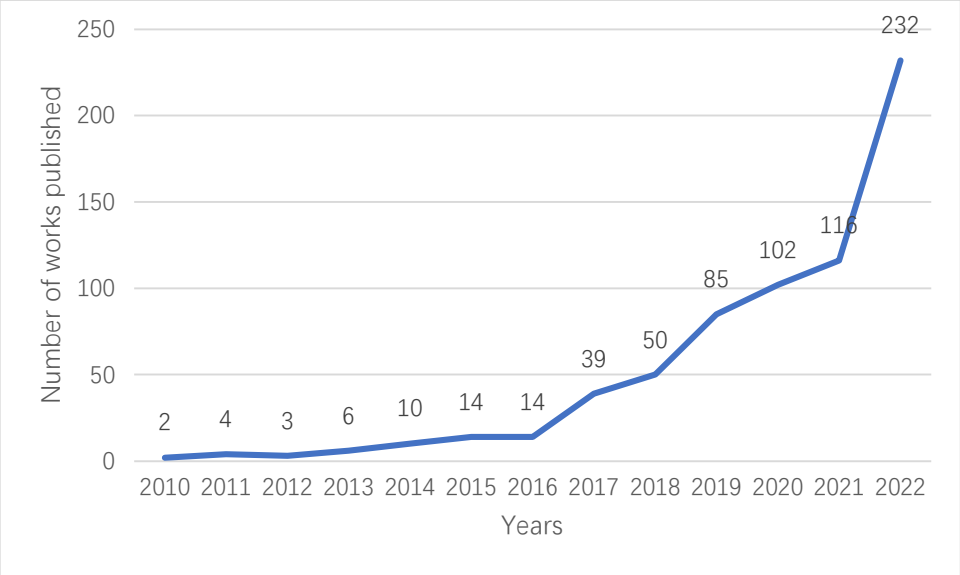

Figure 1. Publication trend in pedagogical translanguaging.

The study of translanguaging in education has yielded a significant increase in publications over the past decade. The trend began with only two publications in 2010 and remained in the single digits until 2014, but the number of publications has steadily grown since then, with a notable surge after 2016. This trend is shown by the continuous increase in publication counts, which have been consistently higher than 50 since 2018 and peaked at 232 in 2022. The growth in publications after 2016 can be attributed, in part, to the appearance of highly cited and turning-point publications during the earlier, foundational period of 2010–2016. For instance, García and Li (2014) examined the implications of a translanguaging method for bilingual education and its impact on traditional schooling practices, while Canagarajah (2011) sought to develop instructional tactics for co-constructing meaning using an ethnography in a writing class.

4.2. Leading geographical locations

The status of geographical location in translanguaging in education was identified by a scientific collaboration network analysis in CiteSpace that employed the cluster analysis approach. The overall distribution network is depicted in **Figure 2**, which illustrates the volume of academic papers authored by nations or regions in the collaborative network. The magnitude of the nodes represents this volume, while the links between the nodes indicate the level of robustness in their collaborative affiliations.

As an assessment of centrality in graph theory based on the shortest paths, *betweenness centrality* measures the likelihood that a geographical location lies on the shortest path between any other two locations (Freeman, 1978). Hence, geographical locations exhibiting high betweenness centrality function as crucial bridging points connecting two or more otherwise disconnected clusters of locations, thereby serving as pivotal nodes (Chen, 2005). To identify the pivotal contexts that play a prominent role in

connecting other contexts in the cooperation network in **Figure 2**, **Table 2** lists the geographical locations with a centrality greater than 0.01 in descending order of their centrality. These locations can be roughly divided into three levels. The first level includes the USA, China, England, and Canada, which have made the greatest contribution in terms of publication volume. The second level includes Australia, Spain, South Africa, and Sweden, and the third level, with publication counts of around 10, includes Germany, Norway, Turkey, Scotland, Finland, and Luxembourg. Interestingly, there is an unusual positive correlation between betweenness centrality and publication count, indicating that geographical locations with high betweenness centrality tend to have not only numerous publications but also close cooperation with other top locations.

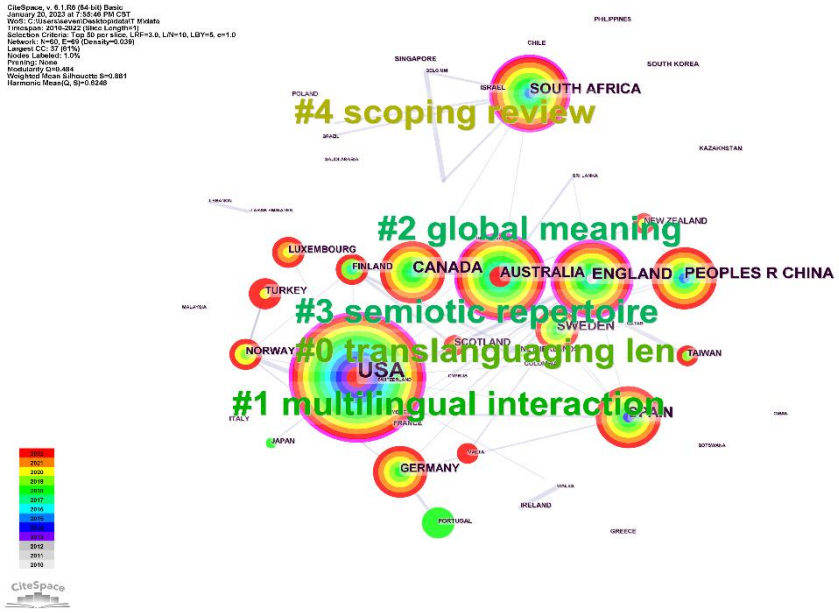

Figure 2. Geographical distribution of countries and regions in cooperation.

Table 2. Top 14 geographical locations with betweenness centrality higher than 0.01.

