

Article

Hot Topics and Evolution of Frontier Research in Early Education: A Bibliometric Mapping of the Research Literature (2001–2020)

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Abstract: The aim of the present study is to explore the evolving trend of research directions in the field of early education. In this research, CiteSpace and VOSviewer were used to visually analyze documents published in eight SSCI journals between 2001 and 2020. Through methods such as co-authorship analysis, cluster analysis, and cocitation analysis, this study found that child care, school readiness, early education quality, effortful control, executive function, self-regulation, and teacher–student relationships are hot topics in early education. Early education research has distinctive interdisciplinary characteristics.

Keywords: early education; bibliometrics; CiteSpace; VOSviewer; mapping



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1. Introduction

Early experience shapes children's social, emotional, and cognitive capacities, which can be the foundation of adult productivity [1]. Therefore, early childhood education (ECE) can have a lasting impact into the adult years [2,3] and is closely related to human sustainable development. In 2015, the United Nations reported The Sustainable Development Goals (SDGs), and Quality Education is the fourth goal (SDG4). Ensuring that children have access to high-quality early education is an inextricable part of SDG4. Therefore, it is crucial to promote the sustainable development of ECE and hence boost the achievement of SDG4. The present article aims to review the evolution of ECE, explore its research hot topics, and provide a reference for its sustainable development in the future.

2. Literature Review

The understanding and application of existing knowledge can be regarded as the cornerstone of academic research [4]. In past studies, the significance of early education has increasingly been confirmed. Children who receive early education typically have better academic performance and higher academic ability and show fewer behavior disorders [5,6]. In the long run, early education has a higher return on investment than other education stages [7], and it is helpful to promote social equity and maintain social order [8]. Therefore, in-depth research in the field of early education is of great significance.

Once a scientific discipline has reached a certain degree of maturity, scholars in the field would use literature reviews as a method to assess the state of its development [9], and this tendency appears in ECE as well. A literature review is a relatively systematic collection and review of previous literature [10,11], and it has many forms, such as narrative, comprehensive, and systematic. Different types have their own focuses, but they usually provide an overall perspective for a specific topic [4]. For example, a study [12] reviewed the composition of early education classrooms and found that in the past two decades, the impact of classroom composition has received more attention, but empirical research on the relationship between classroom composition and the quality of early education is very scarce. Some scholars [13] used meta-analysis to examine early education

programs in the United States from 2000 to 2016. Through the improvement of children's math and reading skills, they found that these programs have a significant impact on children's short-term academic achievement. Some scholars have also paid attention to early childhood behavioral disorders. They reviewed "Active supervision" and identified it as a potential empirical solution [14]. These reviews summarized the research results of the past literature from different perspectives, but either because of the qualitative research methods or the screening conditions of the literature, the number of documents finally analyzed was relatively small. In addition, the research of these reviews was more regional, and comparative studies with an international perspective are rare. Therefore, an overview of early childhood education from an international perspective is of great necessity.

Science mapping is a general process of domain analysis and visualization, and its research scope can cover subjects, research fields, or subject areas related to specific research issues [15]. Typically, research using this method needs to establish the corresponding text database, and keywords or journal names are used as the retrieval units. As in early education research, Yang and Li [16] used China National Knowledge Infrastructure as a database and "preschool education" or "children education" as keywords and searched for relevant documents published in core Chinese journals from 2010 to 2017. Bicom and SPSS were used in their research. Their research found that the main hot topics of early education research in China during this period were: early education reform and development, children and preschool curriculum, rural preschool education, preschool education quality, and preschool teacher professional development. However, the method of using keywords is more suitable for a very narrow point or field. Under that condition, it can cover the whole range through a number of limited keywords, such as education equity, teaching efficiency, and other clear points. The field of early childhood education is a relatively large research field, and the keywords are numerous and complex and cannot be exhausted. If only using such broad keywords as early childhood education, the result error may be too large. Therefore, researchers have begun to use professional journals to remedy this defect in recent years (e.g., Huang, et al. [17]). Top academic journals in various fields represent the most cutting-edge research paradigm features and evolution trends of the discipline [18], and the articles they publish can be regarded as "certificated knowledge" [9], suitable as a data source for scientific knowledge graph research. In previous studies, scholars have tried to visually analyze the hot topics and frontiers in the field of early education by means of scientific knowledge maps. For example, Qiu, Pan, and Hou [19] used data published in well-known early education journals from 2000 to 2012, used CiteSpace as a tool to draw a cocitation network map, and found that the hot areas of international early education research at that period to be children's school readiness, the cognitive theory of children's language acquisition, disorders in children's moral development, infant autism, etc. Lan, Cheng, and Yu [20] also used CiteSpace and analyzed the literature of early education publications from 2000 to 2016 and found that the number of documents and citations of those early education research journals increased year by year after 2007. Through previous studies, journals such as *Early Childhood Research Quarterly*, *Early Education and Development*, *European Early Childhood Education Research Journal*, and *Australasian Journal of Early Childhood* were admitted as important carriers for the exchange of early education research results and were used to conduct bibliometric analysis. In conclusion, these articles all carried out bibliometrics on the research of early education in a certain period of time and presented the evolution of the subject's research direction in a visual manner, so they are of great significance to the research in the field of early education. However, only a single software is typically used in the research, and the methods for the exploration of frontier research are not comprehensive enough, which makes the degree of visualization relatively insufficient. As such, a more comprehensive research is needed.

This paper draws on previous research experience, comprehensively applies two kinds of knowledge graph software (CiteSpace and VOSviewer), and analyzes the selected data in a more comprehensive and diversified way. This research aims to seek the answer to the following questions: Q1: Which authors, institutions, countries, or territories constitute

the main research force in ECE research? How do they connect with others, and is the connection sustainable? Q2: What have been the hot topics in ECE during the past two decades? Q3: How has ECE research evolved in this period, and what characteristics can be detected during the evolution? By finding the answers, this study helps to clarify the current international development trends in ECE.

3. Materials and Methods

3.1. Data

Bradford's law of literature dispersion states that "most key documents are usually published in a few core journals" [21]. This article used data from the Web of Science core collection database. We used WoS because: (1) our research objects were limited to papers published in SSCI journals in early education, which are included in WoS; (2) our research involved the analysis of authors, institutions, research hotspots, and its evolution, and WoS provides a set of metadata that are crucial for bibliometric reviews, including titles, lists of authors, institutions, countries, keywords, abstracts, references, and number of citations [22]; (3) previous studies have indicated that the Web of Science and Scopus provide fairly similar results [23], and therefore, it may not necessary to use different databases simultaneously due to the existence of duplication [24].

