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MAPPING THE RESEARCH LANDSCAPE IN MALAYSIA: A BIBLIOMETRIC ANALYSIS OF EARLY CHILDHOOD EDUCATION AND DEVELOPMENT PUBLICATIONS

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ABSTRACT

This study presents a comprehensive bibliometric analysis of early childhood education and development research in Malaysia, focusing on articles published in Scopus. Publications included in this study consisted of journal articles, books and book chapters, and conference papers, all of which sampled children between four to seven years old. The resulting publications were cleaned up in Open Refine, then later loaded into Excel and Harzing's Publish or Perish for analysis. Visualisations were generated using VOSViewer. The aim was to investigate the publication patterns, citation trends, and collaboration networks of researchers in this field. A total of 250 publications from 1988 to 2022 were analyzed, with a significant increase in publication output observed in the last five years (2017-2022). The results revealed 1576 citations, an average of 46.35 citations per year, and 6.30 citations per paper. The h-index and g-index were found to be 21 and 29, respectively, indicating a growing impact of Malaysian early childhood research in the global academic community. Annual collaboration metrics revealed a diverse range of collaborative efforts among researchers, with the Degree of Collaboration and Collaborative Coefficient showing varying degrees of research partnerships. The collaboration network visualization indicated 31 clusters and 95 items, with the largest cluster containing 11 items, highlighting the potential for further interdisciplinary collaborations in the field. Despite the limitations of using a single database (Scopus) and focusing on a specific topic within the Malaysian context, this bibliometric analysis provides valuable insights into the research landscape of early childhood education and development in Malaysia. Future studies could expand the scope to include additional databases, as well as explore emerging research trends and potential areas for collaboration. This study serves as a foundation for understanding the research dynamics in the field, which could help guide future research endeavours and inform policy and practice in early childhood education in Malaysia.

Keywords: bibliometric analysis, early childhood education, Malaysia, citation trends, collaboration networks

INTRODUCTION

Early childhood education (ECE) plays a pivotal role in fostering the cognitive, social, emotional, and physical development of young children, laying the foundation for their future success and well-being (Britto et al., 2017; Shonkoff & Phillips, 2000). Recognising the significance of ECE, there has been a global surge in research and policy initiatives aimed at enhancing this vital phase of life (UNESCO, 2015). In Malaysia, the government has made substantial investments in pre-primary education, demonstrating its commitment to improving ECE quality and promoting equitable access to educational opportunities for all children (Ministry of Education Malaysia, 2013).

The first eight years of life, encompassing the pre-primary period typically for children aged three to five, is a critical developmental stage (UNESCO, 2017). During these formative years, children's brains develop rapidly, laying the groundwork for their socio-emotional, cognitive, language, and physical health (Dornan & Woodhead, 2015; Lonigan et al., 2000, 2008; McEwen & McEwen, 2017; Verma & Petersen, 2018; Young Lives, 2010). Research indicates that children lacking access to quality ECE are more likely to face academic difficulties, drop out of school, or exhibit behavioral issues (Dornan & Woodhead, 2015; Gullo, 2017; O'Toole et al., 2017; Young Lives, 2010). Furthermore, the gap in ability between these children and their peers tends to widen as they grow older, with long-lasting consequences into adulthood (McEwen & McEwen, 2017; Moffitt et al., 2013).

Early interventions, such as preschool programmes, have been shown to benefit at-risk children significantly, supporting healthy development and providing necessary scaffolding (Bradley & Corwyn, 2002; Lurie et al., 2021; Rosen et al., 2020; Saitadze & Lalayants, 2020; Shonkoff, 2010). In line with international initiatives like the Convention on the Rights of the Child (CRC) (United Nations, 1989), Malaysia has enacted the Child Act 2001 (Act 611), ensuring children's right to quality education and protection (Jabatan Kebajikan Masyarakat, 2017). Government-funded ECE programs, such as Tabika KEMAS, PERMATA, and Perpaduan (Kong, 2022), have been established to bridge the developmental gap and promote equal opportunities for all children, regardless of socioeconomic status (Black et al., 2016; Mohd Noor & Symaco, 2017; Samuel et al., 2017).

Given this context, understanding the research landscape in ECE within Malaysia is crucial for identifying trends, challenges, and opportunities that could inform future research directions and policymaking.

Rationale for bibliometric analysis

Bibliometric analysis is a powerful tool for systematically examining the publication patterns, citation trends, and collaboration networks of researchers in a specific field (Hood & Wilson, 2001). It helps to offer insights into the evolution, intellectual structure and trends within a field of study (Rahimi et al., 2016; Struck et al., 2021). By conducting bibliometric analysis on early childhood education research, stakeholders such as researchers, policymakers, and practitioners can gain an understanding of the most influential publications, authors, and research institutions in the field. Furthermore, this analysis can help identify emerging research topics, collaboration networks, and research gaps, ultimately guiding future research directions and contributing to the improvement of

early childhood education practices and policies (Khodabandelou et al., 2018; Struck et al., 2021).

Bibliometric analysis and mapping are commonly used methods in bibliometric studies. Bibliometric analysis focuses on the impact factor, the number of publications, and the citation index to examine the significance of published scholarly work or journals (Khodabandelou et al., 2018). Research growth and productivity in a field can be measured using publication output, while the impact and scholarly influence of a publication are assessed through citation analysis and the number of citations received (Waheed et al., 2018). The impact of a publication can also be measured using ratios, such as citations per publication (C/P), citations per cited publication (C/CP), h-index, and g-index (Kushairi & Ahmi, 2021).

Quantitative methods are used in bibliometric analysis to assess collaboration between researchers, using metrics such as collaboration index (CI), degree of collaboration (DC), and collaborative coefficient (CC) (Liao & Yen, 2012).The collaboration index (CI) is the ratio of total authors of multi-authored articles to total multi-authored articles, with larger values indicating more extensive collaboration between authors (Elango & Rajendran, 2012). The degree of collaboration (DC) is the ratio of multi-authored articles published in a year to the total number of published articles in that year, reflecting the extent of collaboration between researchers (Zafrunnisha & Pullareddy, 2009). The collaborative coefficient (CC) measures the strength of collaboration between researchers, with values between 0 and 1 (Elango & Rajendran, 2012). Values larger than 0.5 represent stronger collaboration, while numbers close to 0 indicate weak collaboration (Elango & Rajendran, 2012). The table below provides a summary of the bibliometric indicators and their associated methods.

Table 1

Summary of bibliographic indicators and methods.