Count	Betweenness centrality	Country or region
234	0.40	USA
47	0.23	China
45	0.16	England
41	0.13	Canada
32	0.07	Australia
31	0.06	Spain
28	0.04	South Africa
22	0.04	Sweden
13	0.04	Germany
10	0.04	Norway
9	0.03	Turkey
9	0.01	Scotland
8	0.01	Finland
8	0.01	Luxembourg

Notably, the geographical locations at the top of **Table 2** are mainly in the developed world, indicating that there is room for improvement in the study of translanguaging in education in developing locations. The USA, with the highest publication count, has 187 more publications than China, the country with the second highest count. Furthermore, **Figure 3** shows a general upward trend in the number of publications based in the USA over the past decade, which largely parallels the worldwide trend shown in **Figure 1**. Among the 234 works, the most highly cited one, that of Canagarajah (2011), investigates through a classroom ethnography the four types of translanguaging strategies used by a Saudi Arabian student in writing her essay.

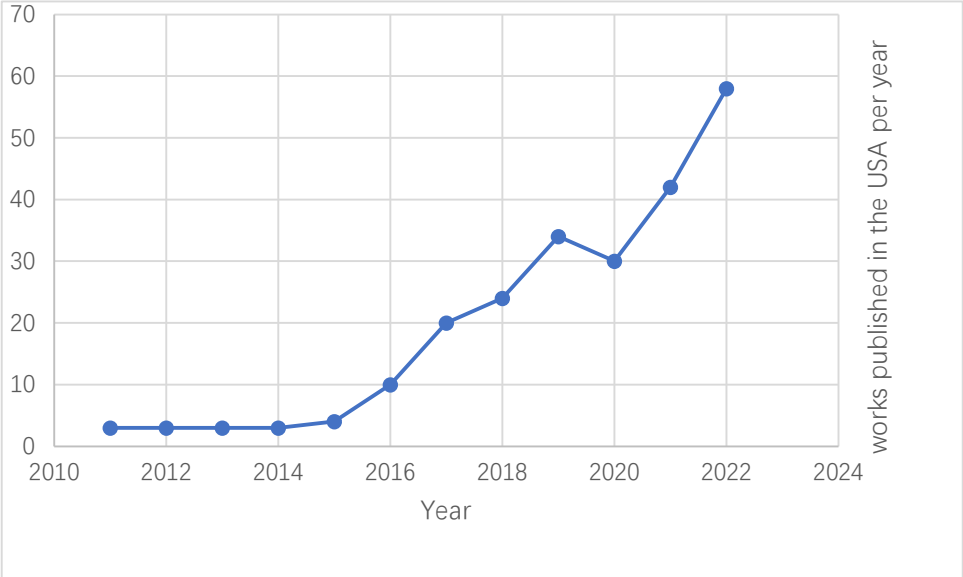

Figure 3. Publications in the US over a decade.

It comes as no surprise that the USA has the highest betweenness centrality, as it has established a robust academic network with 18 other geographical locations over the past decade, including Canada, England, and China. It is noteworthy that its betweenness centrality score is as high as 0.4, as any geographical location with a centrality score of even 0.1 or higher is considered significant in the CiteSpace mapping.

4.3. Co-citation analysis

Co-citation analysis, in its various forms, explores the phenomenon of two journals, authors, or references being cited together in the scholarly literature (Chen, Ibekwe-SanJuan, and Hou, 2010; Small, 1973). It is important to note that the data source for co-citation analysis in this section is the references cited by the 680 valid publications, not the 680 articles themselves. This analytical approach provides valuable insights into prominent topics addressed in classical works and into the origins of research in translanguaging in education. Moreover, it both elucidates the interconnectedness of different nodes within a cluster, such as journals, authors, or references, and reveals the connections that span those clusters (Chen, Ibekwe-SanJuan, and Hou, 2010). It is therefore a useful tool for identifying the intellectual framework in the past and the popular research topics in the present.

4.3.1. Representative journals

Figure 4 illustrates the clusters of highly co-cited literature, including both journals and books. It is necessary to identify prominent academic journals because that knowledge can guide researchers who plan to publish their work, prompting the identification of highly co-cited journals as shown in **Table 3**.

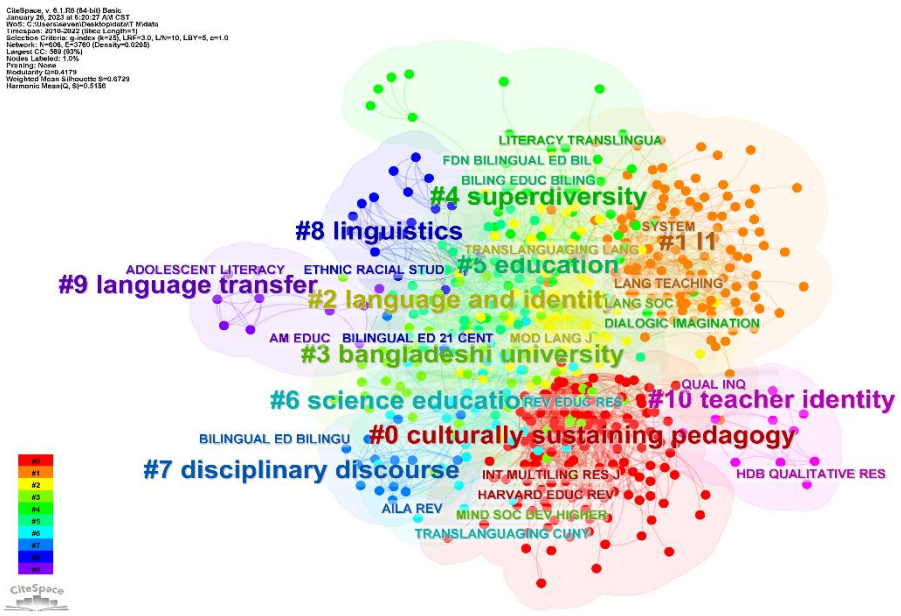

Figure 4. Top 11 clusters of co-cited literature.

