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Exploring the roots: Bibliometrics insights into early years science education

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Abstract

This bibliometric review traces the publication trends, seminal researchers, key journals, geographical distribution and funding of early years science education. Three research questions are considered: (a) what the trend of publications and citations from 2010 to 2024 is, (b) what the structure of authorship and collaboration networks is, and (c) what are the distribution of journals, countries, institutions and funding sponsors that define the field. A corpus of 83 articles was obtained, following screening, from the Scopus database using a structured Boolean search of the articles with a focus on children from the ages of 3-8 in science and STEM education. From 2010 to 2024, the number of articles published annually in the publication was between 1 and 13, reaching a peak of 13 in 2021, whereas the number of citations was between 5 and 218 in the same years, with its peak at 218 in 2023. Kallery, M. and Ravanis, K. were found to be the most productive authors and co-authorship network analysis showed growing interdisciplinary collaboration networks with few research groups at the center. The three most influential journals were found to be Research in Science Education, International Journal of Science Education, and Education Sciences. The top three nations in publications were Turkey, the United States, and Greece, with the Aristotle University of Thessaloniki and the University of Patras being the most prolific institutions, and funding was highly concentrated, with a few research councils from the United States (the National Science Foundation), Germany (the Federal Ministry of Education and Research) and Sweden (the Swedish Research Council) making the bulk of the contributions. The overall picture on which these findings point is one of a gradually growing and geographically differentiated research base with clear directions for future scholarship and international cooperation with regard to early years science education.

Keywords: early years, preschool, kindergarten, science education, early STEM education and bibliometric analysis

INTRODUCTION

Science education in the early years provides a foundational framework through which young learners develop understandings of the physical, social, and cognitive dimensions of the world around them, consistent with the disciplinary priorities underpinning K-12 science education reform (Larimore, 2020). This foundational framework has evolved alongside broader shifts in the policy and practice of early childhood education more generally, reflecting an increasingly explicit recognition of science as a core component of early learning (Haslip & Gullo, 2018).Early science learning encompasses both scientific content knowledge and logico-mathematical reasoning, including the posing of empirical questions and exploratory play

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Contribution to the literature

- This study aims to give a comprehensive overview of the early years (ages 3-8) science and STEM education research published from the first decade of the 21st century until 2024, highlighting the gradual increase of publications over time, along with a narrow distribution of publications in a small number of key journals and institutions.
- The results indicate the most prolific authors, top journals (Research in Science Education, International Journal of Science Education, Education Sciences) and important countries and institutions (Turkey, USA, and Greece; Aristotle University of Thessaloniki and the University of Patras) providing a road map of the field's expertise and collaboration focus.
- This study reveals the limited and highly concentrated co-authorship networks and the small number of funding sponsors, highlighting the tangible possibilities to forge new partnerships and diversify research funding for early years' science education.

(Curran & Kitchin, 2019). This educational phase is widely regarded as critical for establishing later learning pathways in science and for addressing equity gaps in access to scientific literacy (Pereira et al., 2019; Watts et al., 2016), as it introduces children to the nature of science and the construction of scientific knowledge from an early stage of cognitive development (Hansson et al., 2021).

Research indicates that early exposure to science instruction strengthens children's conceptual reasoning and challenges the long-standing assumption that preschool-aged children are incapable of abstract thought (Novak, 2005). Curricula grounded in concrete, everyday phenomena – such as the behavior of objects in water – provide children with the descriptive language needed to make sense of their surroundings (Bracken & Crawford, 2009; Pereira et al., 2019), although developmental psychology and educational research remain insufficiently integrated in this respect (Allen & Kambouri-Danos, 2016). Early exposure to science also cultivates curiosity, positive attitudes toward science, and an appreciation of the relationships between science, technology, and society (Bjerknes et al., 2024), a relationship that is increasingly framed within the broader goal of preparing young children to engage with sustainable development through early STEM education (Campbell & Speldewinde, 2022), while activity-based approaches allow children to connect classroom learning with lived experience (Kiviranta et al., 2024) and help build the scientific literacy and technological familiarity that support later stages of formal education (Howells et al., 2023).

