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Bibliometric analysis of school improvement research: A century of scholarly contributions

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ABSTRACT

This study aims to comprehensively review the historical development and current status of research in the field of school improvement using a bibliometric analysis approach. Recognizing the vital role of schools in society and the necessity for their constant evolution, it is essential to understand the breadth and depth of scholarly efforts in school improvement. Using the Scopus index, 596 English language journal articles on school improvement published between 1916 and 2023 were identified and analyzed. Utilizing the VOSviewer software, the bibliometric analysis was conducted in two stages: descriptive statistics to understand the trend of document volumes and co-authorship countries, and a multidimensional scaling technique to visualize co-authorship, co-occurrence, and citation networks. The data revealed a consistent rise in publication volume over the years, with a peak in 2020. Despite contributions from 45 countries, the United States and the United Kingdom were the most prolific. However, author collaboration was found to be minimal, suggesting potential for broader partnerships. The study also identified key research themes such as leadership, distributed leadership, and accountability through keyword co-occurrence analysis. The most frequently cited literature emphasized the role of collaboration, instructional program coherence, and school culture in school improvement. The findings underscore the necessity for increased global collaboration, exploration of emerging themes, and enhanced geographical representation in future research to further enrich the knowledge base in this vital educational field.

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INTRODUCTION

Schools are living organizations, so they are dynamic and constantly changing. Today, schools are expected to reinvent themselves to demonstrate sustainable improvement (e.g., digitally innovative) and be accountable to the school community (Lee & Louis, 2019; Pata et al., 2022). In other words, schools at the heart of education have to transform, adding value to society. Therefore, schools must constantly improve themselves, so school improvement studies have become mandatory to meet expectations and produce suitable solutions (Parlar, 2014). Data-based approaches should be adopted to initiate and maintain the dynamic school change process leading to improvement (Shelton et al., 2018).

School improvement refers to efforts to take the school from its current to an ideal situation, where the actors are administrators, teachers, students, and families. It is a common responsibility area that the entire school community undertakes together (Anderson-Butcher et al., 2022). School improvement, a multidimensional concept, consists of leadership, professional teacher improvement, curriculum, learning environment, vision-mission, resource management, school culture, school climate, parents, students, high standards, and expectations (Arjanto, 2022; Hopkins, 2001). Its ultimate goal is to improve student outcomes (Ali Mustofa et al., 2021). Therefore, school improvement, which considers the school as a whole, focuses on students' learning outcomes, prioritizing their expectations in cooperation with stakeholders in the school learning ecosystem (Creemers & Reezigt, 2005; Feldhoff et al., 2022; Klein & Schwanenberg, 2022). School improvement adopts a process-oriented approach which starts with a school improvement plan, successively followed by planning, implementation, evaluation, correction, and back to planning. Schools wanting to reinvent and improve themselves must consider their current conditions and then prepare their internal processes for change, focusing on improvement. Improvement attempts not powered by ''well-studied school improvement plans'' are likely to fail. Bibliometric research on school improvement so far are still limited to distributed leadership (Karakose et al., 2022), school leadership and scholarship (Pan & Chen, 2021), educational leadership, administration and management (Hallinger & Kovačević, 2019, 2021; Kovačević & Hallinger, 2020; Tian & Huber, 2020). Therefore, it is necessary to document quantitatively and synthesize the knowledge base about school improvement.

Since the twenty century (1916-2023), the field of school improvement has been studied in various ways, with a wide range of research directions and a large volume of articles output, and many high-quality studies and high-impact results have emerged. Therefore, it is necessary to review the research history and disciplinary development of school improvement from a scientific, professional, and objective perspective and seek new hotspots and topics based on the existing extensive literature.

Bibliometric analysis is a research method that uses statistical methods to quantitatively analyze various aspects of publications (Fu et al., 2023). The research results based on bibliometric analysis can be visualized in figures and tables to obtain the development history, research progress, and emerging topics of a discipline and highlight the contributions of various research teams/institutions/countries. We can obtain development and advancement through bibliometric analysis, fill the academic gaps, and break the bottleneck. Research on school improvement can be carried out since 1916, and after more than 100 years of research, it is urgent to do so to gain a deeper understanding. This study aims to clarify the history of development and research status; we will use Vosviewer software to carry out bibliometric analysis and present research trends and hotspots in a comprehensive, scientific, and intuitive manner with figures and tables, which can provide evidence for the construction of academic guidelines and trends in future.

