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A Bibliometric Analysis of Themes and Network Structures in Sign Language Policy*

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Jeon, Haewon. 2024. A Bibliometric Analysis of Themes and Network Structures in Sign Language Policy Blending. ***Sign Languages and Linguistics Convergence Research,*** *1*(2), 331-352. This study examines the research landscape of Sign Language Policy using bibliometric analysis of Author Keywords and Keyword Plus data. Co-occurrence network and thematic map analyses reveal that Author Keywords highlight niche themes in specialized subfields, while Keyword Plus identifies broader, interdisciplinary connections. Thematic maps categorize research themes into Motor, Niche, Emerging or Declining, and Basic Themes, showcasing their developmental stages and significance. A comprehensive analysis of the themes and network structures of sign language policy data, acquired by bibliometric analysis, enables the understanding of keyword interactions, identification of research trends, and forecasting of future research fields. These insights inform evidence-based policymaking, addressing research gaps and promoting inclusivity, accessibility, and linguistic rights for Deaf communities worldwide.

Key Words: Sign Language, Language Policy, Language Planning, Bibliometric Analysis, Network Analysis

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1. Introduction

Sign language has been recognized as a legitimate subject of linguistic research since it was identified as a natural language by Stokoe(1980, p.366) and Brennan et al.(1984), opposing previous belief that it as merely a system of gestures. Furthermore, Berwick and Chomsky(2015, p.5) recently contended that human language should be examined from the perspective of evolution and genetics, advocating for acknowledging sign language as a full human language. Nonetheless, the misconception that sign language is solely a communication tool continues to prevail among the general public, which is attributed to its lack of political influence and the low representation of Deaf people in the professions.

The United Nations Convention on the Rights of Persons with Disabilities(CRPD), adopted in 2006, acknowledges sign languages as equivalent to spoken languages and mandates governments to advocate for the linguistic rights of those who are deaf. The Korean government has made legal accomplishments in formally recognizing Korean Sign Language(KSL) with the Korean Sign Language Act(2016); nonetheless, KSL's official position remains significantly below that of an equal language. Sign languages frequently encounter supplementary obstacles, including societal bias and oralism, prioritizing spoken languages over sign languages, and complicating the planning and execution process (Reagan, 2006; Rose & Conama, 2018). This context underscores the necessity for both linguistically educated and culturally attuned policies accommodating the distinct requirements of Deaf people. Although language policy and planning in sign languages parallels spoken languages in the broader context of establishing linguistic and cultural identity, notable variances arise from the distinct placing of these languages.

A research by Lee et al.(to appear) indicates that 51 scholarly articles on language policy in sign languages were published from 1998 to 2024, a modest figure compared to the 3,576 publications on language policy in spoken languages during the same time frame. In other words, research on language policy in sign languages is significantly less extensive than on spoken languages. The steady increase in publications regarding sign language policy since 2010 is significant, associated with numerous nations' formal acknowledgment of sign

languages. New Zealand(2006), Iceland(2011), Finland(2012), and the Republic of Korea(2016) have officially recognized their national sign languages, which appears to have stimulated research into the policy ramifications of this recognition. The early 2010s experienced a proliferation of scholarship in deaf studies and sociolinguistics, emphasizing minority languages and language rights. This represented a movement towards acknowledging sign language as a distinct language and comprehending its intricate sociolinguistic dynamics, resulting in a surge of new research and publications. At the same time, technological advancements enhanced the visibility of ASL through the proliferation of video relay services and social media. International debates regarding language policy, access to information, and equal rights have been initiated due to this elevated visibility, which has also initiated academic research. The aforementioned factors resulted in a notable surge in research concerning Deaf language policy in 2020.