Despite this substantial body of conceptual and empirical work, the field lacks a systematic, evidence-based account of how research on early years science education has developed as a scholarly domain – who is producing this knowledge, where it is being produced, in which outlets it is disseminated, and how it is funded. Current narrative reviews (e.g., O'Connor et al., 2021; Wan et al., 2021) collect and integrate substantive results, but they lack the ability to indicate the field's structural and scholarly layout, along with the questions on its development trajectory, co-operative structure and geographic and institutional concentration.

A complementary review methodology to narrative and thematic reviews is the bibliometric approach to systematically mapping publication and citation distributions, author networks, institutional and funding networks from a vast collection of publications, which can be done quantitatively (Ravanis, 2022). This work commenced with two recent bibliometric studies: Aktaş (2022) used bibliometric mapping and content analysis to determine the trends in technology research across early childhood science education; Su and Yang (2023) used bibliometric mapping to map more broadly research in early childhood education in STEM. The present study, in comparison, goes beyond in scope and focus, besides technology integration study (Aktaş, 2022) or broadly defined STEM study (Su & Yang, 2023) in examining literature in the field of science education for children aged 3-8 in terms of co-authorship networks, geographic distribution, funding sponsors, which form the scale of the study remain under-examined in the previous STEM years-related literature. A methodological choice that the decision to only go through the one database (Scopus) rather than combining multi-databases was made in order to assure the consistency in citation count and metadata across retrieved records, as discussed further in the method and limitations and future directions sections, as well as the limitations of the approach.

With this background, the aim of the present study is to systematically map and characterize early years science education research published from 2010 to 2024 in terms of knowledge growth, scholarly and collaborative evolution of the field and geographic and institutional distribution. This study addresses the following research questions (RQs).

Research Questions

RQ1: What are the trends in publication output and citation activity in early years science education research between 2010 and 2024?

RQ2: Who are the most productive and influential authors in this field, and what patterns of co-authorship and collaboration characterize the research network?

RQ3: Which journals, countries, institutions, and funding sponsors have been most influential in shaping the field's development?

LITERATURE REVIEW

The early years science education is significant in the lives of a child, and there are several studies that highlight the contribution of early years science education for a child to prepare them for engaging with STEM further on in their lives (Rodrigues-Silva & Alsina, 2023). We have found that children build some science knowledge before starting formal schooling from the real-world experiences and learned models for phenomena as they learn about the changing state of water (Kambouri-Danos et al., 2019). Structured, curriculum-based interventions have also been shown to enhance young children's science learning outcomes, as demonstrated by evaluations of the balanced learning® curriculum, which reported measurable gains in children's science knowledge relative to comparison groups (Saçkes et al., 2019). It is suggested however that early year science education is neither the same as the more traditional forms of teaching science, nor a totally inappropriate form of science education, as it is well suited to introducing children to scientific ideas and practices such as inquiry-based learning and logico-mathematical reasoning, which form the basis of later scientific thinking (Alamoodi et al., 2019). Thus, for example, when understanding the significance of a cross-nationally applicable curriculum for the enhancement of young children's thinking around science, a constructivist view takes the lead in comparative analyses of the Finnish and Australian early childhood science curricula (Havu-Nuutinen et al., 2021). Children's interactions with science when they are very young have also been found to have a significant effect on their cognitive development and create durable learning experiences for thinking and reasoning (Bae et al., 2023), where scientific, social, and physical skills are integrated into early learning experiences and outcomes, have been seen to support children's broader developmental processes (Bayar, 2023). As part of this exposure to science literacy these early years are also reported to enhance the thinking capacities of children in science, highlighting the importance of pedagogies that are student-centered when supporting them learning the science curriculum (Crotty et al., 2023). Together, these studies point to the fact that instructional exposure to science early on contributes to cognitive and conceptual development, although the framework of science learning considered important is highly variable from physical science boxes to daily science experiences, a conceptual heterogeneity that has implications for the way bibliometric keyword-based search might define the field of printed science literacy.

