

# EARLY BILINGUAL EDUCATION: A GENERAL BIBLIOMETRIC APPROACH AND CONTENT ANALYSIS USING SCIMAT

## EDUCACIÓN BILINGÜE TEMPRANA: ENFOQUE BIBLIOMÉTRICO GENERAL Y ANÁLISIS DE CONTENIDO CON SCIMAT

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## Abstract

Bilingual and multilingual education have certainly gained popularity in the past decades since societies are becoming increasingly aware of the need to welcome additional languages into the school curricula to equip citizens with a functional use of several languages. However, research about the extent to which bilingual practices are present in Early Childhood Education (ECE) has not been fully exploited, mainly because this is a non-obligatory educational stage in most countries, and due to the wide variety of educational contexts in which such practices can take place. This study aims to conduct a bibliometric analysis of ECE, using as a reference the publications in the *Web of Science Core Collection* from 1988 to 2022. For this purpose, 1011 publications were analyzed by applying advanced bibliometric techniques in *SciMAT* bibliometric analysis software. It is hoped this research will serve as a framework to identify existing research lines and outline new ones, establishing synergetic relationships that would not be visible without the maps generated herein.

**Keywords:** Bilingual Education, Early Language Learning, Bilingualism, mapping analysis, bibliometric analysis.

## Resumen

La enseñanza bilingüe y multilingüe han ganado en popularidad en las últimas décadas, ya que las sociedades son cada vez más conscientes de la necesidad de introducir lenguas adicionales en los currículos con el objetivo de que los ciudadanos puedan tener un uso funcional de distintas lenguas. Sin embargo, la investigación en relación con la presencia de las prácticas bilingües en educación infantil apenas ha sido desarrollada, principalmente debido a la no obligatoriedad de este nivel educativo en la mayor parte de los países, así como a la enorme variedad de distintos contextos donde se desarrolla. Este estudio pretende llevar a cabo un análisis bibliométrico de la educación bilingüe temprana utilizando como referencia las publicaciones en *Web of Science Core Collection* de 1998 a 2022. A tal efecto, 1011 publicaciones fueron analizadas aplicando técnicas bibliométricas avanzadas utilizando el análisis bibliométrico *SciMAT*. Se espera que esta investigación sirva como marco para identificar líneas de investigación existentes y nuevas, estableciendo relaciones sinérgicas que no serían visibles sin el mapeado generado en el artículo.

**Palabras clave:** Educación bilingüe, aprendizaje temprano de lenguas, bilingüismo, mapeo, análisis bibliométrico.

## 1. Introduction

Over the last three decades, the generalization of bilingual and plurilingual programs from primary to higher education has led to a large body of research on the topic, especially within the European context. At the Pre-primary level, however, research is scarcer (Thieme et al. 2021), and frequently refers to family contexts where other languages are also acquired from birth (heritage language or emphasis of input in foreign languages from parents/caregivers). In academic contexts, the introduction of additional languages addressed to very young learners is more heterogeneous (Goorhuis-Brouwer and de Bot 2010), non-systematic and, when present, is frequently limited to showering in the additional languages. Notwithstanding this, a significant change has been taking place since 2017, when Ferjan Ramirez and Kuhl's (2017) studies demonstrate the importance of introducing additional languages in Early Childhood Education/Pre-primary schools as well as the cognitive advantages of Early Language Learning and acquisition (see also Kuhl et al. 2016). The impact of this research led to a significant increase in the teaching of

additional languages in Europe within Early Childhood Education (ECE). It also generated an increasing interest in this stage (Ferjan Ramirez and Kuhl 2020), which is key in the development of bilingual proficiency.

In order to identify ongoing research regarding bilingual practices within Pre-primary levels, this paper uses a bibliometric analysis covering authorship, production, and thematic analysis of the main and secondary research themes related to Bilingualism and early learners from 1988 to December 20, 2022. In addition, the areas of development of scientific knowledge associated with this topic are analyzed through *SciMAT* as it offers a complete approach to the field, and evaluates the main performance indicators related to Bilingual Education and Early Language Learning.

Scientific journals are thought to represent one of the main sources of research, projects, and added-value information, providing a new reference point for conducting novel and cutting-edge research into Early Bilingual Education. Therefore, complete bibliometric analysis becomes a key tool for evaluating ongoing actions and research, organizations, countries, sources, and researchers (Bonilla-Aldana et al. 2020; Hossain 2020).

Using bibliometric techniques and tools, the present research focuses on an analysis and description of the development of research themes about Early Bilingual Education and the main related concepts which are available in the literature. First, the research quantifies the main performance-related indicators, i.e., published documents, received citations, journal impact factor (JIF), h-index, most cited articles, most cited authors, and data on the geographical distribution of publications, among others. Secondly, *SciMAT* is used as a science mapping software tool to analyze the areas of development of scientific knowledge associated with Early Bilingual Education within a defined time span (Cobo et al. 2012; López-Robles et al. 2020).

The exponential growth of topics and themes related to Early Bilingual Education calls for an evaluation of the emergent research themes and sub-themes on this subject matter with an emphasis on the most common pedagogical practices, models and implications. This research specifically analyzes (1) the latest research on Early Bilingual Education in the international context, and (2) the main thematic lines that guide the different studies carried out in this field in order to delve into the main topics and most relevant areas. More specifically, the current analysis aims to develop a systematic review to answer the following research questions related to Bilingual Education in early childhood:

- RQ1. What has been the growth of publications indexed in the Web of Science (WoS) database between 1988 and December 2022 focusing on Early Bilingual Education?