Bibliometric Analysis, employed in this research, systematically examines scientific literature to discern patterns, trends, and effects within a specific topic(Passas, I., 2024). It assists in identifying contemporary research themes and prospective trends (Fan et al., 2023; Liu et al., 2004) and has recently become an invaluable instrument in the preliminary phases of systematic literature reviews(Donthu et al., 2021; Khan et al., 2021). Furthermore, Handoyo, S.(2024, p.2) posits that bibliometric outcomes can assist researchers in identifying prevalent themes and potential fields for further investigation. Lee et al.(to appear) conducted a bibliometric analysis revealing differences in the number of publications, citation indexes, core themes, and associated keywords between the language policies of spoken and sign languages.

This study employs bibliometric analysis techniques to identify factors contributing to changes in the evolving landscape of Sign Language Policy, as well as critical themes and their dynamic relationships. The evolution and interaction of themes are analyzed, emphasizing extensive thematic networks via co-occurrence network analysis and thematic map analysis. The multi-perspective view demonstrates the extent of diversity in Sign Language Policy research. This also emphasizes avenues for future research, emerging topics, and interdisciplinary opportunities.

This paper aims to conduct a bibliometric review to systematically map the literature on Sign Language Policy. To systematically map and analyze the evolution of themes, critical connections, and interdisciplinary overlaps in Sign Language Policy research. The author keyword(AUK) and keyword plus (KWP), two data types derived from bibliometrix, are analyzed using a co-occurrence network and thematic analysis. Therefore, the following research questions can be posed. What themes dominated the literature regarding Sign Language Policy? What network structure is built in the literature of Sign Language Policy? They are examined for their distinct thematic and Network structures concerning Sign Language Policy research. Our study explores the differences between them and anticipates the implications for the future of sign language policy. Chapter 2 illustrates the bibliometric analysis and presents the data employed in this study. Chapter 3 explores the findings from the examination of two distinct data sets: AUK and KWP, which were extracted by ranging methodologies. Co-occurrence network analysis and thematic map analysis are employed for the examination, with significant insights derived from the results presented in Chapter 4, followed by conclusions in Chapter 5.

2. Material and methods

2.1. Bibliometric analysis

Bibliometric analysis serves to outline the intellectual framework and research trends within a field through numerical indicators(Zhao et al., 2022,p.1). Bibliometric analysis, a systematic approach for assessing scientific literature, has experienced considerable progress since the beginning(Chen et al., 2018; Donthu et al., 2021; Ellegaard and Wallin, 2015; Li and Lei, 2020). Bibliometric analysis in academia is employed to assess the performance of publications and journals, discern collaboration patterns and emerging research trends, investigate the thematic and network structure of particular fields within the literature, and identify the nuanced variations in the accumulation and evolution of scientific knowledge(Laengle et al., 2020; Ragazou et al., Singh and Dhir, 2015, p.132)

The research employed RStudio in conjunction with the Bibliometrix extension for bibliometric analysis. RStudio(4.4.1) is extensively employed software for statistical computing, graphics, data science, and academic research. Bibliometrix is an auxiliary application and tool for performing quantitative research in scientific measurement and bibliometrics, specifically tailored for RStudio software(Ingale & Paluri, 2022).

[Table 1] Description of bibliometric analysis(Handoyo, S., 2024, p.4)

Analysis	Description	Aspects used in the study
Descriptive Analysis	In a bibliometric study, descriptive analysis entails the process of examining a dataset of scientific publications and summarizing its essential features and patterns. Through descriptive analysis, researchers gain insights into the characteristics and distribution of research outputs.	-Data description -Core journal based on Bradford's law -Production over time of core journal -Most cited documents -Most frequently words
Network Analysis	The network analysis method looked at the relationships and interactions between different parts of scientific literature, such as authors, institutions, journals, and publications. Researchers can learn about the structure, dynamics, and patterns of how scientific knowledge is made and shared by modeling these relationships as networks.	-Co-occurrence net works analysis - Thematic research network analysis -Thematic research quadrant analysis

Bibliometric analysis is primarily categorized into descriptive analysis and network analysis [Table 1]. In bibliometric studies, network analysis presents distinct advantages that enhance descriptive analysis by yielding a more profound and nuanced comprehension of the research landscape(Singh and Dhir, 2015,p.135). Descriptive analysis concentrates on presenting trends and distributions, including publication counts, frequently cited documents, and principal journals, whereas network analysis highlights the relationships and interactions among entities such as authors, institutions, and research areas. This relational emphasis allows researchers to identify collaborative patterns, thematic links, and knowledge transfers within a discipline.