In addition to individual levels of cognitive development, curricular and pedagogical design can impact the enactment of early science learning. Personal skills that are scientifically based like understanding about energy, matter, force and measurement can be understood better and given an early start, helping children to understand scientific concepts more as they can find their way to more advanced science education during their school journey (Assem et al., 2023). Recent practice-oriented work has similarly explored improvement strategies for kindergarten science education grounded in the STEAM framework, arguing that the integration of science, technology, engineering, arts, and mathematics can strengthen the design and delivery of early childhood science activities (Mao et al., 2024; Zhou, 2022). Science is contexed and presented in relevant and meaningful ways, such as offering the means to compare, sort and analyze fallen seeds and leaves in a kindergarten science center, which support exploration and creativity and links classroom learning to lived experience (Bjerknes et al., 2024; Kiviranta et al., 2024). Cultural and environmental considerations are also reported to facilitate understanding and engagement in science when designing curriculum that each considers in the different settings rather than applying a template (Howells et al., 2023; Oliveira & Bonito, 2023). As the examples in this literature review demonstrate, the pedagogical and curricular decision-makers in early education science are not only deciding on whether children will be provided with science content; the actual choice of pedagogy and curriculum that is employed is consequential for learning outcomes.

Home and care environment similarly contributes to early scientific child development. Parental interaction with children, low time on screens, and quality preschool provision have all been linked to better cognitive outcomes in young children (Choiriyah et al., 2021), and parental involvement in their child's learning of science, such as having access to context-specific scientific resources such as print materials, has been found to be predictive of later scientific literacy (Andari et al., 2022). Beyond the home, exposure to science from an early age has been linked to more positive attitudes toward science, greater subsequent science achievement, and an increased likelihood of pursuing science-related careers (Savoca et al., 2023), while early-life environmental exposures more broadly – including pollution – have been shown to shape later cognitive development, illustrating the wider set of factors that condition children's developmental trajectories (Bae et al., 2023).

Early science is linked with science thinking dispositions and abstract and logical reasoning, especially when science learning is integrated into playful activities that involve multiple senses and learning that facilitates information-processing and problem-solving skills (Jung et al., 2022; Lin et al., 2023; Whittaker et al., 2020). Other characteristics of the early life environment are also reported to interact with these more close-to-the-text instructional elements to affect children's cognitive development, such as parents' social status and pre-college attendance in preschool as well as birth order (Kampouri et al., 2017). Although this work documents the significance of early science education in developmental, curricular and contextual dimensions of learning, there is a limited amount of interdisciplinary and/or transnational links among the work of developmental practitioners and the research and evidence-based practices linked to curriculum and STEM in the early years. Such a lack of cohesion in the field makes it important to map the field systematically in order to respond to this fragmentation as addressed in the bibliometric analysis to follow.

In addition to the reviewed substantive literature, this study draws on the concepts of scientometrics and social network theory. In scientometric terms, publication and citation patterns are observable traces of a field's intellectual structure, allowing researchers to infer growth trajectories, thematic clusters, and areas of scholarly concentration from bibliographic metadata (Ravanis, 2022). Co-authorship data, in turn, are interpreted through the lens of social network theory, which treats patterns of collaboration as indicators of the flow of ideas, resources, and expertise across individuals, institutions, and countries. Together, these perspectives frame the bibliometric indicators reported below – publication and citation counts, author productivity, co-authorship ties, journal concentration, and funding distribution – as evidence of how the field of early years science education is structured and by whom it is being shaped, rather than as an assessment of the substantive quality or content of individual studies.

METHOD

For the sake of the RQs raised above, it aims to provide a systematic bibliometric study of the literature on EYSE by mapping certain of the trends and patterns in publications, the most productive authors, the most influential journals and the major funding bodies. The study has been restricted to peer-reviewed, indexed literature collected at the intersection of education/science and therefore only the electronic database Scopus has been used. Being mindful of the mission and goals of other well-defined subfields in bibliometric research, the decision to focus on one database, instead of integrating the answer sets from the two main search engines in these proceedings (Scopus and Web of Science or ERIC), was deliberate to ensure complete bibliographic metadata and consistent citation counts across the retrieved records (which is also followed in bibliometric studies of other well-defined subfields, such as Su & Yang, 2023) the implications of which for coverage and representativeness are summarized in the limitations and future directions section below.

The search keywords combined terms from the categories early years, early childhood education, preschool, kindergarten, AND science education, STEM education, or bibliometric analysis, joined using the Boolean operators AND and OR [author to insert the complete Boolean search string exactly as entered into Scopus, the fields searched – e.g., article title, abstract, keywords – and the exact date the search was conducted]. The search was restricted to the period 2010-2024 in order to capture contemporary trends in the field.