METHOD

The authors use a quantitative research approach to analyze bibliographic data related to the literature collection on school improvement. The bibliometric analysis aims to explore clearly defined bodies of knowledge (Kuzhabekova, 2021; Zupic & Čater, 2015), to highlight broad trends in knowledge production and dissemination (Hallinger & Kovačević, 2019), and to identify

thematic research trends, and (co)citation analysis to locate the most highly cited researchers (McGinity et al., 2022). The bibliometric analysis leverages the capabilities of the VOSviewer software program to analyze a more significant number of documents when compared to previous review research (Hallinger & Kovačević, 2022). VOSviewer is a program we developed for constructing and viewing bibliometric maps (Van Eck & Waltman, 2010). Thus, bibliometric analysis with VOSviewer is considered appropriate for reviewing documents to reflect on the accumulated knowledge of school improvement after 100 years since it was first published.

Identification of Documents

The Scopus index is used to identify published documents about school improvement. Authors use keywords: title (*"School improvement"*). The search yielded 913 published documents on school improvement from 1916 to 2023. The author uses the Scopus filter to limit only 'articles' to the document type, "final" to the publication stage, "journal" to the source type, "English" to the language to change the search keywords to title ("school improvement") and (limit-to (pubstage, "final")) and (limit-to (doctype, "ar")) and (limit-to (language, "english")) and (limit-to (srctype, "j")). This led to the elimination of 317 documents. Thus, the final database consists of 596 articles.

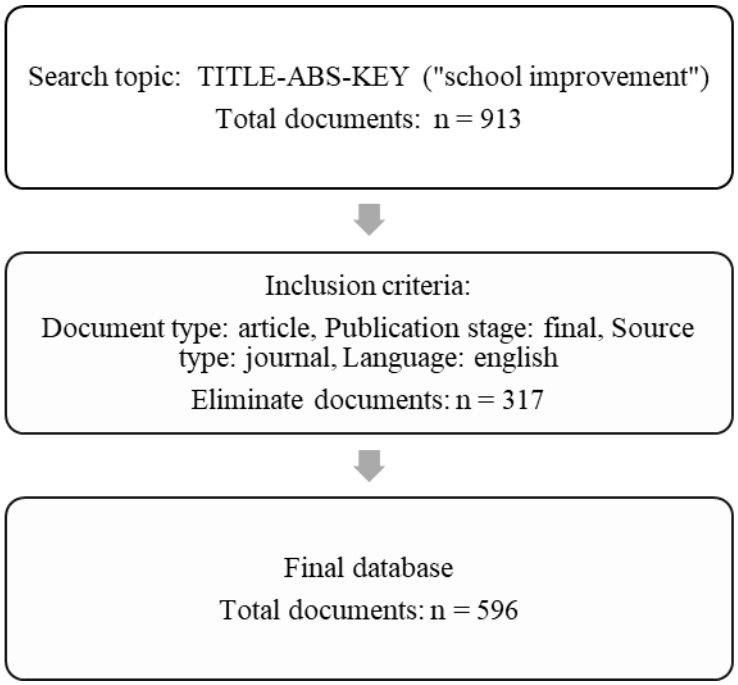

Figure 1. Identification process of school improvement documents

Data Analysis

The author performs two stages of analysis. The first research stage uses descriptive statistics to describe trends related to the volume document by year and co-authorship country. Descriptive analysis is performed with Microsoft Excel. The second analysis stage uses VOSviewer version 1.1.18 to display maps constructed using multidimensional scaling techniques (Van Eck & Waltman, 2010; Zupic & Čater, 2014). The bibliometric analysis includes co-authorship, co-occurrence, and citation analysis, which can be displayed in network visualization (Van Eck & Waltman, 2011).