Thus, network analysis augments bibliometric research by providing a more nuanced and strategic analytical dimension that beyond the capabilities of solely descriptive methods. This paper will concentrate on network analysis, which can more closely identify interrelationships by focusing on keywords, as Lee et al. (to appear) have conducted a descriptive analysis of sign language policy.

2.2 Data collection

WoS, an abbreviation for Web of Science, is the most commonly used and primary method for searching the SCI, SSCI, and A&HCI databases. WoS is a highly comprehensive and authoritative database platform for acquiring global academic information, regarded as the premier database for bibliometric analysis(Li et al., 2023). In this study, we searched WOS using the listed topic strings (TS)[1]with the search option set to 'Topic' to extract bibliographic information of publications containing 'language policy' or 'language planning' in the title, keywords, or abstract of the article. As it was confirmed that research on sign language has been published since 1998, to extract the data required for this study, the year of publication was set from 1998 to 2024, and the search database was limited to the index of SCI-grade academic articles indexes of SCI-level journals. The types of literature are articles, proceedings, and early access articles, and the language is limited to English. After manually screening the searched data, 51 articles were selected and saved as plain text files to complete the groundwork for further analysis.

1) For sign languages, TS = ("sign language" AND ("language polic*" OR "language planning"). The justification for formulating the search word as "language polic*" is to encompass both "policy" and "policies."

[Table 2] Main Information of the Dataset

Category	Descriptions	Results
Main information about data	Time span	1998-2024
	Sources(Journal, Books, etc.)	32
	Documents	51
	Annual Growth Rate %	7.77
	Average Citations Per Document	9.176
	References	2572
Document contents	Keywords Plus (ID)	83
	Author's Keywords (DE)	173
Document Types	Articles	49
	Articles; Early Access	218
	Articles; Proceedings Papers	45

The dataset contains a total of 51 documents in sign language policy[2] and shows an annual growth rate of 7.77%, indicating a consistent rise in research activity in recent years. The average age is about 4.98 years, suggesting that most of the research is relatively recent. Regarding keyword-related pluses(ID) and author keywords(DE), there are 83 KWP[3] and 173 corresponding AUK in sign language policy in the dataset. We performed a network analysis utilizing data obtained from both AUK and KWP to elucidate the themes and network structure of sign language policy, with the results detailed in the subsequent section.

2) This study is restricted by the limited amount of research on language policy in sign language extracted from the Web of Science. To compensate for this, future studies will expand the size of the data to include a broader range of literature such as SCOPUS.

3) Authors' Keywords(AUK) are self-selected by researchers when submitting papers to describe the research field, method or main concept of the paper. They are usually more specific and can reveal the specific content of the research and the researcher 's research perspective. Keywords Plus(KWP) are extracted from the reference title of the sample article, providing more information than the first two keywords. They may include broader terms that are relevant to the research topic, but may not be explicitly present in the article's title or in the keywords chosen by the author(Singh and Dhir, 2015, p.144; Wei et al, 2024, p.4; Zhang et al., 2016, p.968).

3. Results

3.1. Co-occurrence network analysis

Network analysis of co-occurrence links is a useful technique for investigating scientific mapping and the structure of the theme and network of data. It has been utilized to create graphs illustrating the relationships among various items within the dataset(e.g., authors, institutions, keywords) by analyzing keyword associations in literature, emphasizing the comprehension of knowledge components and the organization of the theme and network.

3.1.1 Co-occurrence network analysis of Author Keyword

A co-occurrence network map visually represents the relationships among elements within a particular dataset or text corpus. These entities may include words, phrases, tags, or other elements that can coexist. [Table 3] provides a comprehensive explanation of the facts underlying the co-occurrence network map.