Table 3. The eight co-cited journals with the highest citation counts.

Citation count	Journal	Cluster #
334	*Modern Language Journal*	2
290	*International Journal of Bilingual Education and Bilingualism*	2
236	*TESOL Quarterly*	2
217	*Applied Linguistics Review*	2
202	*Applied Linguistics*	2
194	*International Journal of Multilingualism*	2
184	*Language and Education*	2
166	*Journal of Pragmatics*	2

Notably, all the top eight journals are in Cluster #2, indicating that the topic of *language and identity* is the main research focus of the co-cited journals. Specifically, with a citation count of 334, the *Modern Language Journal* focuses on second- and foreign-language teaching and learning and is committed to facilitating academic communication between teachers and scholars. The *International Journal of Bilingual Education and Bilingualism* is dedicated to publicizing ideas about and solving controversial problems in bilingual education across borders.

Interestingly, as shown in **Table 4**, the top four journals according to betweenness centrality share a value of 0.07, and half of those four belong to Cluster #2, which focuses on language and identity, whereas the remaining journals in the top eight are in Clusters #7, #3, #5, and #0, which focus, respectively, on disciplinary discourse, Bangladeshi universities, education, and culturally sustaining pedagogy.

Table 4. Top eight journals according to betweenness centrality.

Betweenness centrality	Journal	Cluster #
0.07	*Modern Language Journal*	2
0.07	*Bilingual Research Journal*	2

Table 4. (*Continued*).

Betweenness centrality	Journal	Cluster #
0.07	*AILA Review*	7
0.07	*Computers and Education*	3
0.06	*Journal of Multilingual and Multicultural Development*	2
0.06	*International Journal of Bilingual Education and Bilingualism*	5
0.05	*International Multilingual Research Journal*	0
0.05	*International Journal of Multilingualism*	2

Table 3 and **Table 4** show that the *Modern Language Journal* has a high citation count and betweenness centrality, featuring articles such as those of Creese and Blackledge (2010) and Palmer et al. (2014). Both papers offer teaching strategies, criticize the problematic existing bilingual pedagogy, and explore how to use translanguaging to inform teaching in bilingual classrooms.

4.3.2. Key authors

Author co-citation analysis is employed to uncover distinct areas of expertise within a particular field by examining groups of authors who are frequently cited together in the relevant scholarly literature (Chen, Ibekwe-SanJuan, and Hou, 2010). **Figure 5** identifies 16 clusters of author co-citations. The modularity Q score of 0.7345 indicates acceptable connections between the clusters, demonstrating a reasonable level of inter-cluster relationships. The mean silhouette value of 0.9197 confirms a convincing partitioning of the network.

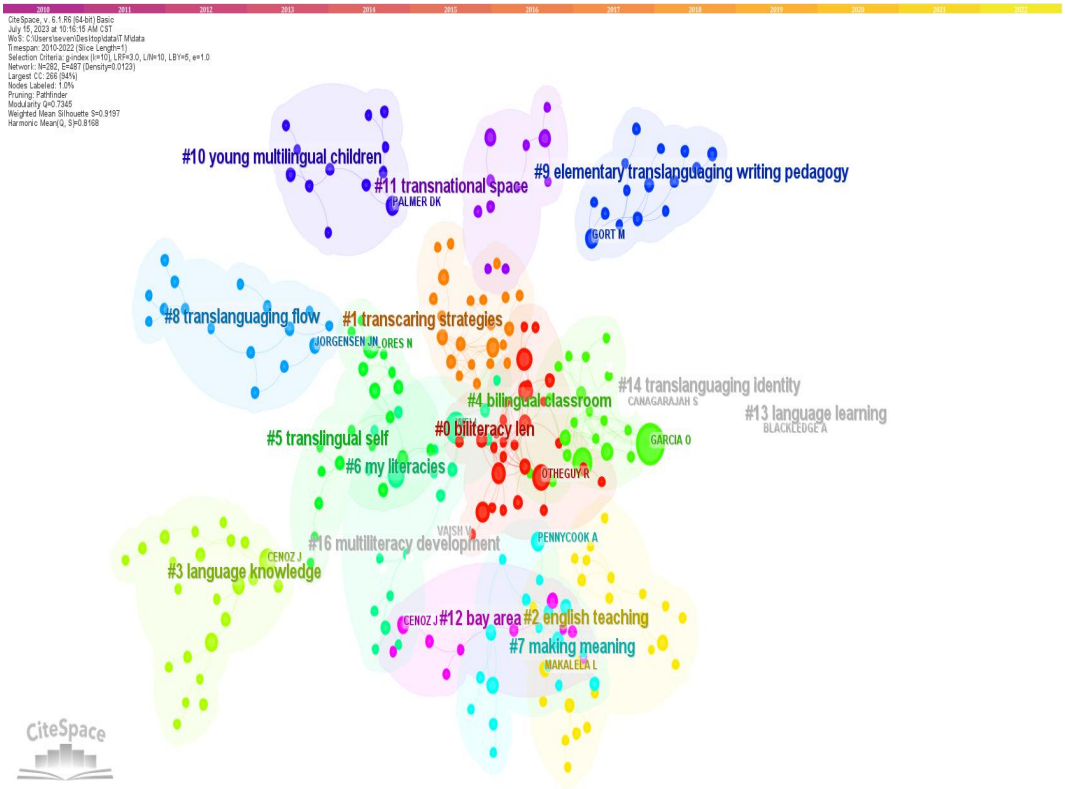

Figure 5. Authors' co-citation network with clusters labeled by topic.