- RQ2. What are the most salient journals, authors and publications on the topic?
- RQ3. What are the key emerging research themes and sub-themes on Early Bilingual Education?

RQ1 and RQ2 are key for researchers who wish to publish papers and understand the subject matter in depth. RQ3 aims to provide insightful novel contributions regarding the identification of research clusters by means of a co-citation analysis. This study is structured as follows: After this brief introduction presenting the goal of the study and the research questions, section 2 covers the state of the art regarding the history and evolution of Early Bilingual Education. Section 3 presents the methodology and data collection used for the study. Section 4 shows the bibliometric analyses including countries, authors and most cited or relevant papers, among others. Finally, section 5 summarizes the main findings and conclusions about the research conducted in *SciMat*.

## 2. State of the Art

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Early Bilingual Education, comprising a variety of models of early years' education offered to children aged between three and about five or six years, and which operates at the critical nexus between home and school, is thought to offer children an opportunity to acquire a second language or to enrich their home language (Hickey 2012). The critical period of learning languages (Lenneberg 1967) has certainly influenced the trend to start to learn languages earlier in life. Today, the existence of this critical period or the age hypothesis is discussed (Hakuta et al. 2003; Muñoz 2006; Dolean 2015; Muñoz and Singleton 2011, among others), confirming that age has never ceased to be related to language learning. Nowadays, policy-makers tend to recommend language learning early in life due to the numerous benefits it entails, such as the social and cognitive advantages as well as the effect on phonological consciousness (Madrid 2001; Cenoz 2003), which outweigh the downsides (Byalstok 2018) sometimes observed regarding this controversial issue. In Europe, the emphasis on providing bilingual input to young children is nothing new but tended to be confined to the elite in most contexts until the arrival of the European Commission recommendations for the introduction and promotion of language education in the early years. This was, in fact, a key influential document at that time since it points out the relevance of Pre-primary/Early Childhood Education as the key stage on which future language learning is based (European Commission 2003). In the next decade, this document was followed by a strategic framework for making this language learning efficient and sustainable (European Commission 2011). Today, compared with nearly two

decades ago, students are learning a foreign language from a younger age in most educational systems (European Commission 2023: 20). Finally, it is worth considering that some approaches to Bilingual Education are currently starting to be implemented at this stage, as is the case of Content and Language Integrated Learning (CLIL) (Otto and Cortina-Pérez 2023), anticipating a change in the way languages are treated in ECE, and which will undoubtedly have an impact on the next generations' command of languages.

Nowadays, there is unanimous consensus on the importance of the Pre-primary education stage in the social, physical, emotional, and cognitive development of a child, mainly due to the strong prominence that Early Language Learning and Bilingual Education have gained in the educational context. The relevance of this period has not gone unnoticed by current educational research, and ECE has been analyzed from multiple perspectives in pursuit of a better understanding of the teaching-learning process at this stage, as shown, for instance, in Andúgar, Cortina-Pérez and Tornel (2019) regarding foreign language provision at the Pre-primary stage in the Spanish scenario. The growing research interest in childhood education (see Heikka et al. 2019, in this respect) runs parallel to the number of specific studies worldwide. Notwithstanding this, analyses of the emerging themes derived from these publications are scarce, since there are “few studies that investigated research trends of ECE from the bibliometric perspective” (Khodabandelou et al. 2018: 142). Despite this limitation, however, it is possible to find certain analyses sharing similarities with the present study, as will be described below.

Çelik's (2022) bibliometric work, covering the period from 1972 to 2022, analyzes indicators related to ECE which are also present in this study (most common language of publication, most productive countries or most frequently used words, among others). Similarly, the clusters obtained in Wang and Lv's (2021) bibliometric work yield information on the most prolific areas in the field of early education (North America, China, Australia and New Zealand) and the importance of interdisciplinary work in research in this field. This information complements the data obtained regarding the main objectives of their work: the “hot topics” in ECE being “childcare, school readiness, early education quality, effortful control, self-regulation, teacher-student relationships, and family factors” (Wang and Lv's 2021: 14).

Some other bibliometric studies in the field of ECE focus on specific issues. Thus, Su et al. (2022), using the bibliometric approach, identified the key themes from research in ECE during the COVID-19 pandemic. Understandably in this case, themes such as students' families, online learning and teaching, physical activity, and stress and mental health emerge from the study. Shirasu et al. (2022) study the effect of ECE on school performance, eliciting research studies which show

cognitive and non-cognitive gains related to school attendance. Finally, Yilmaz et al. (2022) provide a bibliometric mapping analysis on foreign language teaching in pre-school, also examining the technology used in this stage. These studies and some others (Guo 2021; García-Pérez et al. 2022; Hoang et al. 2023, among others) are examples of the interest in recent research on ECE, despite the above-mentioned difference (quantity-wise) with bibliometric studies based on the other educational stages. To our knowledge, there is no bibliometric analysis concerning ECE and the acquisition of more than one language. This is where this study expects to shed some light.

### 3. Methodology and Dataset

#### 3.1. Methodology

Bibliometric methods represent some of the most common and widely accepted techniques for analyzing the output of basic and advanced research. They are commonly used to map the state of the art in each area of academic literature. The indicators they provide help to measure scientific output and its quality, productivity and evolution (Moed et al. 1995; Hirsch 2005; Moed 2009; Kalantari et al. 2017; de Oliveira et al. 2019).