Indicator	Bibliometric method
Research growth, productivity, impact and scholarly influence	Publication output
	Citation analysis (number of citations)
	Ratio of citations to publication
	Citations per publication (C/P)
	Citations per cited publication (C/CP)
	h-index and g-index
Researcher collaboration	Collaboration index (CI)
	Degree of collaboration (DC)
	Collaboration coefficient (CC)

Bibliometric mapping is a visualisation method that provides a structural overview of publications, such as visualising relationships between keywords used in publications, or how publications are distributed among journals (Huang et al., 2020; Khodabandelou et al., 2018). VOSviewer is a commonly used software for bibliometric mapping, which constructs bibliographic maps based on visualisation of similarities (van Eck & Waltman, Software survey: VOSviewer, a computer program for bibliometric mapping, 2010). In VOSviewer, the distance between items represent their similarity, with items closer together being more similar (van Eck & Waltman, 2007; van Eck & Waltman, 2010).

Bibliometric methods are useful in analysing a large volume of literature in a timely manner while uncovering patterns of change in a field of study (Huang et al., 2020). Bibliometrics have been utilised in past studies to reveal global research trends relating to early childhood education, such as those by Khodabandelou et al. (2018) (from 1991 to 2015), Rincón-García and Rincón-Díaz (2021) and Jang & Hsieh (2021).

A comprehensive bibliometric analysis can help identify key trends, areas of strength, and potential gaps in Malaysia's research landscape, particularly in the field of early childhood education. By providing policymakers with essential insights into the research output and impact, bibliometric analysis can help inform evidence-based policy-making, supporting the alignment of research activities with national priorities and the country's aspirations for socioeconomic development.

Furthermore, bibliometric analysis can contribute to the enhancement of research performance, productivity, and quality in public research institutions, as recommended by the World Bank report, "*Assessing the Effectiveness of Public Research Institutions in Fostering Knowledge Linkages and Transferring Technology in Malaysia*" (World Bank, 2020). Improved research output in early childhood education can lead to innovative approaches and best practices, ultimately contributing to better educational outcomes and human capital development. As human capital plays a crucial role in achieving a high-income nation status, fostering a strong research culture in early childhood education is vital. By supporting continuous improvement and fostering research excellence, bibliometric analysis can help ensure that Malaysia's early childhood education system remains at the forefront of innovation and best practices, contributing to the nation's journey towards becoming a high-income, knowledge-based economy (World Bank, 2020).

Although bibliometric analyses have been conducted in various fields, studies focusing on ECE in Malaysia are limited. Despite the significant efforts and policy focus on early childhood education in Malaysia, no bibliometric study has been conducted specifically for the Malaysian context, underscoring the importance of examining the research landscape and trends in the country to inform policy and practice in this crucial area.

This study aims to address this gap by conducting a bibliometric analysis of early childhood education and development research in Malaysia, focusing on articles published in Scopus. Scopus was chosen as the database for this analysis due to its extensive coverage of academic literature and its established reputation as a reliable source for citation data (Mongeon & Paul-Hus, 2016). By investigating the publication patterns, citation trends, and collaboration networks of researchers in the field, this study seeks to provide valuable insights into the research landscape of ECE in Malaysia, which could help guide future research endeavors and inform policy and practice. Ultimately, this study aims to contribute to the ongoing efforts to improve ECE in Malaysia by providing a clearer understanding of the existing research landscape and highlighting potential areas for growth and collaboration.

The following research questions have been formulated to explore the research landscape of early childhood education (ECE) in Malaysia.

1. How has the publication output in early childhood education research in Malaysia evolved over the past three decades?

2. What is the extent and nature of researcher collaboration in early childhood education in Malaysia, and how has this collaboration evolved over time?
3. How do the citation patterns of early childhood education research in Malaysia reflect the impact and relevance of the research in both the local and international contexts?

The research questions aim to provide to provide valuable insights for policymakers, educators, and researchers by examining the growth, nature, and impact of ECE research in Malaysia. By examining the evolution of publication output, the extent and nature of researcher collaboration, and the citation patterns reflecting the research's impact and relevance, this study can help identify areas of strength and potential gaps in the ECE research landscape. Consequently, this information can serve as a basis for developing informed strategies, policies, and interventions that effectively address the unique needs and priorities of early childhood education in Malaysia, ultimately contributing to the enhancement of ECE practice and the well-being of Malaysian children.

METHODOLOGY

In this bibliometric analysis, the focus was on articles published in Scopus on the topic of early childhood education, with an emphasis on studies conducted in Malaysia. Scopus, as a comprehensive and reputable database provides a reliable source of research articles for our analysis, ensuring the inclusion of high-quality and relevant publications. By concentrating on articles pertaining to early childhood research in the Malaysian context, this study aims to provide a detailed and accurate portrayal of the local research landscape in this field. Such a focus enables the identification of trends, patterns, and key players in Malaysian early childhood research, thereby contributing to a better understanding of the research output, impact, and collaborations within this particular context.

Scopus is a large, interdisciplinary, and authoritative abstract and citation database, covering research literature in various fields, including science, technology, medicine, social sciences, and the arts and humanities (Elsevier, 2022). Developed by Elsevier, Scopus indexes over 23,700 peer-reviewed journals, conference proceedings, trade publications, and book series, providing researchers with access to a comprehensive and diverse range of academic content (Mongeon & Paul-Hus, 2016). The database is widely recognized for its extensive coverage, user-friendly interface, and advanced search and analytical features, which enable researchers to explore and evaluate the research landscape effectively (Falagas, Pitsouni, Malietzis, & Pappas, 2008). Scopus is frequently employed in bibliometric studies due to its reliability, accuracy, and comprehensiveness, making it a valuable resource for researchers seeking to analyze and map scholarly output in various disciplines (Mongeon & Paul-Hus, 2016).

Document search was conducted in December 2022, searching in article titles, abstracts, and document keywords, using the phrases “preschool”, “kindergarten”, “young child” or “early childhood” and “Malaysia”. Specifically, the following search strings were used, including Boolean operators and wildcard searches:

1. “preschool” AND “Malaysia”
2. “kindergarten” AND “Malaysia”
3. “young” OR “early” AND “child*” AND “Malaysia”

Publications in English and Malay (Bahasa Malaysia) were included. The search included journal articles, books and book chapters, and conference papers. The resulting publications were saved to Scopus lists, and later downloaded for further cleaning and analysis. Bibliometric data for finalised Scopus saved list was downloaded and loaded into OpenRefine for clean-up. The names of authors and sources was standardised, in cases where variations in spellings occurred.

The cleaned bibliometrics data was loaded into an Excel worksheet to calculate the research growth pattern, and author collaboration index. Excel was also used in combination with Harzing's Publish or Perish (Harzig, 2007) to calculate the annual citation profile. Visualisations of author collaboration patterns were generated in VOSViewer.