The bibliometric analysis made clear that seven authors garnered numerous citations in the references of publications on translanguaging in education (see **Table 5**). The most highly cited author is

O. García, with a total citation count of 741, followed by S. Canagarajah, who amassed 299 citations. Equally noteworthy, the remaining highly cited authors—W. Li, J. Cummins, A. Creese, R. Otheguy, and G. Lewis—all exceeded 125 citations. Collectively, these seven authors account for approximately 28.93% of all references in publications pertaining to translanguaging in education, demonstrating the significance of their contributions to this research domain. Nevertheless, it is essential to note that the presented list of authors is not exhaustive, as other authors have also made notable contributions in this field (e.g., J. Cenoz, N. Flores, N. H. Hornberger, C. Williams, and C. Baker) (cf. Sun and Lan, 2021).

Table 5. The seven most-cited authors.

Total citation count	Author
741	O. García
299	S. Canagarajah
248	W. Li
226	J. Cummins
193	A. Creese
149	R. Otheguy
126	G. Lewis

The two primary clusters consist of citations from over 25 authors. The largest cluster, known as the biliteracy lens (Cluster #0), has a silhouette value of 0.96. It is noteworthy that R. Otheguy and J. Cummins are the most cited authors within this cluster. In the second-largest cluster (Cluster #1), which is identified as trans-caring strategies, O. García is the most frequently cited author.

Upon closer examination of the detailed information regarding the clusters presented in **Table 6**, it is noteworthy that the most frequently cited article in the top five clusters is the same, namely, the work of Bonacina-Pugh et al. (2021). Additionally, the most frequently cited article in the remaining three clusters is also the same, namely, the work of Shi and Rolstad (2022). It is important to note that these two articles are not visually represented in **Figure 5**, which depicts a co-citation network.

Table 6. Summary of the eight largest clusters.

Cluster ID	Size	Silhouette	Label
0	31	0.960	Biliteracy lens
1	26	0.894	Trans-caring strategies
2	24	0.919	English teaching
3	23	1.000	Language knowledge
4	20	0.838	Bilingual classroom
5	20	0.924	Translingual self
6	19	0.837	My literacies
7	18	0.869	Making meaning

Size: The number of articles a cluster contains.

4.3.3. Influential references

The primary rationale for using document co-citation analysis (see **Figure 6**) lies in its utility and the ability of co-cited paper networks to effectively represent distinct scientific specialties (Small, 1973).

Moreover, within a document co-citation network, a cited reference stands out more prominently when investigating common themes among similar references than when using a cited author in an author co-citation network (Chen, Ibekwe-SanJuan, and Hou, 2010).

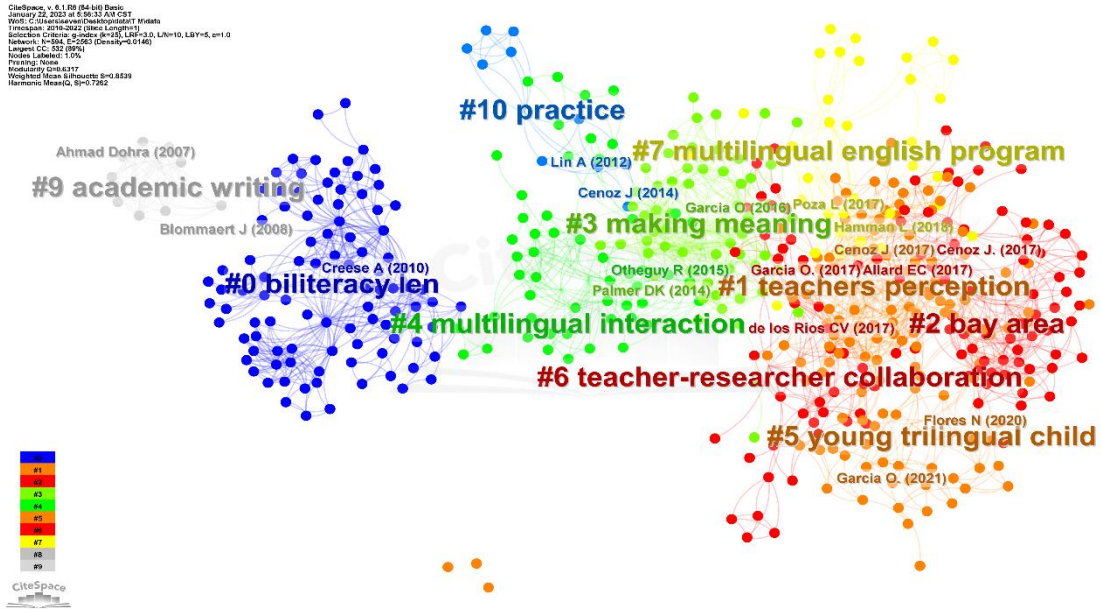

Figure 6. The reference co-citation network clustered by topic.

In **Figure 6** and **Table 7**, the modularity Q value was 0.6317, and the mean silhouette value was 0.8539, indicating that the structure is acceptably modularized and persuasively clustered. Notably, all eight major clusters have mean silhouette values above 0.9 except Cluster #1, which suggests a robust, high-quality cluster analysis. Furthermore, although Cluster #1 has a value lower than 0.9, its value of greater than 0.8 suggests a reasonable clustering quality (Chen, Ibekwe-SanJuan, and Hou, 2010).

Table 7. Details of the knowledge clusters.