Records were included if they met the following criteria:

(a) published in a peer-reviewed journal,

(b) focused on children aged 3 to 8 years,

(c) reported science or STEM education specifically in early childhood settings, and

(d) available in full text.

Full-text availability was verified through institutional subscription access and, where necessary, direct contact with the authors; records were excluded when science or STEM content was not a substantive theme of the study – for example, where it appeared only in passing within a broader early childhood curriculum or publication.

After screening and selecting according to the above-mentioned inclusion criteria, a final dataset consisting of 83 peer-reviewed articles published between 2010 and 2024 was retained for the final analysis [author to insert the number of records identified through database searching, the number screened, the number excluded at each stage with reasons, and a corresponding PRISMA-style flow diagram, to ensure the transparency and replicability of the selection process].

For each of the 83 records included, information was extracted regarding title, author(s), institutional affiliation, year of publication, journal name, abstract, keywords, number of times the document had been cited, and the main theme of the study [author to confirm if some documents were double coded, what percentage was double coded, and describe the interrater agreement, e.g., Cohen's kappa]). Subsequently, bibliometric analyses were performed to measure the number and trends of publications and citations, the geographical distribution of publications, the most cited publications, the most cited authors, co-authorship and collaboration patterns as well as the distribution of publications across journals, and the distribution of publications across funds and sponsors.

Co-word analysis, keyword co-occurrence analysis and cluster analysis in VOSviewer were also used as a complement to systematic thematic analysis and [author

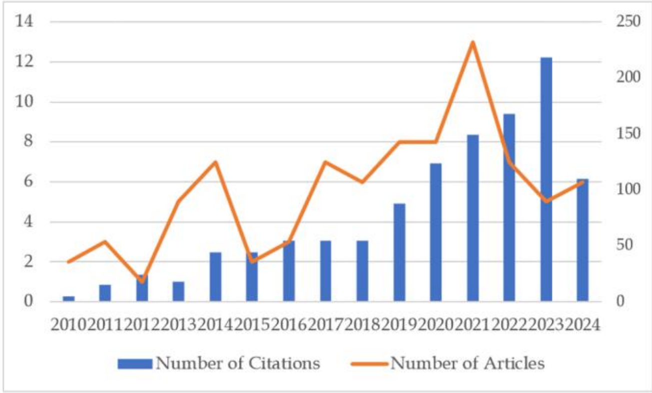

Figure 1. Distribution of number of articles and citations per year (the authors' own elaboration)

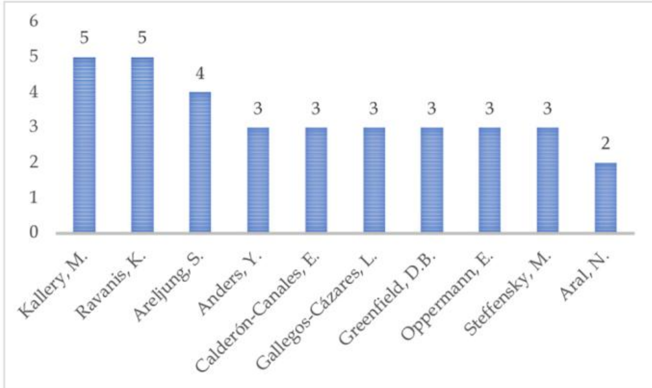

Figure 2. Distribution of number of articles belonging to influential authors (the authors' own elaboration)

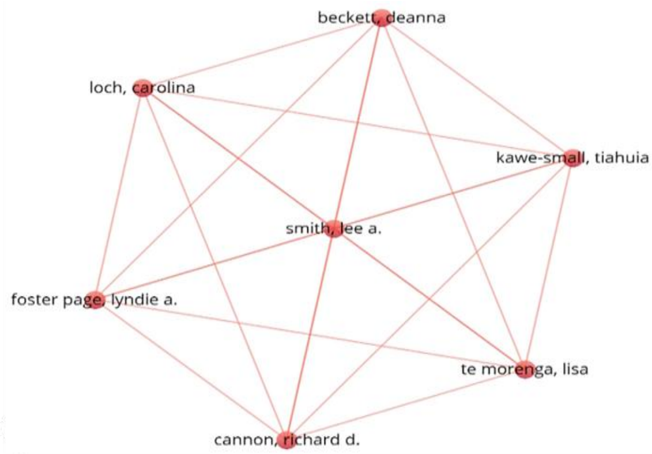

Figure 3. Co-authorship collaborations of network (the authors' own elaboration)

to insert the VOSviewer version used, the minimum-occurrence thresholds applied to keywords and to co-authorship links, the clustering method and resolution parameter, and the procedure by which clusters were labelled and interpreted].