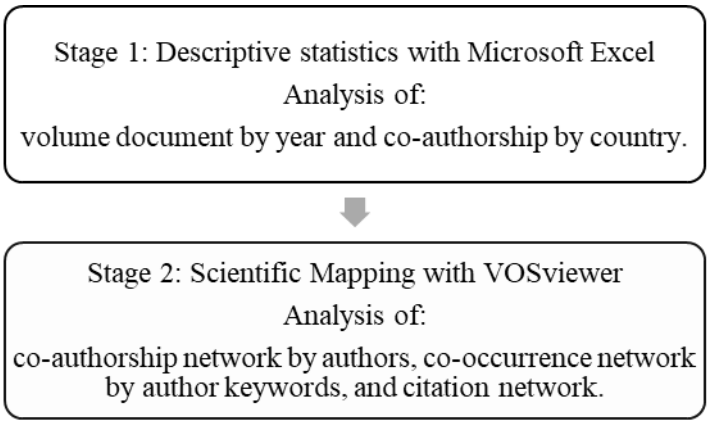

Figure 2. Data analysis process

Co-authorship network analysis is used to identify relationships between authors and between authors' countries. The applicability of co-authorship networks has been regarded for evaluating research collaborations (HabibAgahi et al., 2022). Citation analysis is used to identify "high-impact" leadership documents. A high number of citations is generally construed as an indicator of 'scientific impact' based on the assertion that other scholars' ideas in the cited documents have been read and used (Garfield, 2007).

RESULT AND DISCUSSION

Volume Document by Year

Changes in the number of published documents from a particular research direction directly reflect variations in research results in a certain period. Therefore, it is an essential indicator of the development trend of the period. This is very important for analyzing future research and development dynamics and trends.

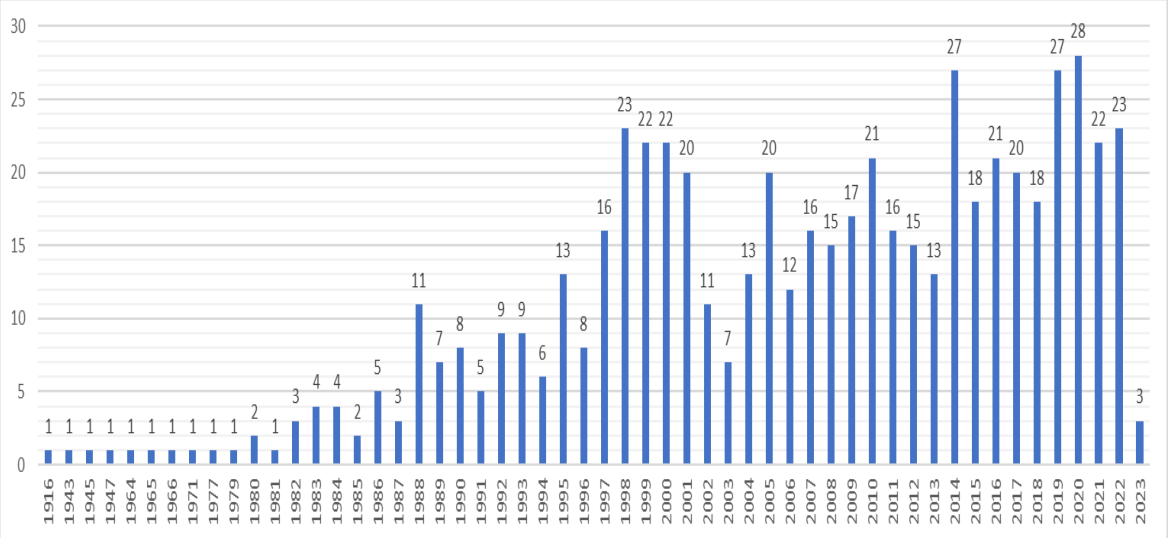

Figure 3. Volume document of school improvement by year

Figure 3 shows the evolution in the number of published articles and the significant variation in this research area over the overall study period. The first scientific article that examined school improvement was published in 1916, titled "The rural school improvement league" by Smith, P., published in the journal The ANNALS of the American Academy of Political and Social Science

(Smith, 1916). Overall, the number of publications in this field continues to increase yearly, especially in the 1990s. The highest productivity was observed in 2020, with 28 documents.