Currently, the bibliometric methodology is used in combination with science mapping and performance analysis (Cobo et al. 2012). It is also used to analyze the trends of certain specific fields (Kalantari et al. 2017), and to detect and visualize specific or general thematic areas. As observed by Hirsch (2005), among others, this methodology is based on co-word analysis and the h-index.

Of the different software tools available for science mapping analysis (see Moral-Muñoz et al. 2020, for the different options), this study uses *SciMAT*. According to Cobo et al. (2012: 1609), the following three features make this tool valuable for science mapping: (a) it has a powerful preprocessing module to clean raw bibliographical data, (b) it enables the use of bibliometric measures to study the impact of each studied element, and (c) it uses a wizard to configure the analysis. Following these authors, the following four phases of analysis can be identified:

1. Detection of research themes through the clustering algorithm (Coulter et al. 1998) over a normalized co-word network (Callon et al. 1983).
2. Visualization of research themes and thematic network in a diagram. This diagram shows the centrality (which measures the degree of interaction of a network with other networks) and the density rank of the detected themes (which measures the internal strength of the network). Both types of measure

allow the visualization of Early Bilingual Education as a field of research with a set of research themes plotted on a two-dimensional strategic diagram (Fig. 1 (a)). The detected themes can be classified into four categories (Cobo et al. 2012):

- a. Motor themes (see Quadrant Q1) or the relevant themes for developing and structuring the research field in question. They present strong centrality and high density.
  - b. Highly developed and isolated themes (see Quadrant Q2), which are strongly related to the motor and relevant themes in (a), are highly specialized and peripheral but do not display the appropriate background or importance for the field.
  - c. Emerging or declining themes (see Quadrant Q3), which are relatively weak and show low density and centrality as they mainly represent either emerging or disappearing/SYNONYM themes.
  - d. Basic and transversal themes (see Quadrant Q4), which are relevant for the field of research but have not been sufficiently developed. They consist of cross-cutting and general basic themes.
3. Main thematic areas. The above-mentioned research themes are analyzed by means of an evolution map (see Fig. 1 (c) below), which links those themes having a conceptual nexus across consecutive periods.
  4. Performance analysis, i.e., the extent to which research themes and thematic areas have relatively contributed to the whole field of research is measured using both qualitative and quantitative means. This performance analysis can be later used to identify the most productive and relevant areas within the research field (see Table 1 below).

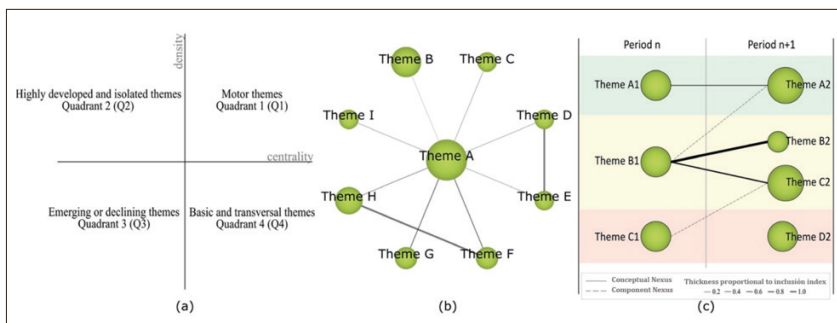


Figure 1. (a) strategic diagram, (b) thematic network, and (c) thematic evolution

Configuration	Values
Analysis unit	Keywords authors, keywords WoS
Frequency threshold	Keywords: P1 = (1), P2 = (1), P3 = (1)
Network type	Co-occurrence
Co-occurrence union value threshold	Keywords: P1 = (2), P2 = (2), P3 = (2)
Normalization measure	Equivalence index
Clustering algorithm	Maximum size: 7; Minimum size: 3
Evolutionary measure	Jaccard index
Overlapping measure	Inclusion Index

Table 1. *SciMAT* indicators of configuration

In addition to science mapping analysis, the present research seeks to identify the citation classics, that is, highly cited articles. For this purpose, the concept of H-Classics proposed by Martínez et al. (2014) is used, which can be defined as follows: “H-Classics of a research area ‘A’ could be defined as the H-core of ‘A’ that is composed of the ‘H’ highly cited papers with more than ‘H’ citations received” (Martínez et al. 2014: 1976).

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### 3.2. Dataset

Publications related to Early Bilingual Education were gathered to analyze their bibliometric features and conduct science mapping. Different corpora and queries were proposed for collecting articles related to Early Bilingual Education from different databases. In this analysis, the authors focused on the queries suggested for Web of Science (WoS), and more specifically they followed the advice suggested by the International Society for Scientometrics and Informetrics (ISSI) distribution list. The present study, therefore, focuses on the following concepts: “early language learning” or “early childhood education” or “preschool” or “early language” or “early education” and “biling”\*.

Consequently, the raw data (publications) were compiled using the WoS, considered the most important database, since it covers a wide range of disciplines and therefore allows comparisons across scientific fields. The publications devoted to Early Bilingual Education and the above-mentioned themes were all downloaded from the *Web of Science Core Collection* using an advanced query, which gathered a total of 1011 publications from 1988 to 2022. The corpus was further refined and limited to the English language and the following types of publications: articles, proceedings and reviews. The citations from these publications were likewise used in this research, being gathered up to 2022. Finally, a total of 955 valid documents were selected for analysis.



After importing the complete raw data into *SciMAT*, a deduplication process was also conducted to improve the data quality by grouping meanings and concepts representing the same notion: “early language learning” or “early childhood education” or “preschool” or “early language” or “early education” and “biling”\*.