Each of these has some drawbacks, beyond the basic language bias and the use of a single data set, with the use of sources not necessarily in the index requiring further investigation (ibid); these are explored fully in the limitations and future directions section. Ethical approval was not essential as the study was based on secondary bibliographic data which are already publicly available. All data necessary for analysis detailed herein are available from the author on reasonable request.

FINDINGS

Publication and Citation Trends

Based on **RQ1**, the trend of publications and citations showed a positive trend over time albeit with a bit of fluctuation, observed from the data collected from 83 published articles retrieved for this review during the years 2010-2024. The annual publication volume fluctuated from one to thirteen articles, increasing from a few publications in the beginning of the decade to thirteen in 2021.

The trends in citation counts were also relatively similar, rising from five citations in 2010 to a high of 218 citations in 2023, but significantly showing a sharp increase from 2019 onwards – the relatively low citations for 2024 are most likely due to the citation lag of very recent publications. These patterns are then interpreted in the light of the aspects of the field which are associated with them in the discussion section below (**Figure 1**).

Identification of Influential Authors and Co-Authorship Networks

To answer **RQ2**, both Kallery, M. and Ravanis, K. were found to have five publications and a strong involvement in the field of research. A second tier of authors – Areljung, S., Anders, Y., Calderón-Canales, E., Gallegos-Cázares, L., Greenfield, D. B., Oppermann, E., and Steffensky, M. – each published between three and four articles (**Figure 2**). These productivity patterns are examined further, together with the structure of co-authorship among these researchers, in the discussion below.

The co-authorship network displayed in **Figure 3** shows that the top authors listed above are not individual contributors but are surrounded by clusters of repeat collaborations. Individual nodes in the network model correspond to individual authors: the grouping of these nodes indicate that a small number of research groups were formed, possibly with repeating collaboration within groups. This network structure is discussed further in the discussion section with regard to implications for knowledge production in the field.

Influential Journals

Within the **RQ3** area, Research in Science Education received the highest frequency as it had the largest number of articles, six out of 83, followed by authors publishing in International Journal of Science Education with 5 articles and Education Sciences with 4 articles.

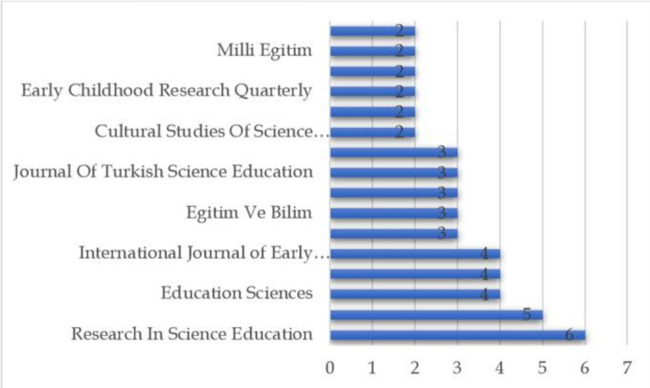

Figure 4. Distribution of number of articles per journals (the authors' own elaboration)

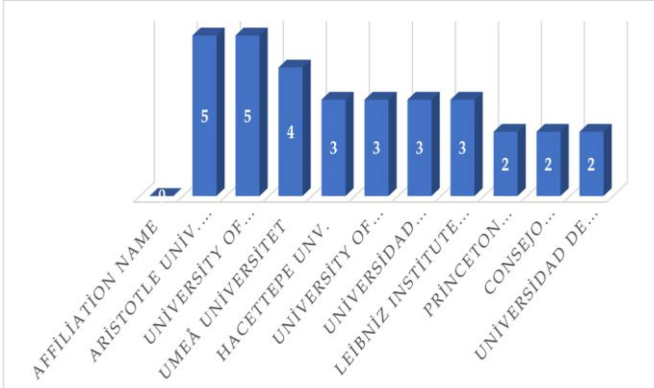

Figure 6. Distribution of number of articles per affiliations (the authors' own elaboration)

Four articles came from the European Early Childhood Education Research Journal, four from the International Journal of Early Years Education, and three from Developmental Psychology.