Cluster	Size	Silhouette	Year	Label (LSI)	Label (LLR)	Label (MI)
1	153	0.836	2017	Bilingual education; translanguaging pedagogies; translanguaging flows	Teacher perception	Common element; many bilingual teachers
0	106	0.949	2009	Transnational literacy practices; multilingual classrooms	Biliteracy lens	Education system
4	46	0.998	2009	Hong Kong; hybrid language use; multilingual university; trans-caring strategies; third spaces; high schools	Multilingual interaction	Pedagogical translanguaging; translanguaging
5	42	0.998	2012	Spatial repertoires; translingual practices; foreign languages; epistemological change	Young trilingual child	Linguistic varieties
3	38	0.961	2012	Deaf education; teacher translanguaging; language policy; language education; school language	Making meaning	Micro-level analyses; critical sociocultural
10	37	0.950	2013	Translanguaging ideologies; international branch campuses; lab instructors; explicit language planning	Practice	Exploring translanguaging practice; purpose

Note: The utilization of Latent Semantic Indexing (LSI), Log-Likelihood Ratio (LLR), and Mutual Information (MI) serve as selection mechanisms for labeling the clusters. For example, the clusters in **Figure 6** are referred to according to the labels selected through the LLR test method.

Among the clusters whose size is greater than 100 as shown in **Table 7**, Cluster #1 emerged as the top-ranked cluster. This cluster, centered on teachers' perceptions, encompasses research on pedagogical translanguaging and comprises 153 articles published mostly around 2017. The mean silhouette value of this cluster is 0.836, indicating a high level of coherence among the co-cited articles. The most frequently cited article in this cluster is that of Li (2018) published in *Applied Linguistics*, which explores the theoretical concept of translanguaging. Cluster #0, in the second rank, stands out prominently. This cluster relates to the biliteracy lens and comprises 106 articles published predominantly around 2009. With a mean silhouette of 0.949, this cluster exhibits a remarkable level of coherence among the co-cited articles.

- Highly cited references

Table 8 lists the references with the highest citation counts, which indicates great importance and impact in constructing the knowledge base of translanguaging in education.

Table 8. Top seven references by citation count.

Citation count	Reference	Cluster #
113	W. Li, 2018, *Applied Linguistics*, volume 39, p. 9	1
69	R. Otheguy et al., 2015, *Applied Linguistics Review*, volume 6, p. 281	4
46	J. MacSwan, 2017, *American Educational Research Journal*, volume 54, p. 167	4
39	J. Cenoz, 2017, *J Multiling Multicul*, volume 38, p. 901	1
32	O. García, 2020, *Int J Biling Educ Bi*, volume 23, p. 17	1
30	W. J. Li, 2018, *Adv Math Phys*, volume 2018, p. 0	1
29	R. Otheguy, 2019, *Appl Linguist Rev*, volume 10, p. 625	1

Among the references with a co-citation count above 45, Li (2018) in his top-ranked conceptual article defines translanguaging as a theory of language, stressing its multimodal nature in response to criticisms. Otheguy et al. (2015) stress that translanguaging is a unique concept that explains how bilingual individuals use their full linguistic repertoire without adhering to the boundaries of named languages, which differs from code switching and challenges the idea of languages as fixed entities. MacSwan (2017) argues that translanguaging supports bilingualism and challenges the idea of discrete languages. He proposes an integrated multilingual model and introduces a multilingual perspective on translanguaging.

While citation counts are crucial, using citation counts as the only ranking criterion can be limiting and not impartial, as doing so determines the value of the references solely on a quantitative basis. Specifically, some documents of good quality cannot be detected because of their late appearance. Therefore, betweenness centrality comparison and burst detection are introduced to discover pivotal-point references and surge references in the following analysis.

- Pivotal-point references

Table 9 lists the references with a betweenness centrality higher than 0.1. In the top two, Canagarajah (2011) recognizes the demand to take translanguaging a step further than conversation and develop pedagogical strategies, whereas Gort and Sembiante (2015) focus on how teachers' translanguaging pedagogy can aid Spanish-English bilingual children academically.

Table 9. Top six references by betweenness centrality.

Betweenness centrality	Reference	Cluster #
0.22	S. Canagarajah, 2011, *Applied Linguistics Review*, volume 2, p. 1	0
0.13	M. Gort, S. F. Sembiante, 2015, *International Multilingual Research Journal*, volume 9, p. 7	3
0.11	J. MacSwan, 2017, *American Educational Research Journal*, volume 54, p. 167	4
0.11	R. Otheguy et al., 2015, *Applied Linguistics Review*, volume 6, p. 281	4
0.10	J. Cenoz, 2017, *J Multiling Multicul*, volume. 38, p. 901	1
0.10	D. K. Palmer et al., 2014, *The Modern Language Journal*, volume 98, p. 757	3

- Surge references

To further visually track the dynamic development of hot research topics extracted from the references, a time dimension was added (see **Figure 7**), which can contribute to identifying an emergent research front regardless of the publication date of the initial document, showing such documents in the 'big picture' even before they have adequate citations (Chen, 2006).

Figure 7. Top seven references with the strongest citation bursts in yearly order.
Note: This figure displays only the primary author of each reference.

References that experience citation bursts at the same time can be grouped together (Chen, Ibekwe-SanJuan, and Hou, 2010). The top seven references shown in **Figure 7** are discussed in groups below on the basis of four manually labeled topics. It is crucial to acknowledge that this categorization is not entirely precise, and overlaps between the identified groups may exist.

The first paper, Creese and Blackledge's (2010) publication, focuses on *bilingual pedagogy*. It experienced a citation burst in the same year as its publication (2010). Ranking first among all seven publications with a strength of 11.31, it advocates for bilingual instructional strategies that use multiple languages simultaneously to enhance learning.

The second set of papers is grouped according to their citation burst years of 2014–2015. The two papers by Lewis et al. (2012a, 2012b) focus on *translanguaging in education*. Their 2012a article highlights the pedagogic advantages of translanguaging and views it as an innate method for meaning-making, shaping experiences, and communication among bilinguals. The other paper by Lewis et al. (2012b) investigates translanguaging's pedagogic aspects, exploring its impact on language proficiency, developmental use among emergent bilinguals, variations in input and output, connection to subject curricula, and role in deepening learning through language and cognitive development.