In order to illustrate the process of identification, screening, and inclusion for journals and articles in this study, we drew the flowchart diagram (Figure 1), which refers to the framework of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [25] to a certain extent. Finally, 8 SSCI journals were chosen, and only articles published in these journals were downloaded as research data, while other research types such as reviews or editorials were discarded. That is because the "articles" are strictly peer-reviewed and was the original research, which can reflect the concerns in this field. Although "reviews" have also been peer-reviewed, these are a restudy of the existing research, which may affect the accuracy of this research, and they are often excluded in similar current research. "Proceeding papers" are original, but lack a strict peer review process in this field, which may also affect the accuracy of these studies. This is different from some fields, such as computer science, which attach great importance to conference papers.

3.2. Analytical Procedures

Knowledge mapping is a way of analyzing documents through visualization. In this study, VOSviewer 1.6.16 and CiteSpace 5.8.R1 (64-bit) were used for the analysis. VOSviewer [26] was used to construct co-authorship maps of authors, institutions, and countries or territories, while CiteSpace [27] was used to analyze the hot topics and frontier research.

Co-authorship analysis focuses on interrelationships among institutions or countries/territories in the literature [28], which assists with outlining the global corporation map of ECE research and quickly mastering the giants in this field. It was also necessary to conduct a series of co-authorship analyses to examine patterns of scientific collaboration between authors, institutions, or countries/territories. In this part, VOSviewer was used. In the analysis of the core authors, according to the calculation formula of the core author with Price's law, $M \approx 0.749 \times \sqrt{N_{max}}$ (M represents the minimum number of papers published by core authors, and N_{max} refers to the number of papers published by the author with the largest number of papers in the research period). When calculating the number of articles published by each author, "Full counting" for the number of authors was selected, that is no matter how many authors there were in each article, each author was counted once. In the analysis of the main research institutions, we listed the top 10 institutions in descending order according to the cumulative number of publications and citations, and we also plotted the cooperative relationship network between the various institutions. The same procedure was conducted to analyze the leading countries or territories.

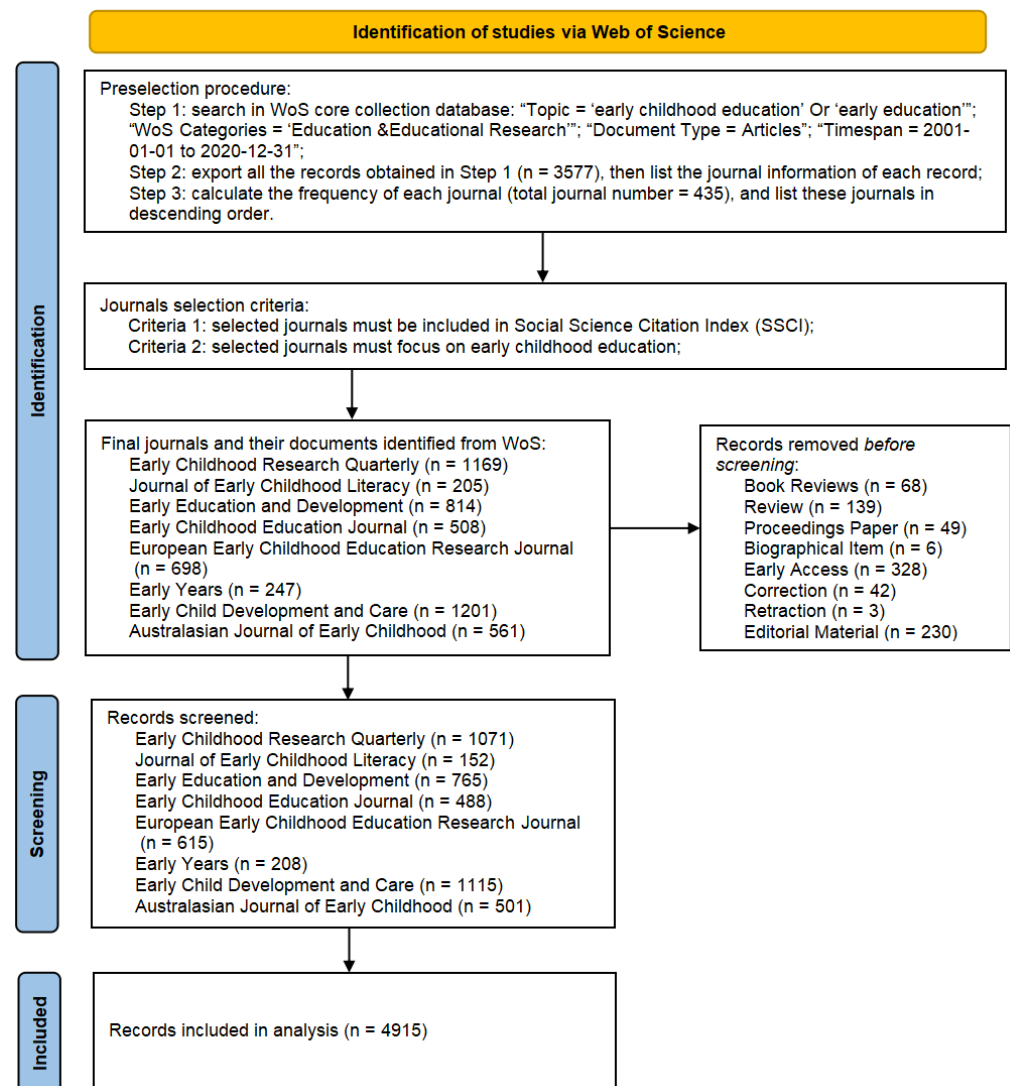


Figure 1. The flowchart of data selection.

In the analysis of the hot topics and evolution of frontier research in international early education, CiteSpace was used to conduct co-occurrence and cluster analysis, burst term analysis, and cocitation analysis. In the procedure, we imported the research data into CiteSpace and set the year interval from 2001 to 2020. The map of co-occurrence words (feature words or keywords) was more conducive to the analysis of hot topics and its evolution, especially with the use of burst term functions [21]. In co-occurrence analysis, keywords can be clustered according to their relations, and each cluster can be labeled by its most significant keyword. Burst terms refer to words that appear more frequently or are frequently used in a relatively short period of time, and the frontiers and trends of the research field can be judged according to the word frequency changes of burst words. As such, we used co-occurrence and cluster analysis to explore the hot topics, where both the timeline view and the core keywords of each cluster in the timeline view were comprehensively considered. In the exploration of the evolution of frontier research, the timezone map, cocitation analysis, keywords, and burst terms were integrated for analysis.