There were also three articles each in three more journals (Eğitim ve Bilim, Journal of Baltic Science Education and Journal of Turkish Science Education). This distribution is found not only in the specialized early childhood outlets, but also in two main science education discourses and developmental psychology journals, suggesting that the domain contributes to and is located in several neighboring literatures (**Figure 4**).

Geographical Distribution of Publications

Geographic analysis reveals the highest number of publications from Turkey (17), the United States (16) and Greece (12). A significant number of publications also came from Sweden (n = 9), Germany (n = 4), and the United Kingdom (n = 4), while Cyprus, Mexico, and Spain contributed three publications each, and Argentina contributed two. The high representation of research activity in a few countries is discussed further as it relates to database coverage, funding and the language used for publication (**Figure 5**).

Distribution of Institutions and Funding Sponsors

As a response to **RQ3**, the institutions of Aristotle University of Thessaloniki and University of Patras (five publications each), Umeå University (four publications), Hacettepe University, the University of Miami, Universidad Nacional Autónoma de México and a Leibniz Institute for Science and Mathematics Education (three each) were found to be the leading contributing institutions (**Figure 6**).

In terms of funding sources, there were 3 US National Science Foundation funded articles, 3 Bundesministerium für Bildung und Forschung (Germany), and 3 Vetenskapsrådet (Sweden) funded articles; 2 were supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, and 2 by the Fundación Bunge y Born. This pattern suggests that a relatively small number of

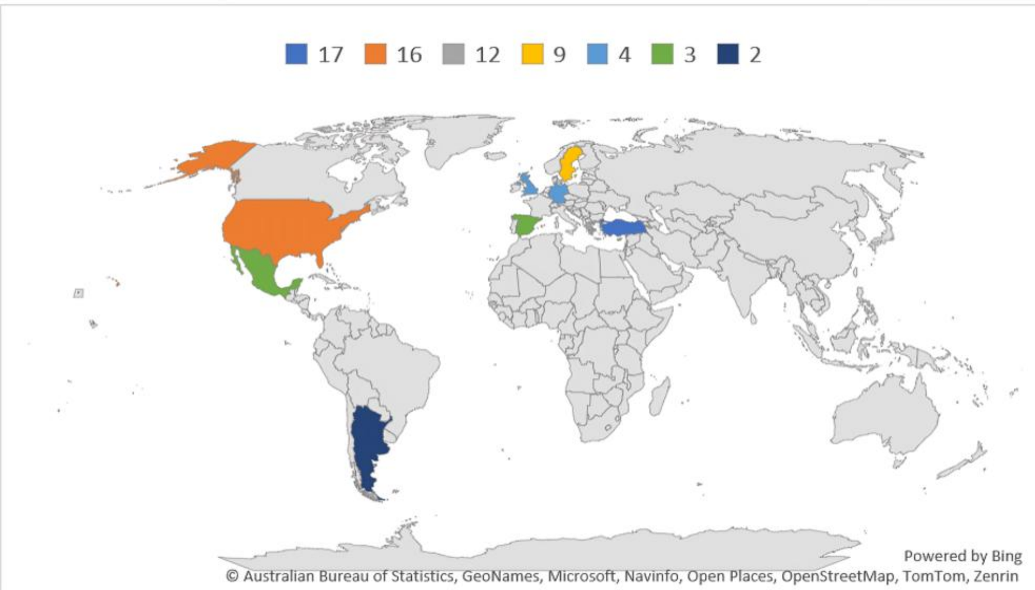

Figure 5. Distribution of publications over countries (the authors' own elaboration)

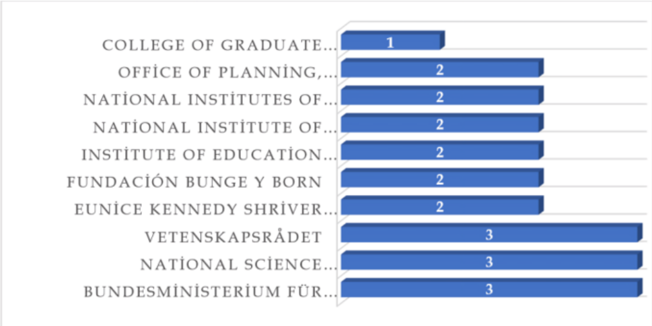

Figure 7. Distribution of number of articles per funding sponsor (the authors' own elaboration)

national funding organizations represent the bulk of identifiable research funding toward this field and the implications of this concentration are discussed in the discussion (**Figure 7**).