Secondly, in order to avoid flatness of the collected data, the whole span of years was divided into consecutive periods. Since those periods were observed to cover the same time spans, and given the low number of publications obtained through the query in the early years, the best option was to split the time span into comparable periods. Therefore, the study period (1988-2022) was subdivided into three consecutive periods: 1988 to 2013 (P1), 2014 to 2018 (P2), and 2019-2022 (P3) with 99, 172 and 186 publications corresponding to the most salient themes, respectively.

Thus, next section deals with the evolution of Early Bilingual Education in terms of publications, citations, and impact by analyzing the following bibliometric indicators: published documents, received citations, journal impact factors, most cited publications, most cited authors, h-index, research areas, and data on the geographical distribution of publications.

The bibliometric performance analysis is therefore structured into three sections: production and impact of published documents; production and impact of authors, journals, and research areas; and H-Classics analysis.

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## 4. Results

### 4.1 Bibliometric Analysis of Early Bilingual Education

This section aims to conduct a bibliometric analysis of terms related to Early Bilingual Education and Bilingualism. Specifically, the analyses are carried out on the basis of literature corpus around the main characteristics of publications (areas of research, language of publication, most productive authors, among others), citations and impact, analyzing the following bibliometric indicators for publications between 1988-2022:

- Diachronic evolution, geographical distribution
- Main languages
- Research areas
- Predominant/Main WoS categories
- Most productive authors

Figure 2a shows the diachronic evolution of the number of publications identified in the last 15 years. As can be observed, there is a clear ascending pattern in the

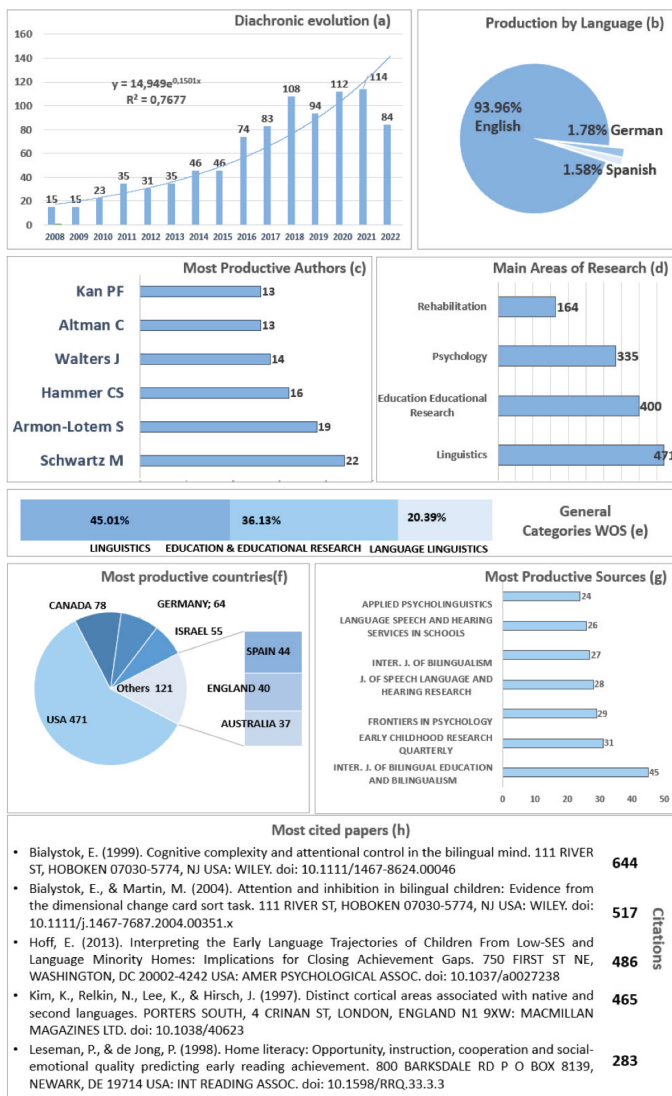


Figure 2. Diachronic evolution of production (a); Production by language (b); Most productive authors (c); Main areas of research (d); General categories in Web of Science (WoS) (e); Most productive countries (f); Most productive sources (g); Most cited papers (h)

literature from 2008. In this respect, and to make the graph more visually legible, publications prior to 2008 (significantly scarcer) are omitted (in this case, the positive trend is shown with  $r=0.77$ ).

The growth in the analyzed period is progressive, although it is important to take into consideration the following aspects: first, two relevant interannual increases stand out in the years 2015-2016 and 2017-2018 with 60.87% and 30.12%, respectively. Secondly, we should be cautious when interpreting the 2021-2022 period since documents are still being incorporated into the WoS and this change cannot be measured. However, the increase in the already positive trend observed from 2016 onwards suggests an increase in the latest research in recent years. The objective of the publications, i.e., scientific dissemination, depends to a large extent on the vehicular language used by researchers. In the case of this study, English stands out as the most used language of publication (Figure 2b), far above the rest (93.96% of the total production). As for the rest, 1.78% has been published in German, 1.58% in Spanish and less than 3% of the total has been published in other languages. This result is not surprising, since English is the lingua franca most frequently used in academia.

With regard to the geographical distribution of publications, these studies point to the United States and Canada as the countries with more publications on the topic, coinciding with the current study. Specifically, the United States is far ahead (471 publications) followed by Canada with 78 publications (see Figure 2f), while the rest of the papers are distributed among a wide range of countries. This can be explained by the tradition of studying Bilingual Education in these two countries, pioneers in this research since the studies carried out by Peal and Lambert (1962), among others. Over time, and especially through the interest and generalization of bilingual programs from an early age in other parts of the world, research on the topic has originated in various countries (mainly Israel, Australia, Spain and UK as indicated in Figure 2f).