4. Results

4.1. The Main Force of International Early Education Research

4.1.1. Leading Authors

According to the theory of Price [29], the number of articles published is an important factor of scientific research activities, which can intuitively reflect the academic activity of the authors. The calculation formula of the core author in Price's law is $M \approx 0.749 \times \sqrt{N_{max}}$. According to Table 1, $N_{max} = 42$, and substituting it into the calculation, we obtain $M \approx 4.854$. This article took $M = 5$, that is authors who have published more than five papers were the core authors in this field. After analyzing the sample literature, we can see that among the 9591 authors, 354 authors were qualified and 53.39% of those core authors were connected. In this study, each author would be counted once regardless of whether there was more than one author in each article. We then found that the core authors appeared 2754 times, while all 9591 authors appeared 14,722 times in total. We also found that articles written by core authors had been cited 60,219 times, while the total citation number was 206,301. That means 3.69% of the authors completed 18.71% of the research work and contributed 29.19% of the citations in early education research.

After the calculation, the authors' information was listed in descending order of the number of publications and citations as in Table 2. Figure 2 shows the network among authors. We used the citation number as the weight criterion of the spots, which means when the citation number is higher, the spot is larger. The network map shows that core scholars in this field have close connections, and since authors with the same colors are frequently and closely tied, we found that their academic circles have formed.

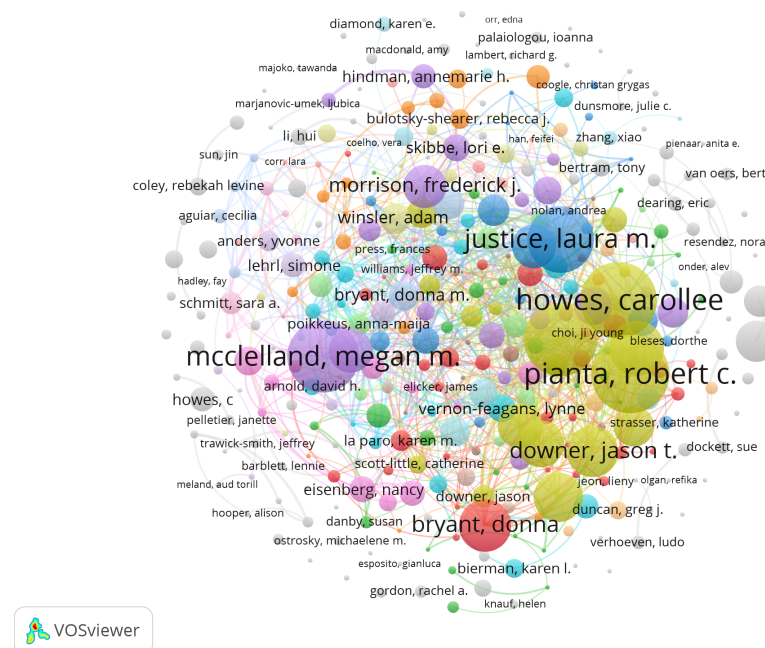


Figure 2. The collaboration network map of the core authors of international early education research.

4.1.2. Leading Institutions: University of North Carolina, University of Virginia, and UCLA

Knowledge mapping on research institutions helped us understand the main research institutions in the field and their cooperative relationships. There were 2222 research institutions in the sample documents of this study, 379 with 5 articles or more, and 189 with 10 or more articles. The information was arranged in descending order according to the number of publications and citations as shown in Table 2. It can be seen that the University of North Carolina (Univ N Carolina) and the University of Virginia (Univ N Carolina) are far higher than other institutions in terms of the number of publications and

citations. Figure 3 shows the network between institutions, and we also used the citation number as the weight criterion of the spots.

Table 1. Authors ranked by number of publications and citations.

Ranked by Publications (P)			Ranked by Citations (C)		
Authors	P	C	Authors	P	C
Justice, Laura M.	42	1688	Pianta, Robert C.	33	2221
Pianta, Robert C.	33	2221	Howes, Carollee	25	2143
Burchinal, Margaret	27	2009	Burchinal, Margaret	27	2009
Howes, Carollee	25	2143	Mcclelland, Megan M.	21	1901
Fleer, Marilyn	21	157	Justice, Laura M.	42	1688
Mcclelland, Megan M.	21	1901	Pianta, Robert	9	1059
Li, Hui	20	184	Bryant, Donna	10	1137
Vernon-Feagans, Lynne	20	404	Downer, Jason T.	16	1111
Hu, Bi ying	19	145	Clifford, Richard	5	1021
Locasale-crouch, Jennifer	19	869	Hamre, Bridget K.	17	951

Table 2. Institutions ranked by number of publications and citations.

Ranked by Publications (P)			Ranked by Citations (C)		
Institutions	P	C	Institutions	P	C
Univ N Carolina	156	5420	Univ Virginia	149	6632
Univ Virginia	149	6632	Univ N Carolina	156	5420
Macquarie Univ	103	948	Univ Calif Los Angeles	40	2387
Charles Sturt Univ	93	851	Oregon State Univ	32	2209
Ohio State Univ	80	1638	Univ Michigan	44	1991
Monash Univ	75	392	George Mason Univ	50	1669
NYU	75	1528	Ohio State Univ	80	1638
Queensland Univ Technol	71	608	Univ Nebraska	70	1538
Univ Nebraska	70	1538	NYU	75	1528
Univ Melbourne	66	504	Columbia Univ	59	1445

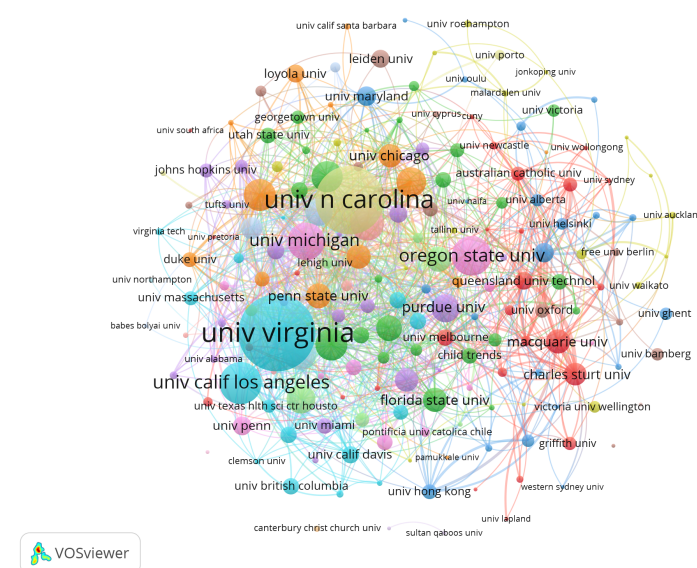


Figure 3. The collaboration network map of the core institutions of international early education research.