DISCUSSION

All the above bibliometric trends suggest a small but growing science research field of early years studies. The publication volume started at a few articles a year at the beginning of the study period and reached 13 articles in 2021, and citations grew sharply, rising to 218 in 2023, indicating growing recognition of the field within the wider early childhood education research arena (**RQ1**). This trajectory is broadly parallel to the growth patterns reported by Ravanis (2022) and by Su and Yang (2023) for related subfields, suggesting that early years science education is following a developmental arc similar to that of STEM-focused early childhood research more broadly, rather than developing along an entirely distinct trajectory. At the same time, the relatively modest absolute number of publications – 83 articles over fifteen years – indicates that the field remains considerably smaller than adjacent areas such as general early childhood education or K-12 science education, and caution is warranted in characterizing this growth as transformative; it is more accurately described as the steady consolidation of an emerging specialist literature.

Revitalizing Kallery, M. and Ravanis, K. as the two most productive authors and a few second-tier authors suggest the identification of a research network that is not diffused across many scholars but is limited to a smaller group of scholars (**RQ2**). On a social network view, the clusters of co-authors in **Figure 3** indicate the existence of a limited number of research communities working together in the production of knowledge in this field rather than a larger, more disconnected network of researchers. This focus has two possible connotations here – it can promote methodological uniformity and continuity and it can also limit the choice of theories and geographical voices available in the discipline, which bears directly on the geographic focus referred to in the following account.

With respect to publication outlets, the contributions of Research in Science Education, International Journal of Science Education and Education Sciences (**RQ3**) suggest that at present, early years science education is published mainly in general science education journals, not to the extent where there exist journals that specialize in early childhood research. The pattern may be more or less prevalent because of the disciplinary positioning of field between disciplines of science education and early childhood studies and has implications for researchers who are making decisions on where to publish articles for which they hope to reach their readers.

The geographic concentration of publications in Turkey, the United States, and Greece, with comparatively modest contributions from elsewhere, warrants closer interpretation than a purely descriptive account allows. Several explanations, which are not mutually exclusive, may account for this pattern. First, the restriction of the search to Scopus, which has stronger coverage of English-language and certain European and North American journals than of regionally indexed or non-English-language outlets, may itself contribute to the observed skew (cf. Aktaş, 2022; method). Second, the concentration of funding among a small number of national research councils – the National Science Foundation in the United States, the Bundesministerium für Bildung und Forschung in Germany, and Vetenskapsrådet in Sweden – suggests that national research infrastructure and funding priorities, rather than the intrinsic importance of early years science education as a topic, may substantially shape which countries produce indexed, internationally visible research in this area. Third, language of publication may compound this effect, since researchers publishing primarily in languages other than English are less likely to appear in Scopus-indexed international journals. The present data cannot adjudicate between these explanations, but the pattern itself suggests that current understanding of early years science education is shaped disproportionately by a small number of national research systems, with direct implications for the field's claims to international generalizability.

Finally, the concentration of institutional productivity in a small number of universities – the Aristotle University of Thessaloniki, the University of Patras, and Umeå University – mirrors the geographic and funding concentration described above, reinforcing the interpretation that research capacity in this field is currently anchored in a small number of well-resourced research centers rather than broadly distributed. Read alongside the findings on authorship and collaboration, this suggests that early years science education research is, at present, produced by a relatively small and interconnected international community – a characterization that carries direct implications for the field's future development, discussed in the limitations and future directions section below.

Limitations & Future Directions

There are several limitations to this study that should be taken into consideration when considering the findings of this study. Most importantly, the decision to limit searching to Scopus makes the process methodologically easier but also means that literature which is only included in Web of Science, ERIC or Google Scholar is not considered, as is grey literature or publications not in English. The above mentioned geographical concentrations are substantial and not a minor limitation in terms of the true international distribution of research activity in this field as it might be that the databases analyzed give rise to some bias; Information on the robustness of the geographical and institutional distribution presented would benefit from being compared with results obtained from Web of Science databases or comparing results from multi-database searches with those obtained from Scopus.