The third set of papers saw a notable citation burst in 2016 and incorporates the topic of *identity* as the research focus from the perspective of bilingual pedagogy. Palmer et al. (2014) examine teacher strategies using identity theory, while Sayer (2013) argues that teachers' implementation of a versatile bilingual pedagogy facilitates translanguaging in the classroom, not solely for comprehending content and for language acquisition but also as a suitable approach for embodying desired identities.

This confirmed the emergence of the keyword identity in 2014 (see **Table 10**).

Table 10. Keywords with the highest betweenness centrality above 0.1.

Rank	Betweenness centrality	First occurrence year	Keyword
1	0.16	2010	language
2	0.14	2013	education
3	0.13	2011	English
4	0.13	2013	classroom
5	0.12	2011	pedagogy
6	0.12	2016	student
7	0.12	2014	identity
8	0.11	2016	literacy
9	0.11	2011	Bilingual education
10	0.10	2016	strategy
11	0.10	2018	school
12	0.10	2017	policy

The last set of papers experienced citation bursts in 2017–2018. These papers delve into the topic of translanguaging in education, focusing on identity and drawing insights from social contexts. One paper in particular, that of Otheguy et al. (2015), had the strongest citation burst in the entire data set with a strength of 17.8. The author argues that viewing oneself as a lingual individual challenges the hierarchical and inequitable identity labels imposed by institutions. Creese and Blackledge (2015) examine the social construction of identities through interactions and explore the intricate connection between language and identities in mobile and complex communication contexts.

4.4. Keywords co-occurrence analysis

Although the preceding analysis greatly contributes to understanding the knowledge base and current landscape of translanguaging in education, the use of keywords co-occurrence analysis can further detect the research frontier. The limitations of co-citation analysis in identifying areas of future research interest necessitate the use of keyword co-occurrence analysis. This method depicts individual keywords as nodes and establishes links between them whenever they co-occur in the literature. The weight of each link is determined by the frequency of the co-occurrence of the word pair across multiple articles. By creating such a network, we can effectively visualize the accumulated knowledge in a specific domain and gain valuable insights by analyzing the patterns and strength of connections between keywords present in the literature (Radhakrishnan et al., 2017). The data source for the keywords co-occurrence analysis is extracted from the keywords present in the literature obtained from the Web of Science, specifically from the 680 valid publications themselves.

The first rationale behind our adoption of keywords co-occurrence analysis is that keywords serve as significant indicators of a topic. Such an analysis provides a clearer representation of current and past hot research trends and contributes to comprehending a topic's conceptual composition and intellectual framework (Callon et al., 1983). In **Figure 8**, the keywords are listed in chronological order of appearance (on the X-axis) while linking back to the emergence of the topic to show the connection between the hot research topic and its source. The top 10 clusters are listed according to their size on the Y-axis (Chen, 2017).

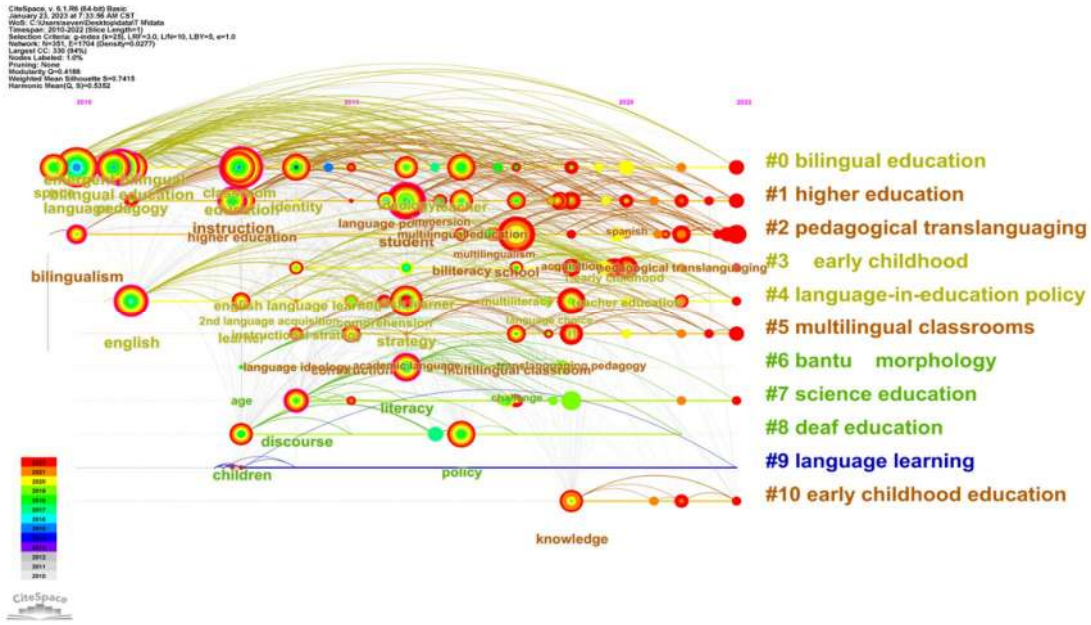

Figure 8. Timeline of the co-occurrence analysis of keywords.

The second rationale for adopting keywords co-occurrence analysis (which relates specifically to the use of the timeline view in CiteSpace) is its ability to:

1) Show the first time each research topic appeared as well as its historical evolution, status quo, and future of the subdomain when analyzing a single cluster. For example, as shown in Cluster #1 in **Figure 8,** while the keyword *identity* was a relatively new concept that did not appear in higher education until 2020, the keywords *ideology*, *teacher*, *language policy*, and *immersion* emerged as early as around 2017, developed afterward, and remained prominent as recently as 2022. In regard to *identity*, empirical studies on language and identity in multilingual higher education constitute a recent hot topic. For example, Dubiner (2021), drawing upon both interviews and questionnaires, shows that Arabic-Hebrew bilinguals in universities have different ideas about the connection between language and identity. The keywords *ideology*, *teacher*, and *language policy* all appear in Mazak and Carroll's (2016) groundbreaking book, which, rather than simply regarding translanguaging as a linguistic ideology, was the first to explore translanguaging in higher education. Most of the chapters in this innovative study shed light on the practice of translanguaging in multilingual communities within university environments worldwide.
2) Reveal the duration and sustainability (Chen, 2017) of one subdomain. While the top four clusters formed in 2011 and remained active through 2022—for example, bilingual education (#0) persists for the entire 10 years—most clusters are relatively young and recently formed (around 2013).
3) Demonstrate the hot and cold focus over various periods when analyzing across clusters. For example, deaf education appeared in 2013 but did not gain much attention until 2016, yet it started to cool down and become less of a concern after 2017.