Inclusion and exclusion criteria

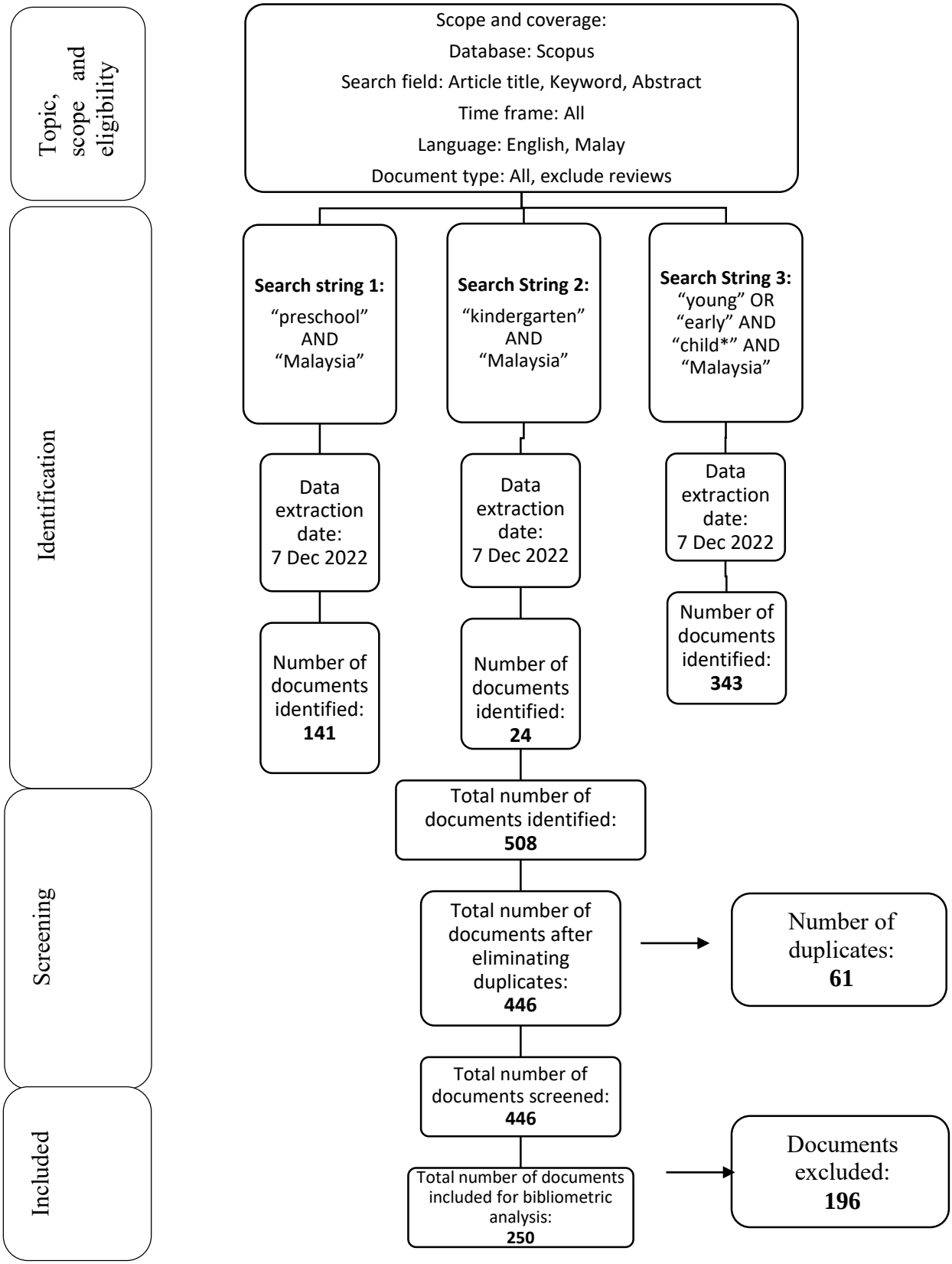
The present bibliometric analysis focused on publications that covered topics related to early childhood education or early learning and development, specifically targeting research papers conducted on children between the ages of four and seven were included. This is due to substantial resources allocated to pre-primary education in Malaysia, which makes research into this age range particularly relevant. Exceptions were made for research involving parents or teachers of young children, or with samples that included both adolescents and children under seven years old. In this study, publications reviewing laws, policies or childcare from a religious perspective were excluded, as the primary focus was on early childhood education research. Similarly, articles unrelated to the aforementioned topics such as medical texts, were excluded.

RESULTS

The initial search in Scopus yielded a total of 508 publications. After removing duplicates, 446 documents were screened for inclusion in the data analysis. Based on the inclusion and exclusion criteria outlined above, 196 publications were eliminated, resulting in 250 documents for further analysis. Refer to flowchart below for illustration of the searching and screening process.

Figure 1

Flowchart illustrating identification and inclusion process for bibliographic analysis. Adapted from Chin and Chew (2021, p.554).



Annual Research Growth

As shown in Figure 2 and Table 2 below, there has been a steady increase in the number of publications related to early childhood education and development, especially in the last five years. The first paper on early childhood research published in Scopus was in 1988. From 1988 to 2008, fewer than 10 documents were published per year, with no publications recorded in the field from 1990 to 1992. A surge in publications began in 2009, with more than 10 publications per years, although there was a slight dip in 2015 where only 9 papers were recorded. From 2019 to December 2022, there have been more than 20 publications per year on early childhood research.

Figure 2

Graph illustrating number of publications per year.