[Table 3] Co-word Network Analysis of AUK in Sign Language Policy

Node	Cluster[4]	BC[5]	CC[6]	PageRank[7]
sign language	1	10	0.063	0.076
deaf education	1	9	0.059	0.056
multilingualism	1	0	0.053	0.035
bilingualism	1	0	0.04	0.023
inclusion	1	0	0.038	0.025
language policy	2	26	0.083	0.115
aranese language	2	0	0.059	0.064
catalan	2	0	0.059	0.064
catalan sign language	2	0	0.059	0.064
catalonia	2	0	0.059	0.064
language	2	0	0.059	0.064
language ideology	3	0	1	0.059
language practice	3	0	1	0.059
deaf	4	0	1	0.059
hard of hearing	4	0	1	0.059
language officialisation	5	0	1	0.059
language policy and planning	5	0	1	0.059

The analysis of the co-occurrence network for AUK reveals five distinct clusters, each characterized by unique interactions of Betweenness Centrality, Closeness Centrality, and PageRank. Cluster 1, encompassing five keywords, such as "sign language," "deaf education," and "inclusion," exhibits moderate Betweenness Centrality(3.8)[8] and Closeness Centrality(0.051), alongside a lower PageRank(0.043). This indicates a role as a foundational cluster connecting various themes but with limited influence across the broader network.

Cluster 2, containing six keywords, including "language policy," "catalan," and "catalonia," has the highest Betweenness Centrality (4.33) and Closeness Centrality(0.063), paired with a notable PageRank(0.0725). These metrics position this cluster as a pivotal hub for integrating interdisciplinary topics and forming critical connections. "language policy" shows the highest betweenness centrality value of 26, signifying its crucial function as a connecting node that links other terms within the network, thereby underscoring its central significance in the discussion of sign language policy.

Clusters 3, 4, and 5 each consist of two highly specialized keywords: Cluster 3 features terms such as "language ideology" and "language practice"; Cluster 4 includes "deaf" and "hard of hearing"; and Cluster 5 encompasses "language officialisation" and "language policy and planning." These clusters exhibit zero Betweenness Centrality but maximum Closeness Centrality(1.0) and moderate PageRank(0.059), representing isolated or niche themes deeply

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4) In bibliometric analysis, a cluster refers to a group of related items (e.g., keywords, articles, or authors) that share certain characteristics or connections, such as co-occurrence, citation relationships, or thematic similarity. Clustering helps identify patterns, group similar entities together, and reveal the structure of a dataset. Bibliometric clustering integrates network-based centrality measures (e.g., degree, closeness, betweenness) (For more details, refer to Ezugwu et al, 2021, p.5 <Fig. 2. Taxonomy of clustering algorithms>.)

5) BC stands for Betweenness Centrality(Bridges different parts of the network; interdisciplinary or emerging themes)

6) CC stands for Closeness Centrality(Measures how central and accessible :a node is widely connected topics)

7) PageRank measures the overall influence and importance of a node (authoritative or dominant themes)

8) This represents the mean value of the words inside each cluster.

interconnected within their respective domains but disconnected from broader interdisciplinary networks. Together, these clusters illustrate the field's structure, with some themes serving as central integrators and others as focused niches, highlighting the dynamic interplay between interdisciplinary connectivity and domain-specific depth.

Cluster 1 emphasizes foundational themes that underpin the broader field of sign language policy. These topics connect essential elements such as accessibility in education and social inclusion for Deaf individuals. Policies should focus on ensuring equitable educational opportunities and advocating for inclusive practices to strengthen the foundation for Deaf communities. Cluster 2 highlights the role of language policies in preserving regional identities and promoting linguistic diversity. It serves as a bridge connecting regional language issues to broader policy discussions. Cluster 3 explores ideological underpinnings and practical implementations of language policy. It underscores the importance of understanding sociocultural beliefs and their impact on policy development. Cluster 4 highlights the importance of tailoring policies to the unique requirements of these communities. Cluster 5 emphasizes the formal recognition and strategic planning of language policies, underscoring the need for structured and official support for sign languages.