4.1.3. Leading Countries/Territories: the U.S., Australia, and Canada

The sample documents of this study included 95 countries or territories, of which 55 countries have published more than 5 articles and 44 countries or territories have published more than 10 articles. These countries or territories are listed in Table 3. Figure 4 shows the network between countries or territories, and the weights of the spots were still determined by citations. It can be seen that the United States contributed the most documents and citations among all the countries or territories. The link strength shows the strength of cooperation, and Figure 3 shows that China is the most frequently associated country with the United States.

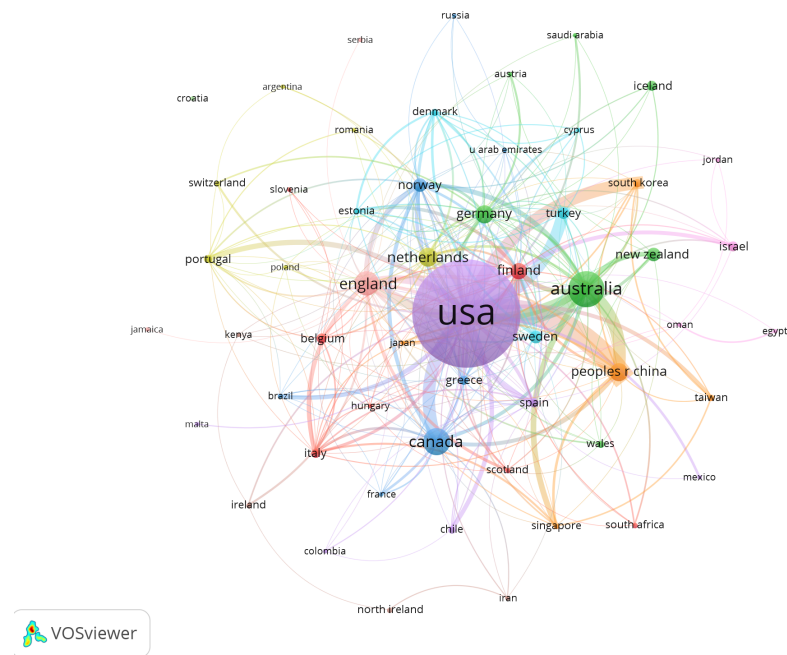


Figure 4. The collaboration network map of the core countries or territories of international early education research.

Table 3. Countries or territories ranked by number of publications and citations.

Ranked by Publications (P)			Ranked by Citations (C)		
Countries or Territories	P	C	Countries or Territories	P	C
USA	2240	40,343	USA	2240	40,343
Australia	723	5219	Australia	723	5219
England	282	2415	Canada	212	3003
Canada	212	3003	England	282	2415
People R China	212	1476	Netherlands	104	1606
Turkey	165	607	Peoples R China	212	1476
Sweden	140	761	Germany	114	1412
Finland	130	1175	Finland	130	1175
Norway	125	885	New Zealand	95	887
Germany	114	1412	Norway	125	885

4.1.4. Hot Topics

The timeline view focuses on sketching the relationship between clusters and the historical span of documents in a cluster [21]. As Figure 5 indicates, 7 clusters in the timeline view were composed of 729 nodes and 7526 lines. Nodes represent the terms with high-frequency counts, and lines represent the strength of co-occurrence between nodes. Size means the number of high-frequency keywords contained in the cluster, and the

serial number of the cluster is also determined by its size. Through the LLR algorithm, the keywords in each cluster are listed in Table 4 according to their significance, and the most significant keywords become the feature words of the cluster, that is the words next to the cluster number in Figure 4.

Table 4. Core keywords of 7 clusters of hot topics in international early education research (LLR algorithm).

Cluster	Size	Mean (Year)	Keywords (with LLR Algorithm)
0	151	2009	effortful control (8854.5, 0.0001); teacher–child relationship (7244.44, 0.0001); teacher–child relationship quality (6528.24, 0.0001); executive function (5522.57, 0.0001); moderating role (4164.99, 0.0001)
1	147	2012	storybook reading (5672.28, 0.0001); shared reading (5469.21, 0.0001); emergent literacy skill (4884.08, 0.0001); home literacy environment (4591.87, 0.0001); early literacy skill (4451.29, 0.0001)
2	147	2014	Australian early childhood education (2477.52, 0.0001); children’s perspective (2164.45, 0.0001); preschool education (2164.45, 0.0001); digital technology (1988.38, 0.0001); early childhood education (1788.36, 0.0001)
3	112	2005	child care (3981.79, 0.0001); early childhood education (3704.07, 0.0001); center-based child care (3125.6, 0.0001); child care quality (3087.74, 0.0001); effortful control (2996.01, 0.0001)
4	107	2014	early childhood education (4445.53, 0.0001); developing children (3780.06, 0.0001); social support (3368.2, 0.0001); hyperactivity disorder (3064.76, 0.0001); maternal behavior (2544.77, 0.0001)
5	46	2010	early childhood education (1495.14, 0.0001); early Head Start (1413.54, 0.0001); parenting quality (1294.54, 0.0001); promotive effect (1294.54, 0.0001); early language development (1067.82, 0.0001)
6	14	2009	early childhood mathematics (499.58, 0.0001); building block (264.64, 0.0001); day community health worker (249.04, 0.0001); baby’s life (249.04, 0.0001); storytelling sagas (233.44, 0.0001)