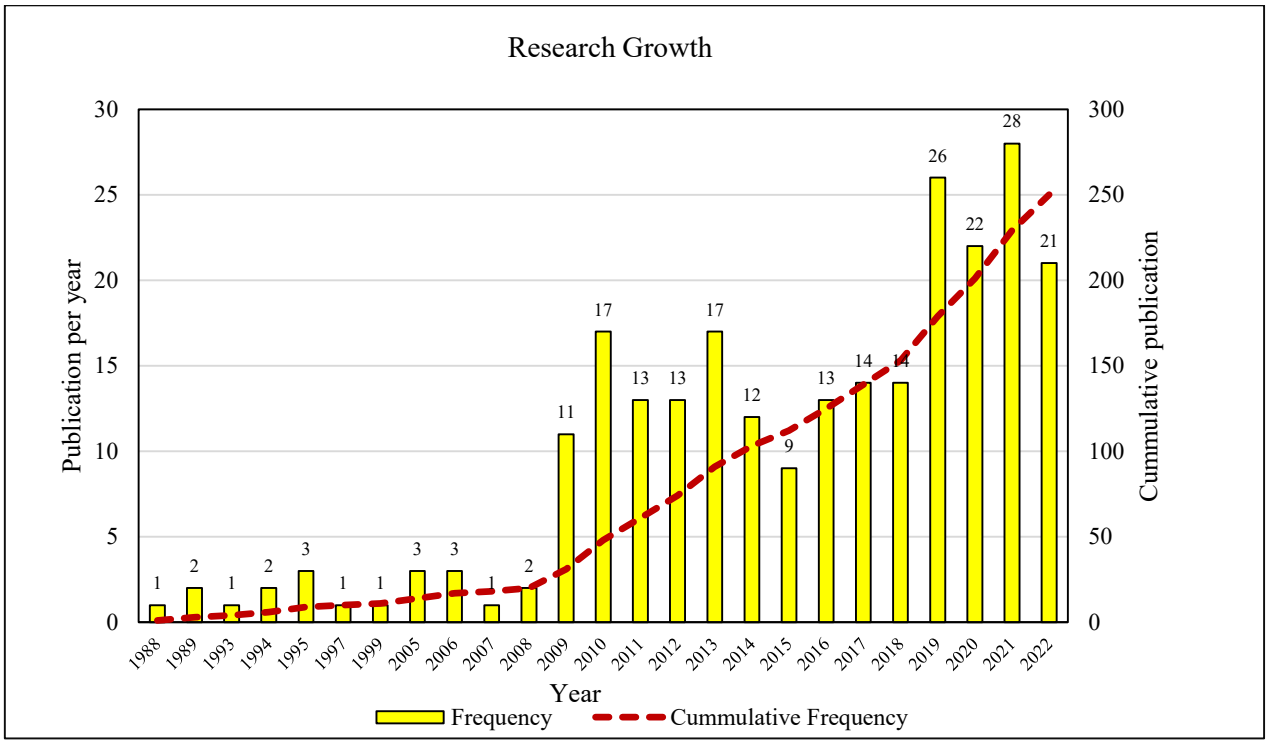


Table 2

Number of publications per year.

Year	Frequency	Percentage	Cumulative Frequency	Cumulative Percentage
1988	1	0.40%	1	0.40%
1989	2	0.80%	3	1.20%
1993	1	0.40%	4	1.60%
1994	2	0.80%	6	2.40%
1995	3	1.20%	9	3.60%
1997	1	0.40%	10	4.00%
1999	1	0.40%	11	4.40%
2005	3	1.20%	14	5.60%
2006	3	1.20%	17	6.80%
2007	1	0.40%	18	7.20%
2008	2	0.80%	20	8.00%
2009	11	4.40%	31	12.40%
2010	17	6.80%	48	19.20%
2011	13	5.20%	61	24.40%
2012	13	5.20%	74	29.60%
2013	17	6.80%	91	36.40%
2014	12	4.80%	103	41.20%
2015	9	3.60%	112	44.80%
2016	13	5.20%	125	50.00%
2017	14	5.60%	139	55.60%
2018	14	5.60%	153	61.20%
2019	26	10.40%	179	71.60%
2020	22	8.80%	201	80.40%
2021	28	11.20%	229	91.60%
2022	21	8.40%	250	100.00%

Annual Citation Performance

Table 3 presents a summary of key bibliometric metrics for early childhood education research over a 34-year period. A total of 250 papers were published in this field, accumulating 1,576 citations. On average, these publications received 46.35 citations per year and 6.30 citations per paper. The h-index, which considers both the number of publications and their citation impact, stands at 21, indicating that 21 papers have been cited at least 21 times. The g-index, which gives more weight to *highly cited* papers, is 29, highlighting the presence of several influential publications within the dataset. In summary, the table provides an overview of the research landscape for early childhood studies, illustrating a growing body of work with a moderate citation impact.

Table 3

Early childhood research citation metrics.

Metric	Data
Total papers	250
Total citations	1576
Number of years	34
Cites per year	46.35
Cites per paper	6.30
h-index	21
g-index	29

Table 4 presents the annual citation performance for early childhood research from 1988 to 2022. Over these years, there has been an increase in the total number of publications (TP) in the field, with the highest number of publications (28) recorded in 2021. Despite this, the percentage of cited publications (NCP) has fluctuated over the years, with the highest percentage (76.19%) in 2020. Total citations (TC) have also varied, peaking in 2010 with 211 citations.

Citation per publication (C/P) serves as an indicator of the average number of citations a publication receives. The highest C/P value was observed in 2007, with 108 citations per publication. However, this value was based on a single publication, which also achieved the highest citation per cited publication (C/CP) of 108.00. The paper, titled "Sympathy, distress, and prosocial behaviour of preschool children in four cultures" was written by Trommsdorff, Friedlmeier and Mayer, and published in the International Journal of Behavioural Development. The study included children from Germany, Israel, Indonesia, and Malaysia.

In terms of h-index, which balances the number of publications and citations (Hirsch in 2005), the highest value (9) was recorded in 2013. The highest g-index, which gives more weight to highly-cited papers (Egghe, 2006), was observed in 2010 with a value of 14.

In summary, the table demonstrates a growing interest in early childhood research, with an increasing number of publications and fluctuating citation metrics. The highest number of total citations occurred in 2010, and the highest h-index and g-index were achieved in 2013 and 2010, respectively.

Table 4

Annual citation performance of early childhood research.

Year	Total Publication (TP)	Percentage (%)	Number of Cited Publications (NCP)	Total Citation (TC)	Citation per Publication (C/P)	Citation per Cited Publication (C/CP)	h index	g index
2022	21	8.40	5	8	0.38	1.60	2	2
2021	28	11.20	10	11	0.39	1.10	1	1
2020	22	8.80	16	67	3.05	4.19	4	7
2019	26	10.40	17	69	2.65	4.06	5	7
2018	14	5.60	9	75	5.36	8.33	5	8
2017	14	5.60	10	44	3.14	4.40	3	6
2016	13	5.20	8	59	4.54	7.38	5	7
2015	9	3.60	7	59	6.56	8.43	5	7
2014	12	4.80	9	89	7.42	9.89	6	9
2013	17	6.80	16	184	10.82	11.50	9	13
2012	13	5.20	8	90	6.92	11.25	5	9
2011	13	5.20	11	91	7.00	8.27	6	9
2010	17	6.80	16	211	12.41	13.19	6	14
2009	11	4.40	7	37	3.36	5.29	4	6
2008	2	0.80	2	14	7.00	7.00	1	2
2007	1	0.40	1	108	108.00	108.00	1	1
2006	3	1.20	1	83	27.67	83.00	3	3
2005	3	1.20	3	110	36.67	36.67	3	3
1999	1	0.40	1	1	1.00	1.00	1	1
1997	1	0.40	0	0	0.00	undefined	0	0
1995	3	1.20	3	89	29.67	29.67	3	3
1994	2	0.80	2	28	14.00	14.00	2	2
1993	1	0.40	1	1	1.00	1.00	1	1
1989	2	0.80	2	33	16.50	16.50	2	2
1988	1	0.40	1	15	15.00	15.00	1	1

Annual collaboration metrics

Table 5 presents the annual collaboration metrics for early childhood research, including the Collaboration Index (CI), Degree of Collaboration (DC), and Collaborative Coefficient (CC). The CI represents the average number of authors per publication, while the DC measures the proportion of multi-authored publications, and the CC indicates the extent of collaboration in the research field. Over the years, the CI has varied, with the highest values observed in 2021 and 1994. The DC has generally remained high, with values ranging between 0.86 and 1.00, indicating a strong tendency for researchers to collaborate on publications. The CC has been fluctuating, with values above 0.5 in most years, suggesting a moderate to high level of collaboration in the field. However, certain years marked with an asterisk (*) have CC values less than 0.5, indicating a lower level of collaboration during those periods. Overall, the table demonstrates a general trend of collaboration in early childhood research, with some variation across the years.