Second, the bibliometric tools and measures presented in this research have certain restrictions. Citation counts are commonly used as indicators of scholarly impact, but all factors that influence the number of citations should not be considered as metrics for impact of research, such as the age of a paper and the practice of citing in a particular subfield and self-citation. Similarly, the co-occurrence and clustering analysis done in VOSviewer is sensitive to the thresholds and clustering parameters used, and different threshold choices may yield different cluster structures; the clusters reported here should therefore be regarded as one plausible representation of the field's thematic structure, rather than a definitive one.

Third, the study's exclusion criteria, while designed to ensure topical relevance, necessarily involved some degree of judgement in determining what constituted a substantive focus on science or STEM education within early childhood settings; works lacking such a focus were excluded. A second coder was used to support consistency in this process; however, some residual subjectivity cannot be ruled out.

These shortcomings have several implications for future research. First, future studies based on bibliometrics should compare the results between Scopus, Web of Science and ERIC to understand whether geography and institutional concentration observed in this study is a real trait of this discipline or it is an artifact of the selection of databases. Second, based on the high level of concentration observed in the co-authorship structure in this study, social network analysis studies might be done more rigorously in the future to see whether greater international collaboration can be correlated with increased diversity in theoretical or methodological approaches. Third, the present study does not critically appraise the substantive content or designs of the studies collected, but could still be strengthened with a critical, content-based analysis of the studies, such as a systematic review of the methodological quality and reported effect sizes of the intervention studies in early years science education. Last but not least, few intervention studies in this area fit the criteria for being longitudinal, and even fewer are large scale intervention studies; future research in the service of building a robust body of evidence on the long-term implications of early science exposure—especially in the countries and institutions most under-represented in this mapped literature—can meaningfully augment the information presented here.

CONCLUSION AND IMPLICATIONS

The aim of this bibliometric study was to describe the development, partnerships and geographic and institutional landscapes of early years science education research between 2010 and 2024. Turnover of publications and citations was more or less equally steep, leading to the conclusion that the field is receiving more scholarly attention as evidenced by the findings related to **RQ1**. As for **RQ2**, the analysis identified a few highly productive authors, which suggests a relative concentration of the research community, as well as a few clusters of co-authors, suggested by the structure of intra-cluster collaboration. Regarding **RQ3**, the distribution of field-specific publishing outlets, geographic locations, institutions, and source of funding, similarly is skewed, with a few journals, geographic countries, universities, and funding agencies representing the majority of the field-specific literature identified.

Overall, these findings have implications for theory and practice in this field. They imply that in the early years science education, as a bibliometric analyzed object, is a part of a specialization which isn't yet mature and is not quite yet spread distributed over the whole continent or the world. Implications for the generalizations of field-based findings are: The abundance of research in certain countries and institutions and the fact that this research has been focusing on a relatively small number of countries facilitates claims about early years science education in that literature that reflect research interests and infrastructures in a limited number of national systems and not the demography of the possibilities of science education across contexts and practice.

These results suggest specific opportunities for researchers, including extending this empirical/bibliometric research by exploring under-represented regions and languages; strengthening cooperation between the currently fragmented bodies of productive authors identified here; and the development of bibliometric mapping and further, more detailed, methodological syntheses. The results highlight how important it is to maintain on-going investments in early science curriculum and preparation programs in countries and institutions that have a well-developed research tradition, especially as the profession has shown continued signs of scholarly attention in this area. The findings point to a tangible solution for policymakers and funding agencies: increasing the national or institutional allocation of resources for early years science education research can promote science education research in an effective way, making it more representative of the international evidence base.

To interpret the results of these conclusions the limitations stated above should be considered, which were especially the limited choice of the sole database searched and the descriptive character of bibliometric analysis. The further development of a wide-ranging empirical research base (including a longitudinal study, as well as intervention studies) within a broader set of national and institutional contexts, enhanced by multi-database bibliometric mapping and contents-based systematic review, would significantly contribute to the evidence base for early years science education as a unique and globally representative area for study.

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