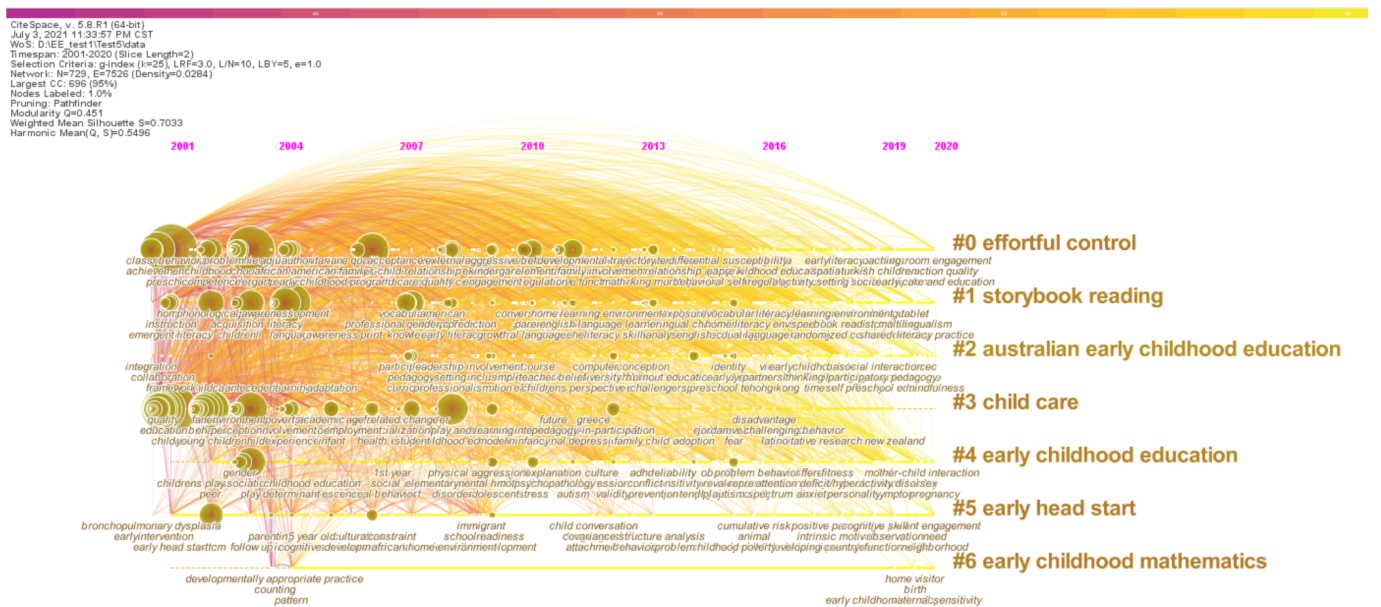


Figure 5. Timeline view of clusters in international early education research.

Cluster 0 and Cluster 3 are the most active clusters: both clusters have many large nodes and strong links, indicating that both kinds of research type have strong vitality and are in a healthy development state. The number of nodes in Cluster 2, Cluster 4,

Cluster 5, and Cluster 6 is less than the others, and that means these types of research may be relatively less significant. However, the solid lines of these clusters also have long time spans, which means research on these themes has lasted for a long time. In addition, the clusters are not independent: the lines between the clusters can show the connection between each, and the density of the lines between the clusters reflects the closeness of the relationship between each.

Through the inductive analysis of the significant keywords in Cluster 0, it can be found that the following two research directions occupy an important position: the first is the relationship between teachers and children and the quality of this relationship; the second is the concern for child psychology. Cluster 1 and Cluster 6 focus on specific aspects of academic skill development in ECE. In Cluster 1, literacy skills are emphasized. In Cluster 6, mathematics is stressed.

Cluster 2, Cluster 4, and Cluster 5 all contain the keyword “early childhood education”, but they have different priorities. Cluster 2 concerns more the research on ECE in Australia. Cluster 4 emphasizes more developing children and their physical activity, while Cluster 5 centers on the theme of early head start.

Cluster 3 can be classified as related to child care. In this type of research, the following kinds of research are worth noting. The first kind is the research on the professional development of early education teachers. The second kind is the relationship between the environment and children’s achievement.

The presentation of the above clustering content is helpful to analyze the hot topics of early education research. It can be seen that current early education has obvious practical considerations. Effortful control, teacher–child interaction, child care, executive function, early education quality and environment, child psychology, etc., are all hot issues in the field.

4.2. Evolution of Frontier Research in Early Education

The research on the evolution of the frontiers of early education research adopts a combination of timezone maps, keywords, and burst words. We used CiteSpace to draw a timezone map of keywords’ evolution as shown in Figure 6, and the top five keywords and burst terms of each year are ranked by frequency in Table 5. When looking at the frontier evolution of the field of early education from the perspective of time, the early education research from 2001 to 2020 can be divided into three phases. The first phase is from 2001 to 2005, which focuses more on basic studies of early education. The second phase is from 2006 to 2010, and it can be regarded as the period of socialization in early education. The social care of early education could be reflected in the studies of social relations in early education (such as the relations of teachers and students) and the impact of social factors (such as socioeconomic background) on early education. The third phase is from 2011 to 2020, and the obvious psychological characteristics of early education can be identified in this phase, which is reflected in the attention given to children’s psychological problems and behavior in the research content. In order to further support this phase division, we also used CiteSpace to draw a cocitation map and then conducted cluster analysis to generate the cluster map as shown in Figure 7.