Table 5

Annual collaboration metrics.

Year	Collaboration Index (CI)	Degree of Collaboration (DC)	Collaborative Coefficient (CC)
2022	4.38	0.86	0.65
2021	4.00	0.89	0.64
2020	3.91	0.86	0.60
2019	3.27	0.88	0.59
2018	2.29	0.71	0.44*
2017	2.79	0.93	0.58
2016	3.15	0.92	0.61
2015	3.56	1.00	0.69
2014	3.25	0.92	0.63
2013	3.53	0.94	0.63
2012	2.54	0.69	0.45*
2011	4.00	0.92	0.62
2010	2.29	0.88	0.50
2009	3.00	0.73	0.50
2008	1.00	0.00	0.00*
2007	3.00	1.00	0.67
2006	1.33	0.33	0.17*
2005	4.00	0.67	0.54
1999	1.00	0.00	0.00*
1997	1.00	0.00	0.00*
1995	2.33	1.00	0.56
1994	3.50	1.00	0.71
1993	1.00	0.00	0.00*
1989	2.00	0.50	0.33*
1988	1.00	0.00	0.00*

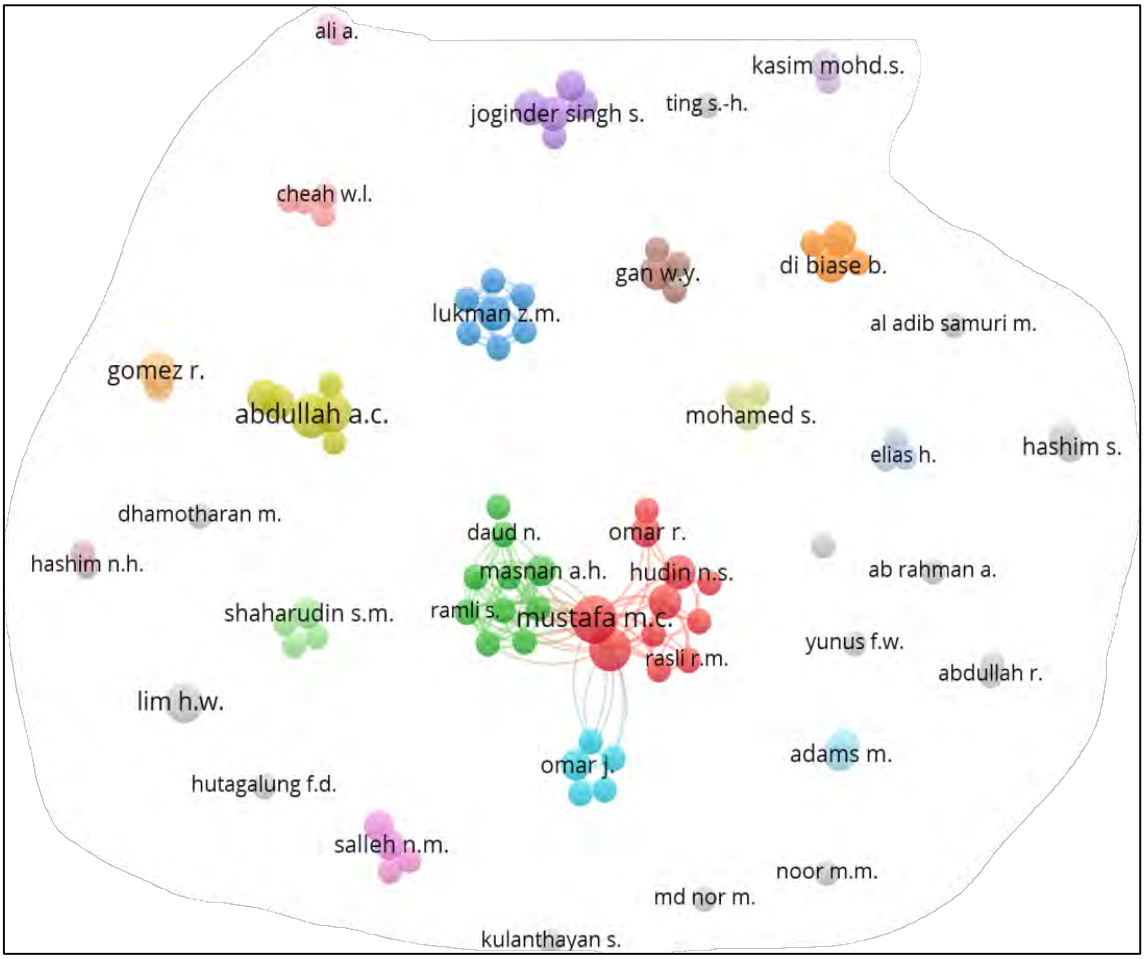
Note: * CC value less than 0.5.

Co-authorship network

The collaboration analysis threshold suggested by Baker et al. (2020) was used in this study where authors with at least 2 publications and zero or more citations are included in the visualisation. The collaboration network comprised 31 clusters and 95 items, with each item e denoting one author. A cluster represents a group of authors who have collaborated with each other on research projects, while an item in the visualization represents an individual author or researcher. The largest cluster contains 11 items, while the smallest clusters contain 1 item. Authors that had collaborated with each other were placed in the same cluster, with lines representing the linkage (i.e., relationship) between authors. Thicker lines indicate stronger connections or more frequent collaborations between authors. The largest clusters had 20 links to other items, while the smallest had no linkages. Mustafa M.C. is at the centre of the largest cluster, with a total of 39 collaborations made with 20 other researchers. The number of linkages between clusters or items can indicate the extent to which different research groups or authors are connected and collaborate with each other.

Figure 3

Collaboration network showing collaboration relationships between authors.



DISCUSSION AND IMPLICATIONS

Early childhood education research in Malaysia has experienced three distinct growth periods: 1988-2008, 2009-2018, and 2019-2022, as evidenced by the data presented in Tables 1-5 and the accompanying visualizations. The initial period saw minimal research growth, while the second period displayed uncertain growth, characterized by an increase in total publications with a slight decline in the middle of the period (Table 1). The third period began in 2019, with a consistent surge in publications, indicating growing research interest in pre-primary education in Malaysia and the increasing acknowledgment of its importance (Table 2).