3.1.2 Co-occurrence network analysis of Keyword Plus

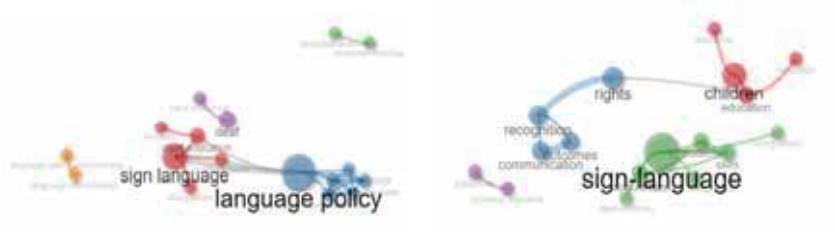
In the previous subsection, we examined the outcomes of the co-occurrence analysis performed with AUK. This subsection presents the findings of the co-occurrence analysis performed using KWP. The co-occurrence analysis results differ due to the distinct methodologies employed in generating AUK and KWP. The results of the analysis with KWP are displayed in the table below.

[Table 4] Co-word Network Analysis of KWP in Sign Language Policy

Node	Cluster	BC	CC	PageRank
children	1	6	0.059	0.063
education	1	14	0.077	0.084
discourse	1	0	0.043	0.036
language	1	0	0.053	0.033
rights	2	12	0.077	0.062
recognition	2	10	0.067	0.079
communication	2	0	0.05	0.057
outcomes	2	0	0.05	0.057
sign-language	3	12	0.167	0.129
acquisition	3	0	0.111	0.061
skills	3	0	0.111	0.07
students	3	0	0.111	0.07
bilingualism	3	0	0.091	0.027
cochlear implantation	3	0	0.091	0.027
deaf-children	3	0	0.091	0.027
cochlear implants	4	0	1	0.059
preschool	4	0	1	0.059

The co-occurrence analysis of KWP data reveals four distinct clusters, each contributing uniquely to the thematic structure of the research field. Cluster 1, comprising keywords such as "children," "education," "discourse," and "language," focuses on foundational themes in education and language development. With moderate Betweenness Centrality(5.0) and Closeness Centrality(0.058), it connects various subfields but does not dominate the network. Cluster 2, defined by keywords such as "rights," "recognition," "communication," and "outcomes," is pivotal to discussions on social justice and policy. It exhibits the highest Betweenness Centrality(5.5) and Closeness Centrality(0.061), reflecting its role as an interdisciplinary bridge, with a notable PageRank(0.0638) highlighting its influence in integrating justice, communication, and public policy research.

Cluster 3, the largest cluster, includes terms such as "sign-language," "acquisition," "skills," "students," "bilingualism," "cochlear implantation," and "deaf-children." Despite its lower Betweenness Centrality(1.71), its higher Closeness Centrality (0.110) emphasizes its focus within its domain, while a moderate PageRank(0.0587) suggests influence in applied research on bilingualism, language acquisition, and strategies for the deaf and hard-of-hearing communities. Finally, Cluster 4, featuring "cochlear implants" and "preschool," represents a focused niche in early childhood education and technological interventions. With zero Betweenness Centrality, it is isolated within the network but achieves maximum Closeness Centrality (1.0), reflecting tight integration in its domain, supported by a moderate PageRank (0.059). This cluster underscores the importance of early interventions in supporting language and communication development for children with hearing impairments.