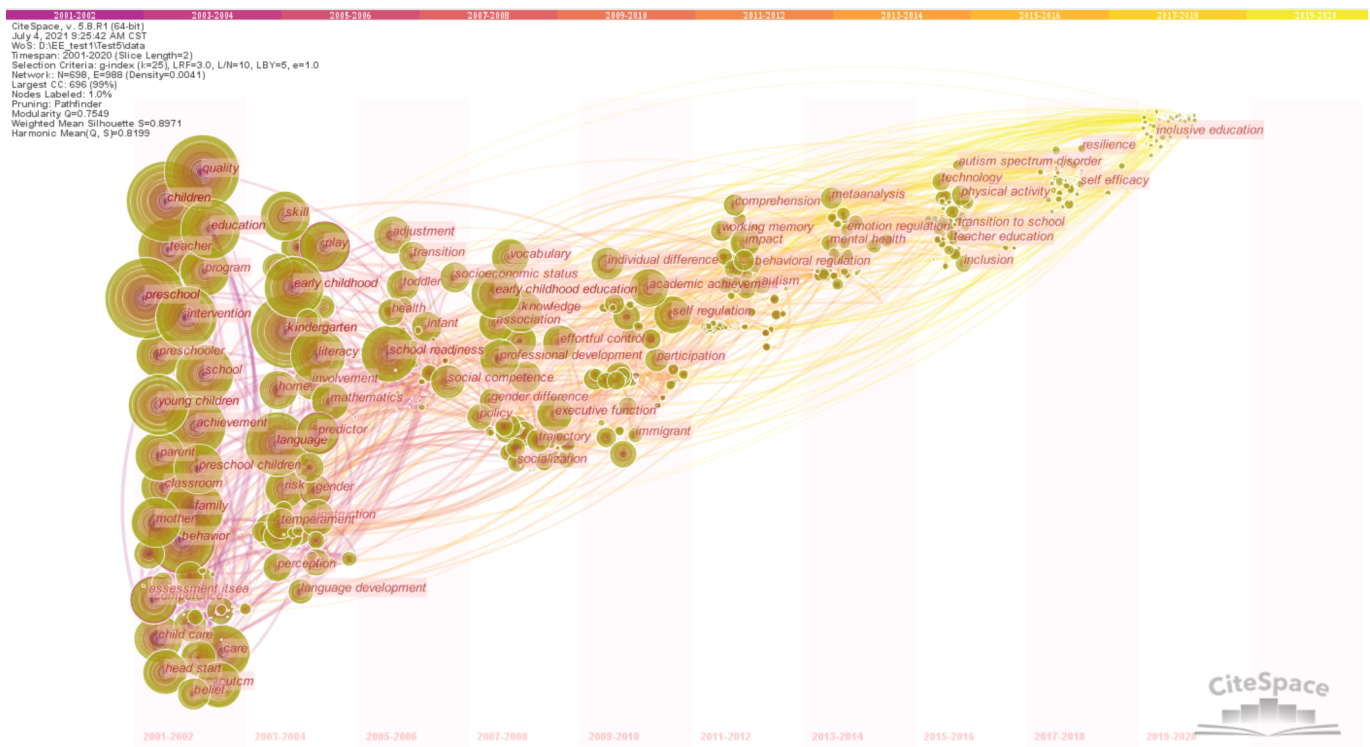


Figure 6. Timezone map of keywords evolution in international early education research.

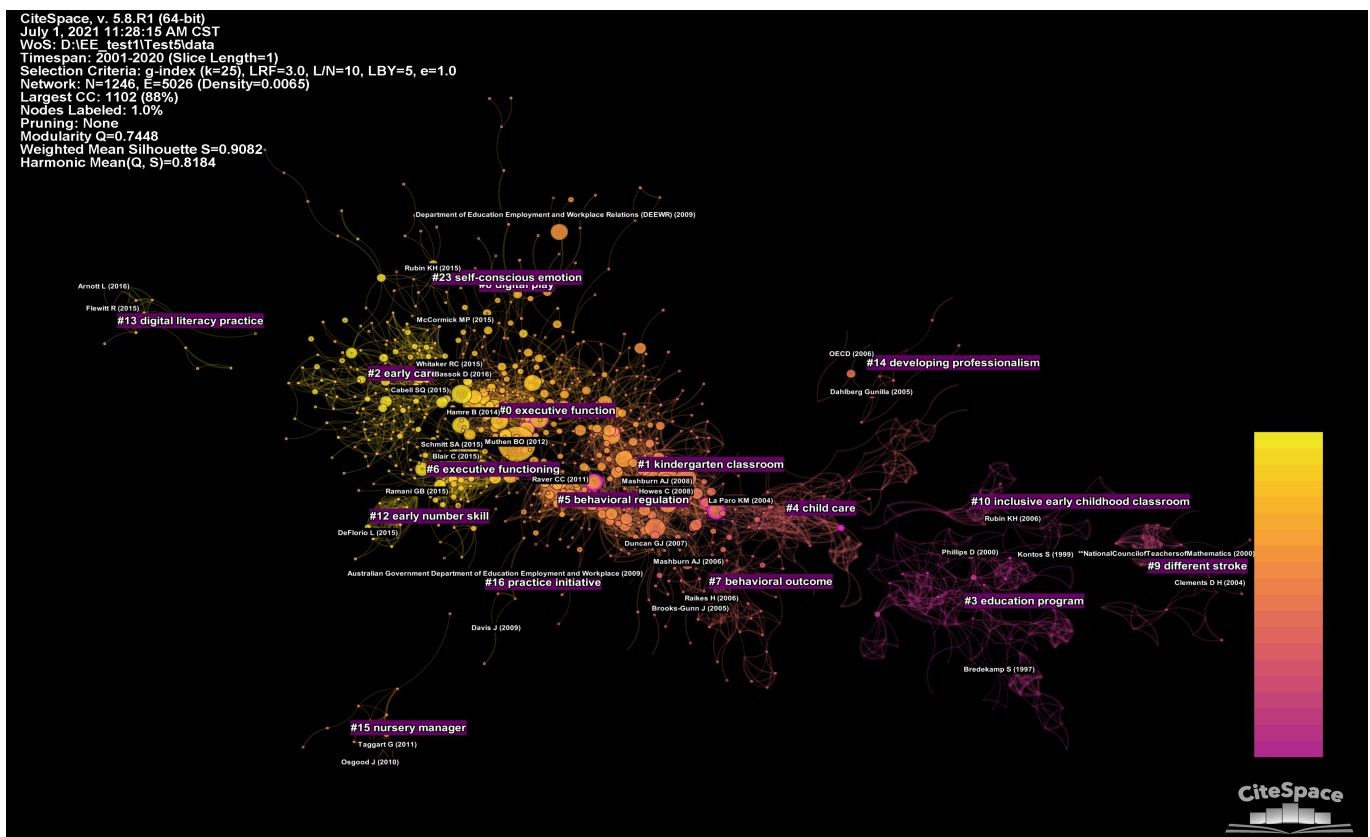


Figure 7. Co-citation network map of international early education research.

Table 5. Keywords and burst terms in different years of international early education research.