Despite the rise in publications, citation performance remains inconsistent. Of the 250 publications surveyed, 166 were cited while 84 were uncited (Table 3). Years with the highest total citations were those with comparative studies involving multiple countries, which are more informative for the international research community (Table 4). Research focusing solely on Malaysia may have more relevance to local researchers, resulting in lower citation counts.

The growth in research is also reflected in the degree of researcher collaboration. During the initial slow growth period, the collaboration index was 1.92, indicating limited collaboration among researchers. As the field expanded, the collaboration index increased to 3.04 and then to 3.89 in the most productive years (Table 5). This suggests that researchers increasingly collaborated as the field grew. The degree of collaboration, or the proportion of publications with multiple authors, also increased significantly during this time.

Despite the increase in collaboration, the collaborative coefficient remained low to moderate, implying a fragmented collaboration network. As shown in Figure 2, the collaboration pattern observed resembles a small-world network, characterized by high connectedness within clusters but limited connections between clusters (Watts & Strogatz, 1998). While this network fosters cooperation and innovation within individual clusters, it may also lead to conformity, risk avoidance, and redundant information (Vlegels & Huisman, 2021). This fragmented network could hinder the effective sharing of knowledge among researchers and impede future collaborations, ultimately slowing the growth of knowledge and innovation.

The findings from this bibliometric study on early childhood education research in Malaysia highlight several important implications for researchers, policymakers, and educational institutions. First, the increase in publications in recent years suggests a growing interest in and recognition of the significance of early childhood education in Malaysia. This implies that the research community is beginning to prioritise this crucial stage of education, which could lead to better educational policies and practices in the country.

Second, the fragmented collaboration network found in the study indicates the need for better communication and knowledge sharing among researchers in the field. By fostering stronger connections between research clusters, the potential for innovation and advancement in early childhood education research could be greatly improved.

Lastly, the inconsistent citation performance of publications suggests that researchers should consider conducting more comparative studies involving multiple countries. These studies tend to be more informative for the international research community, and their increased visibility could attract more resources and attention to the field of early childhood education in Malaysia.

Limitations and future directions

The current bibliometric study has several limitations that should be considered when interpreting the findings. First, the study relies on data available from Scopus, which might exclude relevant research published in other databases or in non-indexed journals. Second, the study focuses on publication and citation counts as primary indicators of research growth and impact. While these metrics are widely used in bibliometric studies, they may not fully capture the complexity of research productivity and influence.

Future research directions could build upon the findings of this study by exploring several avenues. These may include conducting in-depth qualitative analyses of the most influential publications to identify key themes, trends, and knowledge gaps in early childhood education research in Malaysia. Additionally, examining factors that contribute to the fragmented collaboration network and identifying strategies for promoting stronger connections among researchers in the field can be beneficial. It would also be insightful to investigate the impact of early childhood education research on policy and practice in Malaysia, determining how effectively research findings translate into real-world improvements in education. Lastly, exploring the potential benefits of interdisciplinary collaborations in early childhood education research could lead to novel insights and innovations that can advance the field.

Addressing these research directions and limitations can provide valuable insights into promoting the growth and impact of early childhood education research in Malaysia, ultimately contributing to better educational outcomes for young children in the country.

CONCLUSION

The current study found that while early childhood education (ECE) in Malaysia has been gaining attention from researchers in recent years, various gaps still existed especially in terms of collaboration between authors. The growth of research into ECE in Malaysia is indicative of more data and better understanding of child development in Malaysia. This could then inform improving childcare practices and policy, leading to better child development outcomes.

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REFERENCES

Agarwal, A., Durairajanayagam, D., Tatagari, S., Esteves, S., Harlev, A., Henkel, R., . . . al., e. (2016). Bibliometrics: Tracking research impact by selecting the appropriate metrics. *Asian Journal of Andrology, 18*(2), 296-309. https://doi.org/10.4103/1008-682X.171582

Baker, H., Pandey, N., Kumar, S., & Haldar, A. (2020). A bibliometric analysis of board diversity: Current status, development, and future research directions. *Journal of Business Research, 108*, 232-246.

Black, M., Walker, S., Fernald, L., Andersen, C., DiGirolamo, A., Lu, C., & Grantham-McGregor, S. (2016). Early childhood development coming of age: Science through the life course. *The Lancet, 6736*(16), 77-90. https://doi.org/10.1016/S0140-6736(16)31389-7.

Bradley, R., & Corwyn, R. (2002). Socioeconomic Status and Child Development. *Annual Review of Psychology, 53*, 371-399. https://doi.org/https://doi.org/10.1146/annurev.psych.53.100901.135233

Dornan, P., & Woodhead, M. (2015). How Inequalities Develop through Childhood: Life course evidence from the Young Lives cohort study. In *Innocenti Discussion Paper No.2015-01*. Florence: UNICEF Office of Research.

Elango, B., & Rajendran, P. (2012). Authorship trends and collaboration pattern in the marine sciences literature: A scientometric study. *International Journal of Information Dissemination and Technology, 2*(3), 166-169.

Elsevier. (2022). *Scopus Content*. Retrieved 2 December, 2022, from Elsevier: https://www.elsevier.com/solutions/scopus/how-scopus-works/content

Gullo, D. (2017). A structural model of early indicators of school readiness among children of poverty. *Journal of Children and Poverty*. https://doi.org/https://doi.org/10.1080/10796126.2017.1401899

Huang, C., Yang, C., Wang, S., Wu, W., Su, J., & Liang, C. (2020). Evolution of topics in education research: A systemetic review using bibliometric analysis. *Educational Review, 72*(3), 281-297. https://doi.org/ https://doi.org/10.1080/00131911.2019.1566212

Jabatan Kebajikan Masyarakat. (7 February, 2017). *Perkembagan Awal Kanak-kanak (ECCE)*. Retrieved 8 August, 2020, from Jabatan Kebajikan Masyarakat: http://www.jkm.gov.my/jkm/index.php?r=portal/left&id=U3N0NlFXbVFSOGQ2ajJHalBUc2J6dz9

Khodabandelou, R., Mehran, G., & Nimehchisalem, V. (2018). A bibliometric analysis of 21st century research trends in early childhood education. *Revista Publicando, 15*(1), 137-163.

Kushairi, N., & Ahmi, A. (2021). Flipped classroom in the second decade of the Millenia: A bibliometric analysis with Lotka's law. *Education and Information Technologies, 26*, 4401-4431. https://doi.org/https://doi.org/10.1007/s10639-021-10457-8

Liao, C., & Yen, H. (2012). Quantifiying the degree of research collaboration: A comparative study of collaborative measures. *Journal of Informetrics, 6*(1), 27-33. https://doi.org/https://doi.org/10.1016/j.joi.2011.09.003

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: evidence from a latent-variable longitudinal study. *Developmental psychology., 36*(5), 596.