In relation to the areas of knowledge (Figure 2d) and the general WoS categories (Figure 2e), LINGUISTICS leads the classification with 471 publications and 45.01%, respectively. The next area, EDUCATION, takes second place with 400 publications and 36.13% of the publications analyzed. These two areas were expected in the search, and frequent interrelations between both areas take place when studying language learning and development in academic contexts.

Along with the organizations that endorse the publications, and the areas and categories in which they are framed, it is essential to determine the most productive authors and the most cited papers in the analyzed period in order to evaluate the evolution of the field of research. Thus, Figure 2c shows the most productive

authors, where not very disparate figures are observed: 22 papers by Schwartz, followed by 19 and 16 papers by Armon-Lotem and Hammer, respectively. In general, Schwartz's research deals with the conceptualization of preschool bilingual education as a distinct area and the language practices and agency of bilingual preschool teachers, while Armon-Lotem focuses on vocabulary, metalinguistic awareness and language dominance in bilingual preschoolers. Hammer is well known for his studies on language pathologies, early language and reading development among bilingual kids. Finally, as shown in Figure 2h, there are two publications that stand out in terms of citations as compared to the others, namely those by Bialystok (2018) on analysis (representation) and control (selective attention) as basic components of language processing among bilingual children, and Bialystok and Martin (2004) on attention and inhibition in young bilinguals. These figures corroborate the relevance of Bialystok's research and her trajectory; her leading research in other related fields such as Psycholinguistics offers similar figures.

#### 4.2. Thematic Evolution Analysis

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To carry out the thematic analysis of the literature, the papers are divided into three main periods: from 1989-2013 (P1), from 2014-2018 (P2) and from 2019-2022 (P3). A balanced division of documents is followed as a criterion for separating the periods. The three periods show a certain consistency, as can be observed in Figure 3, which represents the evolution of keywords in the three periods (P1 - first circle; P2 - second circle; P3 - third circle); it shows output arrows, which indicate the number of keywords maintained in the next period (15 and 22), while a total of 68 new keywords appear in the second period and 26 in the third one. Specifically, there is a consistency of 0.89 and 0.88 between periods, indicating little thematic variability between them.

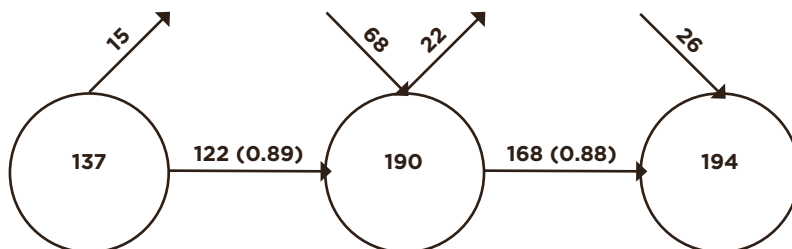


Figure 3. Evolution of the keywords in different periods

# Early Bilingual Education: A bibliometric approach

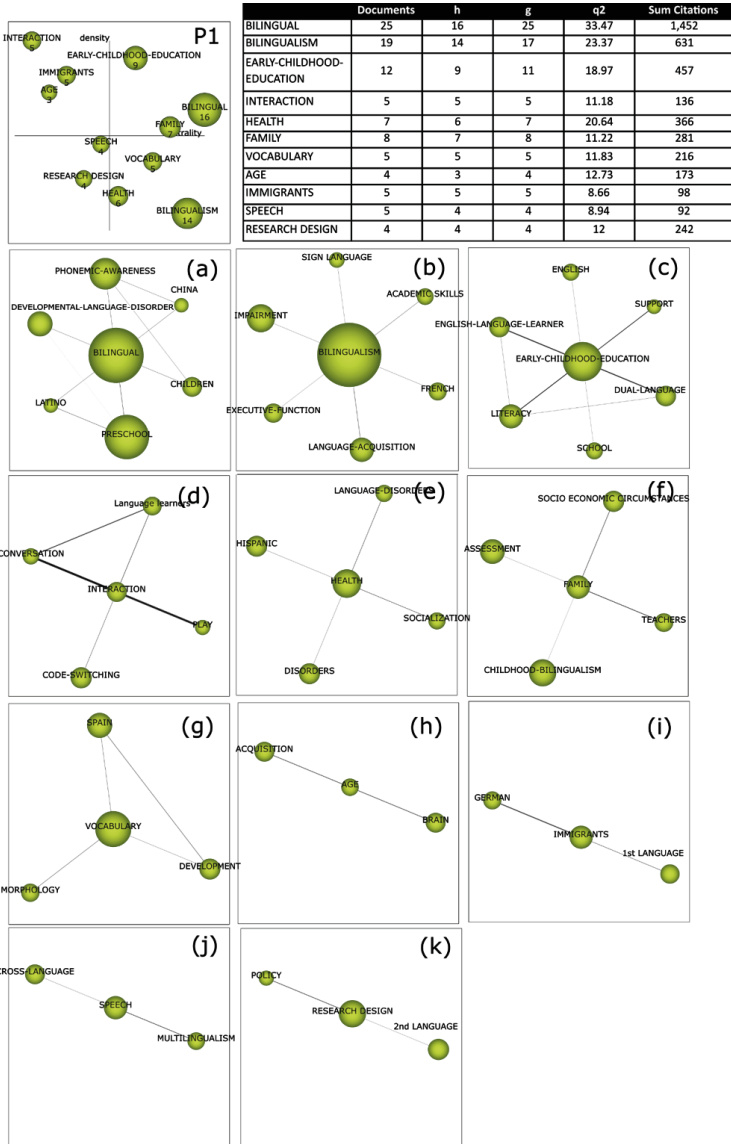


Figure 4. Strategic diagram for period 1

Turning now to the specific analysis of each period (P1, P2 and P3), the strategic diagrams show the values of centrality and density for the main concepts. In addition, the images and their size represent the reference proportional value, calculated according to the h-index.