[Figure 1] Co-occurrence network analysis of AUK and KWP

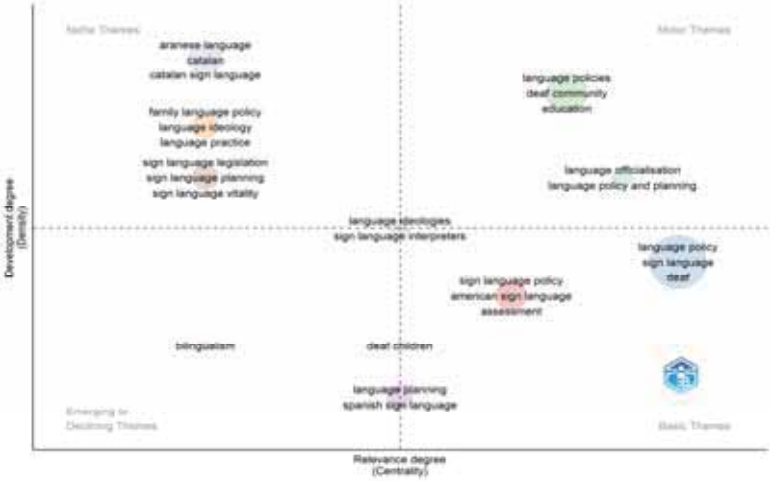
Together, these clusters demonstrate the interconnected yet diverse nature of research within the field. Cluster 1 highlights the importance of integrating sign language into early childhood and mainstream education systems to promote linguistic equity. Cluster 2 indicates that policy enforcement agencies must enhance their legal frameworks to ensure the full recognition of sign languages as equal to spoken languages and promote campaigns that address social stigma and advocate for the linguistic rights of Deaf individuals. Cluster 3 focuses on applied research in language acquisition, skills development, and bilingual education, particularly addressing Deaf and hard-of-hearing students.

3.2 Thematic map analysis

Thematic map analysis is a bibliometric technique that finds, visualizes, and elucidates the principal issues addressed in extensive academic literature. This strategy provides a comprehensive understanding of the study's scope and distinctly clarifies significant patterns and areas requiring further inquiry (Handoyo, S. ,2024, p.15; Singh and Dhir, 2015, p.144). Themes are employed in bibliometric research to categorize and analyze the multitude of subjects inside the literature. The themes are categorized into four types: basic, motor, niche, and emerging/declining. Each theme type serves a crucial role in the development, expansion, and organization of the research domain. Basic themes underscore the essential domains of the inquiry. Motor themes delineate the most dynamic and impactful domains. Niche themes reveal specialized or inadequately examined domains. Emerging themes indicate possible future trajectories. Conversely, declining themes refer to research issues that have ceased to attract scholarly interest.

[Figure 2] is a thematic map[9] that provides a detailed view of the visual graphic generated from KWP data extracted from Bibliometrix. This visualization reveals four quadrants—Motor Themes, Niche Themes, Emerging or Declining Themes, and Basic Themes—each representing the developmental stage and significance of research topics.

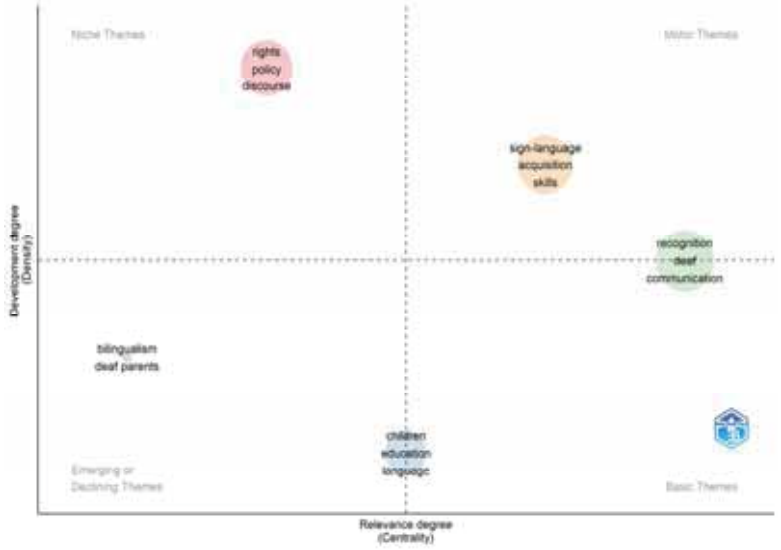
9) The thematic map provides a complementary perspective to the co-occurrence analysis by categorizing themes based on their centrality (relevance) and density (development). These motifs can be categorized into four quadrants on a two-dimensional graph, utilizing density and centrality as the two axes(Singh and Dhir, 2015:144).