Lonigan, C. J., Schatschneider, C., & Westberg, L. (2008). Identification of children's skills and abilities linked to later outcomes in reading, writing, and spelling. . *Developing early literacy: Report of the national early literacy panel*, 55-106.

Lurie, L., Hagen, M., McLaughlin, K., Sheridan, M., Meltzoff, A., & Rosen, M. (2021). Mechanisms linking socioeconomic status and academic achievement in early childhood: Cognitive stimulation and language. *Cognitive Development, 58*, 101045. https://doi.org/https://doi.org/10.1016/j.cogdev.2021.101045

McEwen, C., & McEwen, B. (2017). Social structure, adversity, toxic stress, and intergenerational poverty: An early childhood model. *Annual Review of Sociology, 43*, 445-472.

Moffitt, T., Poulton, R., & Caspi, A. (26 July, 2013). Lifelong impact of early self-control. *American Scientist, 101*, pp. 352-359. Retrieved from https://playistheway.com.au/img/cms/Lifelong%20Impact%20of%20Early%20Self-Control.compressed.pdf

Mohd Noor, M., & Symaco, L. (2017). Education Policies and Practices in Malaysia. In M. Samuel, M. Tee, & L. Symaco (Eds.), *Education in Malaysia* (Vol. 39, pp. 67-83). Singapore: Springer Nature. https://doi.org/10.1007/978-981-10-4427-4_5

O'Toole, S., Monks, C., & Tsermentseli, S. (2017). Executive function and theory of mind as predicotrs of aggressive and prosocial behavior and peer acceptance in early childhood. *Social Development, 26*(4), 907-920.

Rahimi, R., Koseoglu, M., & Okumus, F. L. (2016). Bibliometric studies in tourism. *Annals of Tourism Research, 61*(1), 180-198. https://doi.org/10.1016/j.annals.2016.10.006

Rosen, M., Hagen, M., Lurie, L., Miles, Z., Sheridan, M., Meltzoff, A., & McLaughlin, K. (2020). Cognitive stimulation as a mechanism linking socioeconomic status with executive function: A longitudinal investigation. *Child Development, 91*(4), e762–e779. https://doi.org/10.1111/cdev.13315

Saitadze, I., & Lalayants, M. (2020). Mechanisms that mitigate the effects of child poverty and improve children's cognitive and socio-emotional development: A systematic review. *Child & Family Social Work, 26*(3), 1-20. https://doi.org/10.1111/cfs.12809

Samuel, M., Tee, M., & Symaco, L. (2017). The Educational Landscape of Malaysia. In M. Samuel, M. Tee, & L. Symaco (Eds.), *Education in Malaysia* (Vol. 39, pp. 1-16). Singapore: Springer Nature. https://doi.org/10.1007/978-981-10-4427-4_1

Shonkoff, J. (2010). Building a new biodevelopmental framework to guide the future of early childhood policy. *Child Development, 81*(1), 357-367.

Shonkoff, J., & Phillips, D. (2000). *From Neurons to Neighborhoods: The Science of Early Childhood Development.* Washington, D.C.: The National Academies Press. https://doi.org/https://doi.org/10.17226/9824.

Struck, S., Stewart-Tufescu, A., Asmundson, A., Asmundson, G., & Afifi, T. (2021). Adverse childhood experiences (ACEs) research: A bibliometric analysis of publication trends over the first 20 years . *Child Abuse & Neglect, 112*, 104895. https://doi.org/https://doi.org/10.1016/j.chiabu.2020.104895

Sweileh, W. (2018). Research trends on human trafficking: A bibliometric analysis using Scopus database. *Globalization and Health, 14*, 106. https://doi.org/https://doi.org/10.1186/s12992-018-0427-9

The Malaysian Administrative Modernisation and Management Planning Unit. (2021). *Getting Formal Education*. Retrieved 15 February, 2021, from MyGovernment: https://www.malaysia.gov.my/portal/subcategory/98

UCL Library Services. (10 November, 2022). *Scopus*. Retrieved 2 December, 2022, from UCL: https://library-guides.ucl.ac.uk/scopus/what-is-scopus

Agarwal, A., Durairajanayagam, D., Tatagari, S., Esteves, S., Harlev, A., Henkel, R., . . . al., e. (2016). Bibliometrics: Tracking research impact by selecting the appropriate metrics. *Asian Journal of Andrology, 18*(2), 296-309. https://doi.org/10.4103/1008-682X.171582

Baker, H., Pandey, N., Kumar, S., & Haldar, A. (2020). A bibliometric analysis of board diversity: Current status, development, and future research directions. *Journal of Business Research, 108*, 232-246.

Black, M., Walker, S., Fernald, L., Andersen, C., DiGirolamo, A., Lu, C., & Grantham-McGregor, S. (2016). Early childhood development coming of age: Science through the life course. *The Lancet, 6736*(16), 77-90. https://doi.org/10.1016/S0140-6736(16)31389-7.

Bradley, R., & Corwyn, R. (2002). Socioeconomic Status and Child Development. *Annual Review of Psychology, 53*, 371-399. https://doi.org/https://doi.org/10.1146/annurev.psych.53.100901.135233

Dornan, P., & Woodhead, M. (2015). How Inequalities Develop through Childhood: Life course evidence from the Young Lives cohort study. In *Innocenti Discussion Paper No.2015-01.* Florence: UNICEF Office of Research.

Elango, B., & Rajendran, P. (2012). Authorship trends and collaboration pattern in the marine sciences literature: A scientometric study. *International Journal of Information Dissemination and Technology, 2*(3), 166-169.

Elsevier. (2022). *Scopus Content*. Retrieved 2 December, 2022, from Elsevier: https://www.elsevier.com/solutions/scopus/how-scopus-works/content

Gullo, D. (2017). A structural model of early indicators of school readiness among children of poverty. *Journal of Children and Poverty*. https://doi.org/https://doi.org/10.1080/10796126.2017.1401899

Huang, C., Yang, C., Wang, S., Wu, W., Su, J., & Liang, C. (2020). Evolution of topics in education research: A systemetic review using bibliometric analysis. *Educational Review, 72*(3), 281-297. https://doi.org/ https://doi.org/10.1080/00131911.2019.1566212

Jabatan Kebajikan Masyarakat. (7 February, 2017). *Perkembagan Awal Kanak-kanak (ECCE)*. Retrieved 8 August, 2020, from Jabatan Kebajikan Masyarakat: http://www.jkm.gov.my/jkm/index.php?r=portal/left&id=U3N0NlFXbVFSOGQ2ajJHalBUc2J6dz09

Khodabandelou, R., Mehran, G., & Nimehchisalem, V. (2018). A bibliometric analysis of 21st century research trends in early childhood education. *Revista Publicando, 15*(1), 137-163.