During period 1 from 1989 to 2013 (P1), eleven research themes related to Bilingualism and Bilingual Education could be identified, which are visible in the strategic diagram P1 (Figure 4). Among them, six are considered key as driving themes, core themes and cross-cutting themes: EARLY-CHILDHOOD-EDUCATION, BILINGUAL, BILINGUALISM, FAMILY, VOCABULARY and HEALTH, with the first three standing out for their h-index, number of publications and sum citations (see Figure 4 (a), (b), (c), (f) and (g) and the corresponding table for P1). The presence of the term FAMILY is noteworthy, which will not appear as an emergent theme in the subsequent periods. The fact that learning additional languages in academic environments has become more popular in more recent years might explain the salience of this term in the first period: the family context was the main context of exposure to more than one language in homes where bi- or plurilingualism was the norm.

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For the second period (2014-2018), as indicated in the strategic diagram P2 (Figure 5 and corresponding table), thirteen research topics were identified as being directly related to the analyzed terms. Seven out of these thirteen topics are driving, basic and cross-cutting themes: INFANTS, INTERVENTION, READING, BILINGUALISM, BILINGUAL, EARLY-CHILDHOOD-EDUCATION, LANGUAGE. The classification according to their h-index shows BILINGUAL, BILINGUALISM and EARLY-CHILDHOOD EDUCATION standing out in the first place, followed by INTERVENTION and READING. EARLY-CHILDHOOD-EDUCATION, BILINGUAL and BILINGUALISM also appear as basic or cross-cutting themes as they did in the previous period.

Less salient themes are mostly related to oral skills, since the learners' age conditions oral approaches in the acquisition/learning of additional languages. Therefore, terms such as SPEAKING, HEARING or SPEECH establish more networks than terms explicitly related to written skills (see Figure 5).

The third period (2019-2022) takes into consideration those works published after the publication of the Companion Volume to the CEFR (Council of Europe 2018). This publication is especially relevant for the Pre-primary/Early Childhood Education stage, since it emphasizes language education across the curriculum. This policy had been previously introduced in the Primary stage of education mainly through the CLIL approach, and it is therefore expected it would also be of interest once it was generally implemented in the Pre-primary/Early Childhood Education stage.