[Figure 2] Thematic map quadrant of AUK

Keywords like "language policies," "deaf community," and "education" in the Motor Themes quadrant indicate topics that are both highly relevant and well-developed, driving research in the field. The Niche Themes quadrant, which includes "aranese language," "catalan sign language," and "family language policy," highlights specialized and highly focused areas with strong internal development but limited interdisciplinary relevance. In the Basic Themes quadrant, foundational topics such as “language policy”, “sign language”, and “deaf” exhibit high centrality but low density, indicating that they form the groundwork for this field. Lastly, the Emerging or Declining Themes quadrant contains keywords like "bilingualism" and "language planning," signaling themes that are either gaining momentum or waning in influence.

[Figure 3] presents a thematic map that offers an extensive illustration of the visual graphic derived from AUK data obtained through Bibliometrix.



[Figure 3] Thematic map quadrant of KWP

In the Motor Themes quadrant, keywords such as "sign-language," "acquisition," and "skills" emerge as both highly relevant and well-developed, which exhibit high centrality and hign density indicating their pivotal role in driving advancements in other field. The Niche Themes quadrant features "rights," "policy," and "discourse," representing specialized areas with strong internal focus but limited interdisciplinary connectivity. These topics highlight concentrated scholarly efforts on social justice and language policy. In the Basic Themes quadrant, foundational concepts such as "recognition," "deaf," and "communication" are central to the research field but remain less developed, underscoring their significance as groundwork for future exploration. Lastly, the Emerging or Declining Themes quadrant includes keywords like "bilingualism" and "deaf parents," suggesting areas either gaining relevance or losing prominence.

Compared to the co-occurrence analysis, which identifies networked relationships between keywords, the thematic map offers a macro-level overview of research maturity and thematic importance, providing a strategic lens for understanding established areas and potential growth directions within the academic landscape.

4. Discussion

The co-occurrence network analysis reveals distinct differences between AUK and KWP data, particularly in their data sources, centrality metrics, and thematic focus. AUK are explicitly provided by the authors, reflecting the core focus of their individual studies. As a result, they are narrower in scope and more specific, often highlighting niche topics and specialized terms. These keywords tend to form tightly clustered and specialized groups with high Closeness Centrality, indicating strong internal connectivity within themes like "language ideology," "deaf," and "language officialisation." However, their Betweenness Centrality is generally lower, as they primarily serve niche roles rather than acting as bridges between broader research domains. For example, Cluster 2 in AUK exhibits the highest Betweenness Centrality (4.33), reflecting its role in connecting specific areas such as "language policy" and "catalonia." This network structure makes AUK ideal for exploring specific research gaps and identifying trends within specialized subfields.

In contrast, KWP data are algorithmically generated from frequently cited terms in titles and references, offering a broader and more contextual overview of the research field. These keywords frequently exhibit higher Betweenness Centrality, signifying their role in connecting diverse and interdisciplinary themes. For instance, Cluster 2 in KWP, featuring terms like "rights," "recognition," and "communication," has the highest Betweenness Centrality (5.5), emphasizing its function as a bridge between social justice and communication domains. Additionally, the Closeness Centrality of KWP terms highlights broader accessibility across the network, with clusters like "sign-language," "acquisition," and "bilingualism" connecting multiple subfields. This broader thematic scope allows KWP to highlight interdisciplinary opportunities, foundational themes, and collaborative potential, making it more suitable for understanding overarching research trends and mapping the intellectual landscape of a field. Together, the two datasets provide complementary insights, balancing domain-specific depth with interdisciplinary breadth.