Year	High-Frequency Keywords	Burst Terms
2001	children, preschool, quality, education, intervention	quality, early Head Start, agreement, program
2002	young children, behavior, family, care, preschool children	child care, attachment, behavior, mother, competence
2003	kindergarten, early childhood, skill, play, preschooler	preschooler, boy
2004	language, literacy, predictor, mathematics, experience	income, poverty, experience
2005	infant, toddler, cognitive development, awareness, stability	family, awareness
2006	school readiness, health, social competence, socioeconomic status, care quality	print, employment
2007	knowledge, professional development, vocabulary, student, socialization	African American, child care quality, teacher–child relationship
2008	early childhood education, effortful control, classroom quality, early literacy, gender difference	low income, 1st grade, American, leadership, elementary
2009	model, engagement, prekindergarten, adolescent, child development	adjustment, school, social competence, school outcome
2010	self regulation, individual difference, stress, oral language, strategy	individual difference, Head Start, self regulation, language development, teacher child relationship
2011	executive function, comprehension, elementary school, autism, behavioral regulation	emergent literacy
2012	impact, science, validity, math, depression	middle childhood, literacy skill, attachment security, developmental trajectory, scale
2013	meta analysis, working memory, talk, communication, preschool classroom	temperament, professionalism, stability, propensity score, false belief
2014	perspective, pretend play, early childhood education and care, English, bilingual children	united states, ability, Spanish, reliability
2015	physical activity, technology, preschool teacher, early year, reading	elementary school, obesity, Australia, efficacy, fear
2016	autism spectrum disorder, dual language learner, Hong Kong, pre kindergarten, view	dual language learner, children’s perspective, view, problem behavior, early numeracy
2017	writing, time, anxiety, speech, qualitative research	early literacy skill, sex difference, case study, family literacy, guided play
2018	randomized controlled trial, self efficacy, family engagement, teacher child interaction, book reading	educator, reading comprehension, randomized controlled trial, autism spectrum disorder, self efficacy
2019	early childhood development, symptom, shared reading, developmental delay, preschool education	
2020	mindfulness, pregnancy, race, literacy practice, motor skill	

Phase I (2001–2005) more commonly focuses on the basic research on ECE. The main frontier research issues in this phase include quality of early education, child care, achievement, language, intervention, Head Start, etc., indicating that these studies appeared early and received extensive attention. Attention paid to children in early education covers a comprehensive consideration on the growth environment of children and people with whom they come into contact. It is also based on the importance of early education: the quality of early education has received attention regarding the impact of children’s achievements, and the quality of early education has always been a hot topic of research. Evaluation tools for the quality of early education, such as “CLASS” and “ECERS”, are widely used in early education research. As an important early education project in the United States, Head Start has played an important role in promoting fairness in early education and bridging the gap between disadvantaged children and their advantaged peers since its introduction. Research on this project has provided evaluations and suggestions. Co-citation analysis verified the focus of those basic studies. For example, the highest co-cited article was written by Hamre and Pianta [30], exploring whether instructional and emotional

support in the first-grade classroom can have a positive impact on disadvantaged children. Then, research on the Classroom Assessment Scoring System (CLASS) [31] was also highly co-cited. In that research, La Paro, Pianta, and Stuhiman provided information about its development and field use.

Phase II (2006–2010) has more distinctive social characteristics. It can be seen from the keywords that school readiness, social competence, socioeconomic background, individual differences, gender differences, classroom quality, socialization, teacher–student relations, etc., are the key themes of this period. It can be found that the individual differences and socialization characteristics of children have received more attention. First of all, from the perspective of research on interpersonal and social relations in early education, more attention has been paid to research on teacher–student relationships. Research shows that teacher–student interaction plays an important role in the development of children, and teacher–student relationships can predict children’s academic performance, social behavior tendency, etc. On the other hand, there are related discussions on the social and economic background and the social and educational equity under its influence. In fact, the research on family socioeconomic status and children’s academic achievement is also an important part of the field of early education research. The research at this phase shows that researchers pay more attention to the social reality. Co-citation analysis found that in this phase, research conducted by Mashburn et al. [32] and Howes et al. [33] has had a wide influence. They examined the development of the social skills of children in ECE and provided suggestions on the measures to facilitate children’s school readiness.

Phase III (2011–2020) has more obvious psychological features than before. On the one hand, psychological terminologies have been cited more frequently. For example, “executive function”, which is the ability to regulate emotions, responses, and actions, was the most cited keyword in 2011; and “working memory”, which is the mental ability to store, retrieve, and process information [34], was also highly cited. On the other hand, research on early education focuses more on children’s mental health. For example, the appearance of keywords such as “autism”, “autism spectrum disorder”, “fear”, and “anxiety” shows that research on those issues has played a significant role in this period. It can be seen in the cluster view that Cluster 0 (executive function) is at the junction of different stages where the color transits from orange to yellow. By the cocitation analysis, we found the document that most widely influenced this period was *Mplus User’s Guide* written by Muthen, which means that quantitative methods have gained more attention. In this phase, many articles on self-regulation [35,36] and executive function [37] have been highly co-cited, which means these topics have been of high concern.

It is worth noting that some research issues have always been hot topics in the field of early education. For example, related issues such as child care and quality of early education have run through nearly two decades of early education research. In short, the evolution of frontier research in early education presents the characteristics of the gradual integration of multiple disciplines. The multi-angle analysis of the influence of external factors and internal problems of early education reflects the increasingly distinctive scientific characteristics of early education research. However, the emergence of new frontiers does not represent the cooling of past hot topics, and new hot topics may also have emerging clues before they arouse attention.

5. Discussion

From the analysis of the main research forces in the field of early education, the United States occupies a major position. In addition, from Figure 1, we can find that there are relatively close relationships among these core authors. This shows that the main academic circles in the field of early education have been formed, which ties well with the previous study [20]. The formation of the academic circle reflects the construction of a social network among researchers. On the one hand, it is helpful for resource sharing, but on the other hand, there are hidden dangers of closure. In the economic field, social capital generated by limited solidarity and trust is the core of group economic progress [38]. The same

social relationship enhances the convenience and efficiency of economic communication among community members while implicitly restricting outsiders [39]. This kind of implied exclusion in the circle still has certain applicability in other fields, and it should be considered in order to maintain the sustainability of early education research.

Ideas are the substantive content of discourse, and discourse is the interactive process of conveying ideas [40]. On the one hand, academic discourse power is embodied as “right”, which is qualification. It refers to the “right to create and renew” and the “right to give meaning and academic autonomy” [41]. Those who master academic discourse power “lead the trend of academic development, determine the setting of academic topics, influence the scale of academic judgment, and dominate academic exchanges and many other aspects” [42]. The obvious advantage of the United States in the field of early education actually reflects its power in the control of the discourse in the field of early education.