# Early Bilingual Education: A bibliometric approach

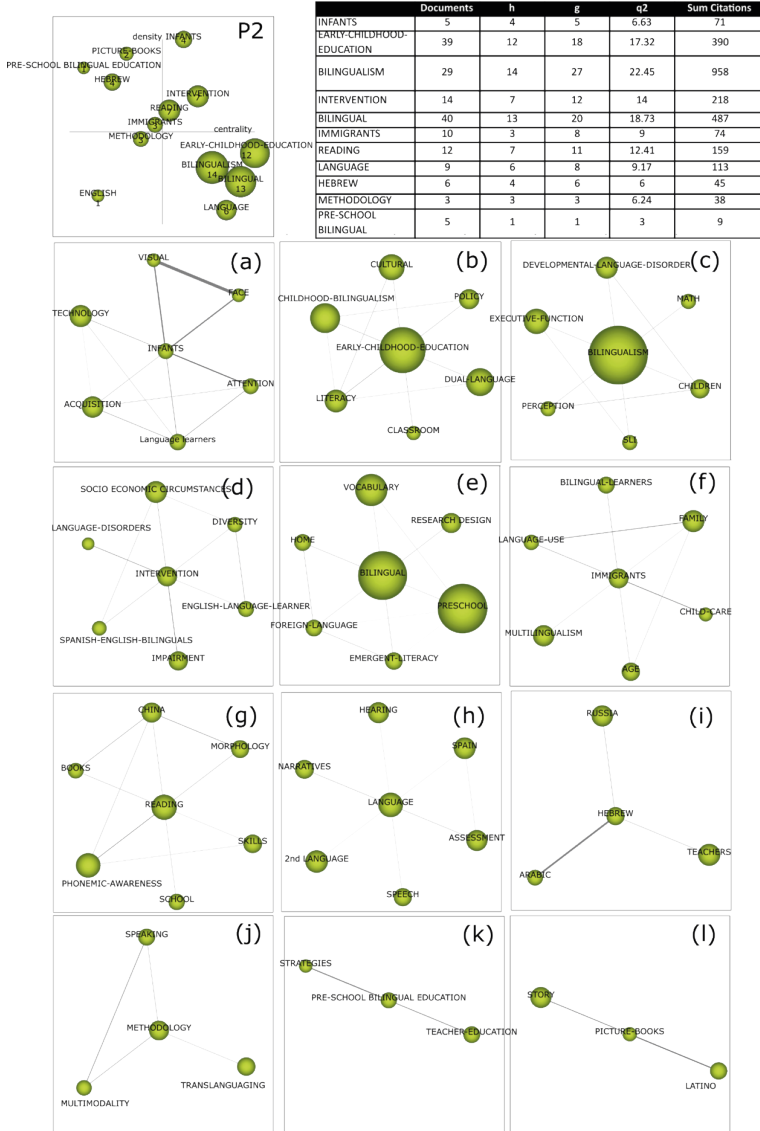


Figure 5. Strategic diagram for period 2

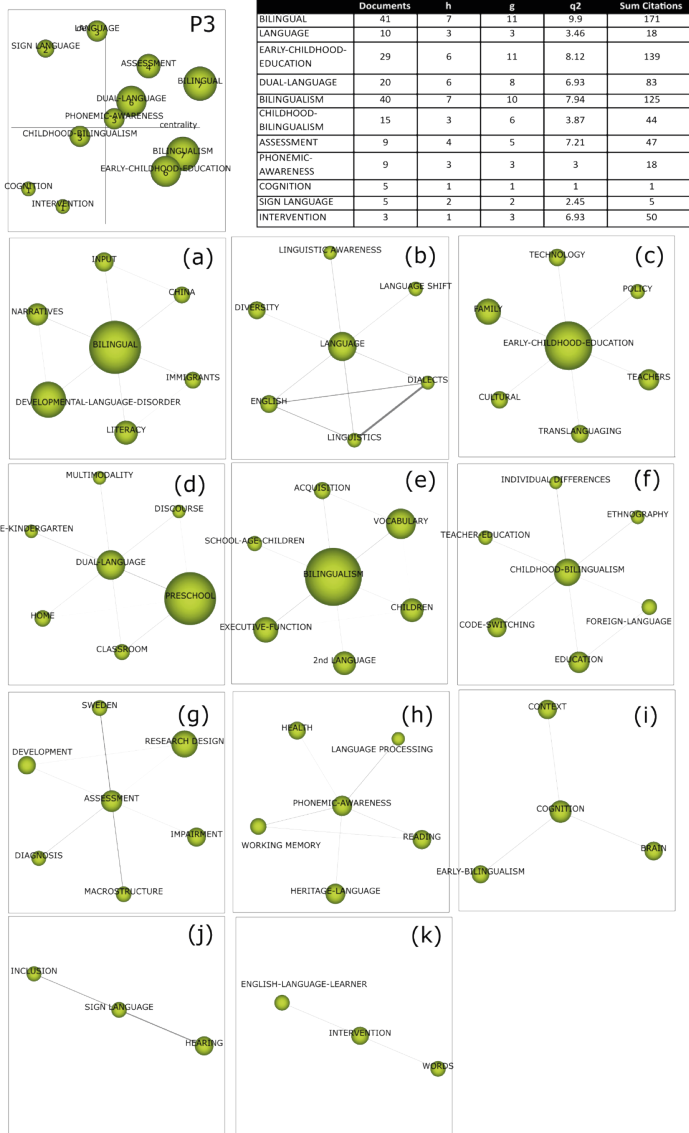


Figure 6. Strategic diagram for period 3



As shown in Figure 6, eleven themes of related research could be identified. Five research topics out of the eleven are considered key for their contribution to the growth of knowledge on the topic of Bilingualism: BILINGUAL, EARLY-CHILDHOOD-EDUCATION, DUAL-LANGUAGE, BILINGUALISM and ASSESSMENT. Compared to the previous period, motor themes such as BILINGUAL, EARLY-CHILDHOOD-EDUCATION, and BILINGUALISM are maintained. Based on the h-index of the topics analyzed, the one which stands out is DUAL-LANGUAGE. Finally, CHILDHOOD-BILINGUALISM appears as an emerging theme in this period.

The total number of cites support the interest in the key topics identified in the previous periods while the salient topic of DUAL-LANGUAGE reflects studies emerging from the US, where the dual language programs are common and have a long tradition, especially in some states. It is expected that a gradual increase of additional languages in the Pre-primary stage in the European context will generate more publications within this field in the near future.

### 4.3. Conceptual Evolution Map

Another interesting aspect of this type of analysis is the possibility of studying the conceptual evolution over the selected periods. The main objective is to show in a visual format which themes co-occur, and which ones bifurcate along the different sections. Stronger and thicker lines indicate a stronger relationship between the concepts than the dotted or thin lines, i.e., the thickness is proportional to the inclusion rate and the volume of the spheres is proportional to the h-index of the documents associated with each cluster (Cobo et al. 2012). These relationships show the direct linkage and co-occurrences of the key topics analyzed by research in recent decades within the field of ECE and Bilingualism.

As shown in Figure 7, there are different types of relationships between the themes throughout the periods. Some of the strongest relationships presented can be seen by following the colors. In the first place, marked in purple, is the concept BILINGUAL, co-occurring in the three periods. This fact can also be observed with BILINGUALISM, marked in pink and repeated in the three periods. These two terms are clearly salient throughout the time analyzed, suggesting their relevance over the three decades.

The term EARLY CHILDHOOD EDUCATION also appears in all three periods but, unlike the previous cases, it is related to ENGLISH (P2) and LANGUAGE (P3), showcasing the above-mentioned interrelation between the fields of Linguistics/Languages and Education. There are other interesting relationships such as those found between P2 and P3, as with the concept INTERVENTION, which shows an interest in research to analyze and document the actions addressed to those difficulties

related to the acquisition of two or more additional languages. Finally, a strong link between READING and PHONEMIC AWARENESS shows the research interest in studying these skills, which are central to literacy and consequently to communication.