Thematic maps of AUK and KWP data illustrate significant differences in their data sources, thematic emphasis, and cluster distribution, offering

complementary perspectives on the research area. Thematic maps derived from AUK reflect the authors' perspectives, focusing on specific, niche topics tied directly to individual studies. These maps capture specialized areas , such as "Catalan Sign Language," "Sign Language Legislation," and "language ideology" in Niche Themes, and foundational but underdeveloped topics like "Sign Language Policy" and "deaf" in Basic Themes. In contrast, KWP maps are generated algorithmically, offering a broader context by extracting frequently cited terms. These maps highlight wider thematic contexts, such as "children," "education," and "language" in Basic Themes, and interdisciplinary connections like "rights," "recognition," and "communication" in Motor Themes. Thematic maturity also varies between the two; AUK emphasize specific themes at varying developmental stages, with Motor Themes like "language-officialism" and "deaf community" reflecting application-driven research. On the other hand, KWP maps provide a higher-level view of thematic maturity, with Motor Themes emphasizing well-developed and highly relevant topics such as "Sign Language" and "acquisition." Together, these thematic maps offer a nuanced understanding of the research field, balancing detailed exploration of niche areas with a broader view of interdisciplinary connections and overarching trends.

The foundational clusters (Cluster 1) in both analyses (AUK and KWP) underscore the essential significance of education and early language acquisition, indicating the necessity for policies that incorporate sign language into early childhood education, teacher training programs, and bilingual educational frameworks. Advocacy-oriented clusters (Cluster 2) emphasize the imperative of legally recognizing sign languages as equivalent to spoken languages, with public initiatives to mitigate stigma and advance linguistic rights. A strong emphasis on interdisciplinary collaboration across education, advocacy, and technology can connect topic clusters and facilitate comprehensive language planning. Ultimately, synchronizing national initiatives with global best practices can enhance the legal and educational frameworks essential for preserving the linguistic and cultural variety of Deaf populations globally.

5. Conclusion

Understanding sign language policy is crucial to confronting the enduring myths and systematic injustices associated with sign languages. Despite decades of acknowledgment as authentic human languages and their validation as full languages from evolutionary and genetic viewpoints, sign languages persist in experiencing marginalization in policy and practice. The uneven position of sign languages, even in countries with legal provisions, mirrors wider societal prejudices, including oralism. These problems underscore the significance of comprehensive language policies that not only advocate for the linguistic rights of Deaf populations but also acknowledge sign languages as equivalent to spoken languages. Investigating sign language policy is essential for addressing systematic disparities, fostering the preservation and advancement of sign languages, and guaranteeing linguistic and cultural fairness for Deaf populations globally.

Network analysis in Bibliometrix provides a systematic and dynamic viewpoint, illustrating the evolution of research trends and networks across time. These findings contribute to research by identifying deficiencies and emerging trends, making network analysis an excellent tool for guiding future investigations. In co-occurrence network analysis, AUK emphasize niche and specific themes, offering a detailed view of specialized subfields. In contrast, KWP provides a broader, interdisciplinary perspective, highlighting overarching themes and connections across domains. While AUK are valuable for pinpointing precise research areas, KWP excels at identifying bridges between disciplines and understanding the larger research landscape. Together, they offer complementary insights, balancing depth and breadth in bibliometric analysis.

The thematic map analysis of both AUK and KWP data provides a comprehensive visualization of research themes, categorizing them into Motor Themes, Niche Themes, Emerging or Declining Themes, and Basic Themes. Motor Themes, such as "language policies," "sign-language," and "acquisition," are highly relevant and well-developed, driving advancements in key areas like applied linguistics, education, and social justice. Niche Themes, including "Catalan Sign language" and "rights," highlight specialized and focused areas

with limited interdisciplinary connections, reflecting concentrated scholarly efforts. Basic Themes, such as "recognition," "deaf," and "language policy," represent foundational but underdeveloped concepts. Emerging or declining themes, such as "bilingualism" and "language planning," indicate subjects that are either gaining traction or losing significance.

By integrating the findings from co-occurrence network and thematic map analyses into decision-making processes, policymakers can create evidence-based, inclusive policies that address the unique challenges and opportunities in language planning, education, and accessibility. These insights enable targeted interventions, foster interdisciplinary collaboration, and ensure that linguistic rights and cultural diversity are upheld in both national and international contexts.

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