To further illustrate our second rationale, **Figure 8** clearly demonstrates a significant gap between nodes and clusters, indicating potential avenues for future investigation. To elaborate on this point, future research could focus on establishing the missing links among the clusters or nodes (keywords) within the context of translanguaging in education. This would provide a more comprehensive understanding of

the phenomenon and its implications for educational practices. For example, there are nearly no lines between the node 'knowledge' in Cluster #10 and the node 'strategy' in Cluster #5, which means that to close these existing research gaps, future research may specifically focus on projects such as investigating how teachers' strategies in the multilingual classroom affect knowledge absorption in early childhood education. There are also currently few links between Cluster #7 and Cluster #8, so future research might explore deaf education in the science classroom, which could revive the popularity of the topic of deaf education.

To identify keywords characterized by strong connections to other keywords or that are positioned between different groups of keywords, which enables us to pinpoint specific keywords that occupy a crucial position within the network, we compiled a list of keywords with a betweenness centrality value of greater than 0.1 (**Table 10**). While keywords such as *language and pedagogy* are intuitive and vague, there are some interesting co-occurring keywords worth analyzing. For example, *English* and no other language ranks third, showing that English remains the most influential language, even in translanguaging classrooms, which reflects the fact that those productive and cooperative countries at the top of **Table 2** are mainly English-speaking. It is also noteworthy that *bilingual education* rather than *multilingual education* (which did not draw much attention until 2014) and student rather than teacher (which did not appear until 2017) have a higher betweenness centrality.

To further track the evolution more effectively and visually and, most importantly, to identify future trends in translanguaging in education, **Figure 9** shows the top four keywords with the strongest citation bursts.

Figure 9. Top four keywords with the strongest citation bursts in yearly order.

Figure 9 focuses on the investigation of two keywords specifically associated with education, namely, *bilingual education* and *teacher education*. It is noteworthy that these two keywords, respectively represent the earliest and latest occurrences of keyword bursts.

The topic of bilingual education, an important research focal point in translanguaging, developed rapidly in the seven years from 2011 to 2017. Although it saw some major decreases from 2017 to 2021, it regained its popularity among scholars in 2022 with a surge in its appearance records (see **Figure 10**). Among the articles that feature the keyword *bilingual education*, Hornberger and Link's (2012), which concludes that an education model based on translanguaging practices can enhance the effectiveness of English learners, has the highest citation count (293).

In contrast, *teacher education*, a relatively recent and dynamic keyword, emerged in 2017 but experienced a delayed surge in development, becoming more prominent in 2020 as illustrated in **Figure 9** and **Figure 11**. This indicates that, although research focused more on the student over the past decade as shown in **Table 10**, attention shifted to the teacher, specifically to determine how to educate teachers to teach in the translanguaging classroom. For example, Henderson and Palmer (2020) examine how teachers act as language policy-makers and consider the potential and conflicts of dual language bilingual

education.

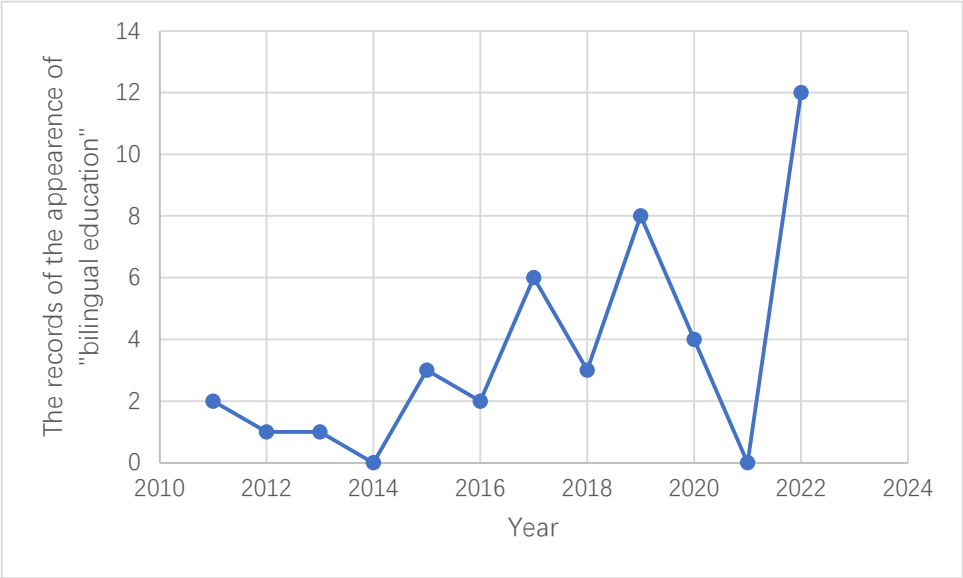

Figure 10. Trend of the occurrence of the keyword *bilingual education*.