Kushairi, N., & Ahmi, A. (2021). Flipped classroom in the second decade of the Millenia: A bibliometric analysis with Lotka's law. *Education and Information Technologies, 26*, 4401-4431. https://doi.org/https://doi.org/10.1007/s10639-021-10457-8

Liao, C., & Yen, H. (2012). Quantifiying the degree of research collaboration: A comparative study of collaborative measures. *Journal of Informetrics, 6*(1), 27-33. https://doi.org/https://doi.org/10.1016/j.joi.2011.09.003

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: evidence from a latent-variable longitudinal study. *Developmental psychology., 36*(5), 596.

Lonigan, C. J., Schatschneider, C., & Westberg, L. (2008). Identification of children's skills and abilities linked to later outcomes in reading, writing, and spelling. . *Developing early literacy: Report of the national early literacy panel*, 55-106.

Lurie, L., Hagen, M., McLaughlin, K., Sheridan, M., Meltzoff, A., & Rosen, M. (2021). Mechanisms linking socioeconomic status and academic achievement in early childhood: Cognitive stimulation and language. *Cognitive Development, 58*, 101045. https://doi.org/https://doi.org/10.1016/j.cogdev.2021.101045

McEwen, C., & McEwen, B. (2017). Social structure, adversity, toxic stress, and intergenerational poverty: An early childhood model. *Annual Review of Sociology, 43*, 445-472.

Moffitt, T., Poulton, R., & Caspi, A. (26 July, 2013). Lifelong impact of early self-control. *American Scientist, 101*, pp. 352-359. Retrieved from https://playistheway.com.au/img/cms/Lifelong%20Impact%20of%20Early%20Self-Control.compressed.pdf

Mohd Noor, M., & Symaco, L. (2017). Education Policies and Practices in Malaysia. In M. Samuel, M. Tee, & L. Symaco (Eds.), *Education in Malaysia* (Vol. 39, pp. 67-83). Singapore: Springer Nature. https://doi.org/10.1007/978-981-10-4427-4_5

O'Toole, S., Monks, C., & Tsermentseli, S. (2017). Executive function and theory of mind as predicotrs of aggressive and prosocial behavior and peer acceptance in early childhood. *Social Development, 26*(4), 907-920.

Rahimi, R., Koseoglu, M., & Okumus, F. L. (2016). Bibliometric studies in tourism. *Annals of Tourism Research, 61*(1), 180-198. https://doi.org/10.1016/j.annals.2016.10.006

Rosen, M., Hagen, M., Lurie, L., Miles, Z., Sheridan, M., Meltzoff, A., & McLaughlin, K. (2020). Cognitive stimulation as a mechanism linking socioeconomic status with executive function: A longitudinal investigation. *Child Development, 91*(4), e762–e779. https://doi.org/10.1111/cdev.13315

Saitadze, I., & Lalayants, M. (2020). Mechanisms that mitigate the effects of child poverty and improve children's cognitive and socio-emotional development: A systematic review. *Child & Family Social Work, 26*(3), 1-20. https://doi.org/10.1111/cfs.12809

Samuel, M., Tee, M., & Symaco, L. (2017). The Educational Landscape of Malaysia. In M. Samuel, M. Tee, & L. Symaco (Eds.), *Education in Malaysia* (Vol. 39, pp. 1-16). Singapore: Springer Nature. https://doi.org/10.1007/978-981-10-4427-4_1

Shonkoff, J. (2010). Building a new biodevelopmental framework to guide the future of early childhood policy. *Child Development, 81*(1), 357-367.

Shonkoff, J., & Phillips, D. (2000). *From Neurons to Neighborhoods: The Science of Early Childhood Development.* Washington, D.C.: The National Academies Press. https://doi.org/https://doi.org/10.17226/9824.

Struck, S., Stewart-Tufescu, A., Asmundson, A., Asmundson, G., & Afifi, T. (2021). Adverse childhood experiences (ACEs) research: A bibliometric analysis of publication trends over the first 20 years . *Child Abuse & Neglect, 112*, 104895. https://doi.org/https://doi.org/10.1016/j.chiabu.2020.104895

Sweileh, W. (2018). Research trends on human trafficking: A bibliometric analysis using Scopus database. *Globalization and Health, 14*, 106. https://doi.org/https://doi.org/10.1186/s12992-018-0427-9

The Malaysian Administrative Modernisation and Management Planning Unit. (2021). *Getting Formal Education*. Retrieved 15 February, 2021, from MyGovernment: https://www.malaysia.gov.my/portal/subcategory/98

UCL Library Services. (10 November, 2022). *Scopus*. Retrieved 2 December, 2022, from UCL: https://library-guides.ucl.ac.uk/scopus/what-is-scopus

UNESCO. (2017). *Early Childhood Care and Education*. Retrieved from UNESCO: https://en.unesco.org/themes/early-childhood-care-and-education

United Nations. (1989). *Convention on the Rights of the Child.* Retrieved from United Nations Human Rights Office of The High Commissioner: https://www.ohchr.org/EN/ProfessionalInterest/Pages/CRC.aspx

van Eck, N., & Waltman, L. (2007). VOS: A New Method for Visualising Similarities Between Objects. In R. Decker, & H. Lenz (Eds.), *Advances in Data Analysis. Studies in Classification, Data Analysis, and Knowledge Organisation.* Berlin, Heidelberg: Springer. https://doi.org/https://doi.org/10.1007/978-3-540-70981-7_34

van Eck, N., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*, 523-538. https://doi.org/https://doi.org/10.1007/s11192-009-0146-3

Verma, S., & Petersen, A. (2018). Developmental Science and Pathways to Sustainable Development for Children and Youth. In S. Verma, & A. Petersen (Eds.), *Developmental Science and Pathways to Sustainable Development for Children and Youth* (Vol. 74, pp. 1-37). Springer.

Vlegels, J., & Huisman, J. (2021). The emergence of the higher education research field (1976-2018): preferential attachment, smallworldness and fragmentation in its collaboration networks. *Higher Education, 81*, 1079-1095. https://doi.org/https://doi.org/10.1007/s10734-020-00600-8

Waheed, H., Hassan, S., Aljohani, N., & Wasif, M. (2018). A bibliometric perspective of learning analytics research landscape. *Behaviour & Information Technology, 37*(10-11), 941-957. https://doi.org/https://doi.org/10.1080/0144929X.2018.1467967

Watts, D., & Strogatz, S. (1998). Collective dynamics of 'small-world' networks. *Nature, 393*, 440-442.

Young Lives. (2010). *Early Childhood Care and Education as a Strategy for Poverty Reduction: Evidence from Young Lives.* Young Lives Policy Brief 9.

Zafrunnisha, N., & Pullareddy, V. (2009). Authorship pattern and degree of collaboration in psychology. *Annals of Library and Information Studies, 56*, 255-261.