The development of children in early childhood is a process of interaction among themselves, their families, and the wider social environment [3]. First of all, in terms of children’s own development, researchers explore the laws of children’s physical and mental development or expect early intervention in children to improve their development. Given that physical health is essential for good learning and development [43], physical education for children should be given more attention. In fact, the quality of life provided in early childhood is not only an investment in childhood health [44], but also greatly beneficial to the prevention of disease in adulthood [45]. Early childhood social and emotional development is also worthy of attention. Studies have shown that children’s social and emotional abilities can predict their future academic achievement [46,47].

Family factors play a pivotal role in the development of children in early childhood, and the parents’ economic, cultural background, education level, and other factors will affect the development of the children. Studies have shown that two major trends in early education in the United States have become increasingly obvious in recent years [48]. One is the increasing proportion of children receiving formal early education; the other is the increasing proportion of school-aged children that come from immigrant families. First of all, formal early education usually has the characteristics of being independent of children’s families, with care and education provided by trained professionals. The term “immigrant families” usually refers to first-generation children born outside of the United States or second-generation children of parents born abroad. The topics that accompany the background of immigrant families often include language and cultural diversity, weak socioeconomic status, etc., while poverty is considered to be a pervasive hazard that affects many aspects of children’s development process [49]. Children from families with better economic and social backgrounds tend to show better academic achievement and social communication skills [50], while children of the same age from lower economic and social backgrounds suffer from insufficient school readiness [51]. However, these children from relatively disadvantaged families can fill this gap by receiving early education [52]. In addition, the parent–child relationship is also crucial to the development of children [53].

From a broader perspective, the government’s attention to early education exerts an impact on early childhood from a macro perspective. “Head Start” in the United States [54] aims to improve the quality of early education and enhance children’s school readiness; the U.K. promotes the “Effective Preschool Education Project (The Effective Provision of Pre-School Education Project (EPPE)) to pursue high-quality and fair early education [55–57]. China has adopted a series of policies and regulations to guarantee financial investment in early education, such as the “Three-year Action Plan for Preschool Education”, and improve the policy system of early education, which plays an important role in the scientific and standardized development of early education [16,58,59]. In fact, research has examined the effectiveness of these policies, and their positive significance has been confirmed to some extent. Existing research also shows that whether it is due to the recognition of the importance of early education or the consideration of maintaining social equity, the government has given higher attention to early education. In short, attaching importance to and ensuring the sound development of early education has gradually

become a worldwide social consensus. With the deepening of global connections, early education research with a global perspective has important practical value. The introduction of advanced and successful early education experience and localized learning has important guiding significance for relatively underserved areas.

Judging from the historical trend of the evolution of early education research, the field of early education research is constantly broadening, and the characteristics of diversified research with multidisciplinary integration are becoming increasingly distinct. This is consistent with previous research [19]. This interdisciplinary research feature can be reflected in two aspects. One is that the research on some long-term hot topics has widened the horizon due to the collision of knowledge in other disciplines, and the other is that the new development of knowledge in other disciplines has triggered educational change. That is, education uses external knowledge to explore and develop its own research and the application of external new knowledge in education or the demand for educational reform. However, the characteristics of disciplinary integration have not only deepened the current research on educational phenomena and laws, but also made some scholars review the past defenses of the independence of pedagogy. Analyzing the objects of educational research from the perspective of Karl Popper's "Three Worlds", we can find that education has both a physical and objective material world, a mental and spiritual world, and an objective knowledge world. From this perspective, education is obviously inclusive, and the intersection of education and other disciplines has also played a role in promoting the development of education. For example, Phase II and Phase III show the interdisciplinary character of early education research. From a social perspective, children are not only individuals, but also social beings. Their development is not only carried out in the interactions of their own social network, but also closely related to the broader pattern of social capital. Early education research's emphasis on children's sociality helps to understand and promote the development of children in early childhood more comprehensively. Meanwhile, with the deepening of the intersection of early education and psychology, the laws of children's psychological development have been more clearly and deeply recognized and used in the practice of early education. Problems such as behavioral disorders in early childhood are also interpreted from the perspective of psychology. The investigation of early childhood psychology can actually be regarded as a more internal study of children, which is an exploration from the outside to the inside, and reflects the respect for the objective psychological growth law of children as independent subjects. The application of psychological knowledge is a manifestation of the more scientific research on early education.

6. Conclusions and Implications

This study used bibliometric methods to analyze early education research and provided an overall view of its development. The main findings were that: core researchers work in close cooperation, and academic circles have formed. The collaboration in academic circles plays a critical role in enhancing its influence. North America, China, Australia, and New Zealand are the main contributing forces of early education research. Early education research is encompassing: topics such as child care, school readiness, early education quality, effortful control, self-regulation, teacher–student relationships, and family factors have been widely discussed. Through the two-decade development period of early education, early education research has had an obvious interdisciplinary characteristic, which helps provide an understanding of children in early childhood from a more comprehensive perspective.

According to the evolution of early education research, constructing a sustainable support system for the development of children is of great significance. Forging a sustainable growth environment for children requires the joint efforts of academia, family, and society. The results of the present research also revealed researchers should pay more attention to the diversified development of early education in research content, methods, and subjects. Interdisciplinary research needs to be further promoted. Future studies need to integrate

the research progress of other disciplines such as sociology, psychology, physiology, and brain science and fully recognize children as independent individuals and social beings. Research methods need to be diversified and comprehensively applied, and more attention should be paid especially to the measurement of potential factors, so as to fully understand children in different aspects and deeply explore the development path of children with different growth backgrounds and different academic achievements. The construction of academic communities in the field deserves more attention. The formation of academic communities helps to build academic consensus and enhance the international influence of the team. As such, it is necessary to pay attention to the openness of academic communities, and it may be critical to broaden access channels and strengthen communication between those communities.

7. Limitations

First, this research analyzed eight journals from different countries, but was still limited to English journals. Therefore, it might be more comprehensive to involve more top journals from non-English speaking countries in future research. Second, this study explored the developing phases of early education research by the use of bibliometric mapping, but since bibliometric mapping highly relies on the data and analytical tools to present an overview, it may lack the in-depth analysis of specific themes compared with other types of reviews such as systematic reviews and meta-analyses. Third, this study only used “articles” to analyze ECE research, but bibliometric analysis based solely on “reviews” may also provide an interesting perspective if the “reviews” have been performed at a certain scale. Fourth, the present study used co-occurrence analysis and cocitation analysis to identify the features of the evolution of early education, such as the interdisciplinary tendency, but did not show the specific pathways of the knowledge flow through disciplines. For example, how do other disciplines influence early education research and vice versa? Therefore, further analysis of specific themes is needed.

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