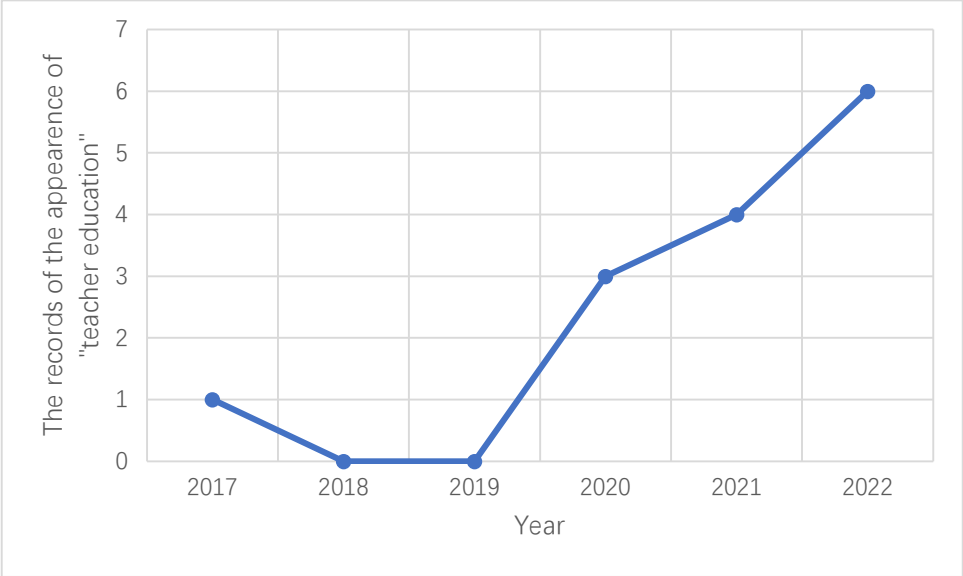

Figure 11. Trend in the occurrence of the keyword *teacher education*.

5. Discussion

The comprehensive scientometric analysis conducted in this study sheds light on the multifaceted phenomenon of translanguaging in the context of education. The findings offer valuable insights into the current landscape of translanguaging research, its evolution over the past decade, and the implications for pedagogy and educational policy. In this discussion, we will delve into the implications of each major finding and their significance within the broader context of education and multilingualism.

The analysis of publication trends over the past decade revealed a notable trajectory in the development of translanguaging research in education. The three discernible phases identified—initial, gradual growth, and rapid advancement—underscore the increasing scholarly attention to translanguaging as a pivotal aspect of educational practice. This evolution is indicative of the rising recognition of the significance of leveraging students' linguistic repertoires and multilingual capabilities

within educational settings.

A geospatial analysis highlighted the distribution of translanguaging research across different regions. Notably, the study unveiled a relative concentration of research in developed countries, underscoring the need for more inclusive representation of developing countries in the discourse. This finding aligns with the broader call for equitable and inclusive educational practices that acknowledge and integrate diverse linguistic backgrounds. Addressing this geographical disparity can potentially contribute to a more holistic understanding of translanguaging for education on a global scale.

The identification of prominent themes within translanguaging research showcases the diverse areas where the concept has gained traction. Bilingual education, higher education, pedagogical translanguaging, early childhood education, and language-in-education policy emerged as key areas of focus. These themes underscore the multifaceted nature of translanguaging and its applicability across different educational contexts. Importantly, these findings signal a departure from monolingual teaching methodologies toward recognizing and utilizing students' linguistic resources for enhanced learning outcomes.

At the heart of this research lies the critical pedagogical implications of embracing translanguaging in education. The analysis underscores that by actively engaging students' linguistic repertoires and incorporating their home languages, educators can foster a sense of belonging, enhance cognitive engagement, and stimulate creativity. The identified themes, particularly in bilingual education and pedagogical translanguaging, emphasize the potential of translanguaging practices to bridge cultural divides and create inclusive educational environments.

In summary, the analysis of keyword co-occurrence unveils the evolving research frontiers within the field of translanguaging in education. As multilingualism continues to shape educational landscapes, the dynamic nature of research themes suggests exciting avenues for future investigation. This includes exploring the intersections of technology, digital literacies, and translanguaging, as well as investigating the role of translanguaging in addressing issues of social justice and equity in education.

6. Conclusions

This review analyzed 680 relevant journal articles published between 2010 and 2022 on translanguaging in education from the Web of Science Core Collection. Through comprehensive visualization assessment, distinct research evolution patterns emerged over the past decade. Notably, three phases were identified: initial modest development, subsequent gradual growth, and later rapid advancement. Geospatial analysis revealed a lack of studies in developing countries, suggesting opportunities for enhancing research in those regions (Fang, Zhang, and Sah, 2022; Liu and Fang, 2022). Co-citation analysis uncovered intellectual foundations and prominent research trends, aided by CiteSpace tools (Chen, Ibekwe-SanJuan, and Hou, 2010). Moreover, integrating temporal analysis with keyword co-occurrence analysis detected evolving key topics and potential research front.

The findings of this study emphasize prominent themes in translanguaging education: bilingual education, higher education, pedagogical translanguaging, early childhood, language-in-education policy, and multilingual classrooms. Prominent documents highlighted the benefits of translanguaging pedagogy in stimulating cognition, enhancing creativity, and fostering a sense of belonging. The importance of leveraging students' linguistic repertoires and home languages for effective learning was underscored, recognizing the significance of multilingualism in education contexts. While this study provides comprehensive insights, certain limitations warrant consideration. First, the dataset's time frame and

focus on journal articles may have excluded relevant contributions from other sources. Second, the reliance on a single database, namely the Web of Science, as the primary source of literature may potentially exclude important articles available in other databases. Additionally, the evolving nature of translanguaging in diverse educational contexts necessitates ongoing exploration.

Author contributions

Conceptualization, LL and FF; methodology, LL; software, LL; validation, FF; formal analysis, LL and FF; investigation, LL; resources, FF; data curation, LL and FF; writing—original draft preparation, LL; writing—review and editing, FF; visualization, LL; supervision, FF; project administration, FF; funding acquisition, FF. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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