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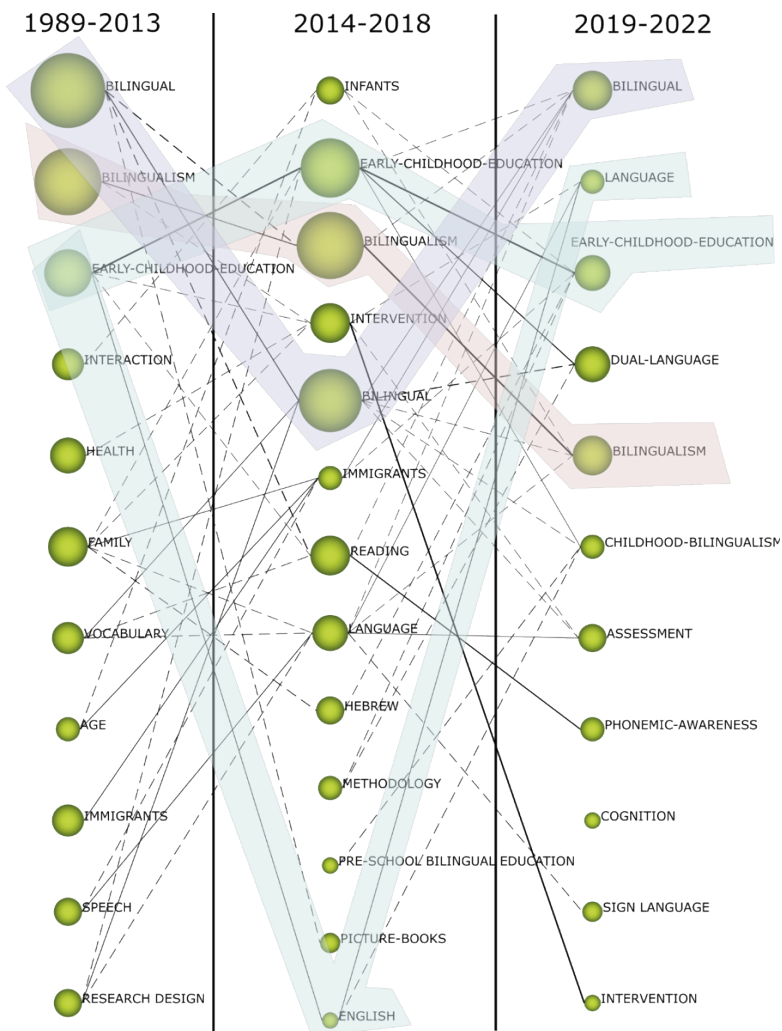


Figure 7. Conceptual evolution map

The analysis has provided answers to the three research questions. RQ1 focused on exploring the growth of publications indexed in the Web of Science (WoS) database between 1989 and 2022 in the area of Early Bilingual Education. Stemming from Figure 2a (diachronic evolution), the study has shown an upward trend of the publications including the terms included in the query (from 15 publications in 2008 to 114 in 2021). As for RQ2, the most salient journals, authors and publications on the topic have all been identified and also analyzed in connection with their citation rate. Finally, RQ3 aimed to shed light on the key emerging research themes and sub-themes on Early Bilingual Education. This has been obtained in the evolution plan and in the figures related to each period. BILINGUAL, BILINGUALISM and EARLY CHILDHOOD EDUCATION stand out as emerging themes which also co-occur in the three periods.

### 5. Concluding Remarks

This study used a bibliometric analysis of the main performance indicators related to Bilingual Education and Early Language Learning to identify the main authors, organizations, countries, sources, research areas, and to evaluate the development in this field. We believe the study contributes to identifying the trends in research in the last three decades, and allows a comparison of the interest accrued to date in Early School Education and Bilingualism in the three periods under study.

The first period analyzed, despite covering a wider time range, features a more limited number of documents. The topic of FAMILY stands out, in contrast to the last two periods where the school context is more salient. This shows a research interest in the acquisition and learning of two or more languages outside the family context parallel to the increase in the learning of additional languages in the early school periods. In addition, a trend moving away from written materials and skills towards spoken skills and oral practice is also observed in the conceptual evolution map (phonemic awareness appears for the first time as a relevant topic in the last period). The research on this topic might reflect the methodologies introduced in Pre-primary in recent years where the work devoted to phonics takes up significant time.

The last two periods, of four and three years respectively, show the research interest in intervention, which is essential at this educational stage when children are acquiring and developing their languages and in which the identification of difficulties and linguistic impairments is key for avoiding future complications. It is assumed that future research will continue to focus on this aspect.

The information yielded by the *SciMAT* outcomes indicates an increasing interest in analyzing how early learners develop their linguistic repertoire; notwithstanding

this, ECE is a stage which has attracted limited interest in comparison to compulsory education. It is expected that the generalization of bilingual and dual programs will generate more interest in the future.

Despite the contributions of this paper, we would like to mention the following limitations. First, only indexed publications in the WoS were considered. For future research, a comparison of these results with those from other databases such as Scopus is recommended. Second, the search term “bilingual\*” as a generic concept in the database may have led to excluding discussion of other related terms in the area such as “multilingual\*” and “plurilingual\*”. It is also worth mentioning that other articles which focus on this area but do not incorporate the concept of Early Bilingual Education in the title were left out of the analysis. Finally, *SciMAT* offers different grouping algorithms and similarity measures that are selected at the discretion of the researcher, as is the case with the clustering of keywords in the co-word analysis, which was performed based on the authors’ criteria. Therefore, considering the increasing relevance of this topic, it would be advisable to conduct more exhaustive analyses of statistical results by analyzing the relationship between keywords and the identified axes and thematic lines. For future research, it might be interesting to address those less noticeable issues which could merit further consideration.

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