There are four main phases: (1) a birthing period: during the 1910s – 1970s characterized by low levels of scholarly activity; (2) stable growth period: between 1916 and 1981, the annual volume of publications grew slowly, with a slight increase in 1980; (3) rapid increase period: between 1982 and 2001, the annual volume of publications increased significantly, exceeding 11 publications for the first time in 1988 and reaching a peak of 23 publications in 1997; (4) plateau period: in 2004 to present, there is a slight decrease in the number of publications fluctuated slowly. In this stage of exploration, experiments, and argumentation, the school improvement research has become relatively stable. This is in line with longitudinal analysis research that reveals four temporal waves that are interrelated with one another (Karakose et al., 2022; Kovačević & Hallinger, 2019).

Volume Document by Country

From 1916 to 2023, there were 45 countries involved in research on school improvement. The top 5 countries from relevant publications are the United States (USA), with a total of 205 documents; the United Kingdom, with a total of 149 documents, Australia with a total of 26 documents, Canada with a total of 24 documents, and the Netherlands with a total of 20 documents. The geographical distribution of the articles indicating the dominance of certain countries has a high impact on developing the knowledge base (Hallinger & Kovačević, 2019).

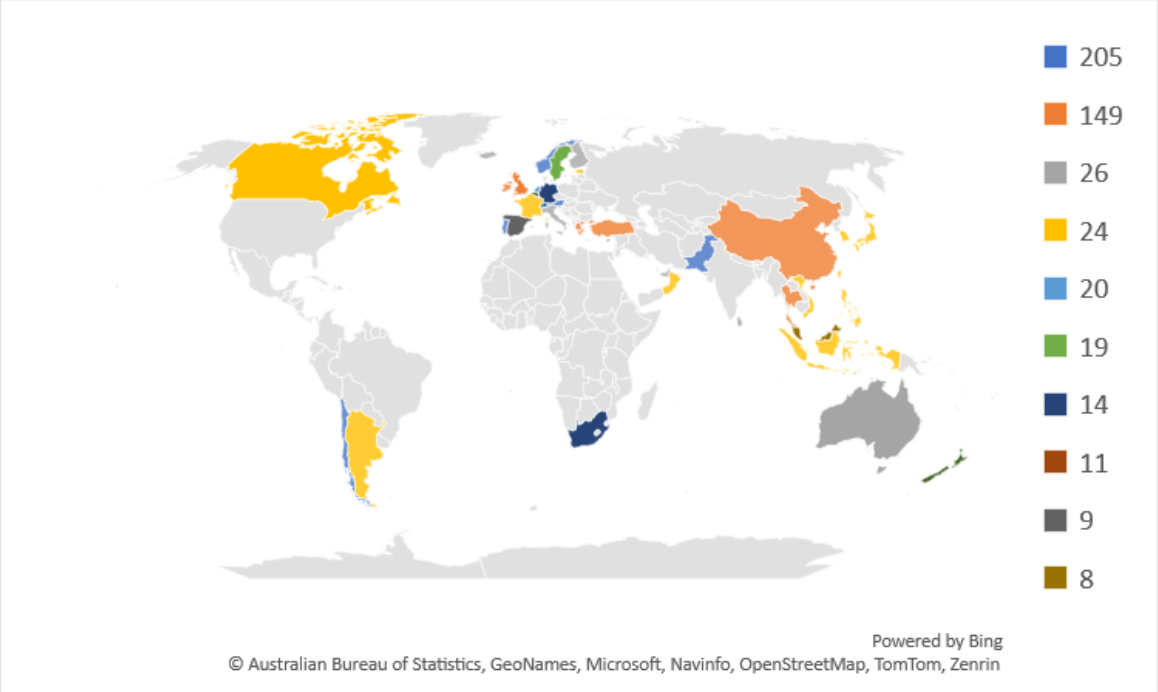

Figure 4. Volume document of school improvement by country

Collaborative Relationships between Authors

The joint publication network in the scientific analysis of school improvement from 1916 to 2023 reveals 1,029 authors, but only 47 are visually mapped in Figure 5 because some are unrelated. This shows that there has not been good cooperation between the authors.

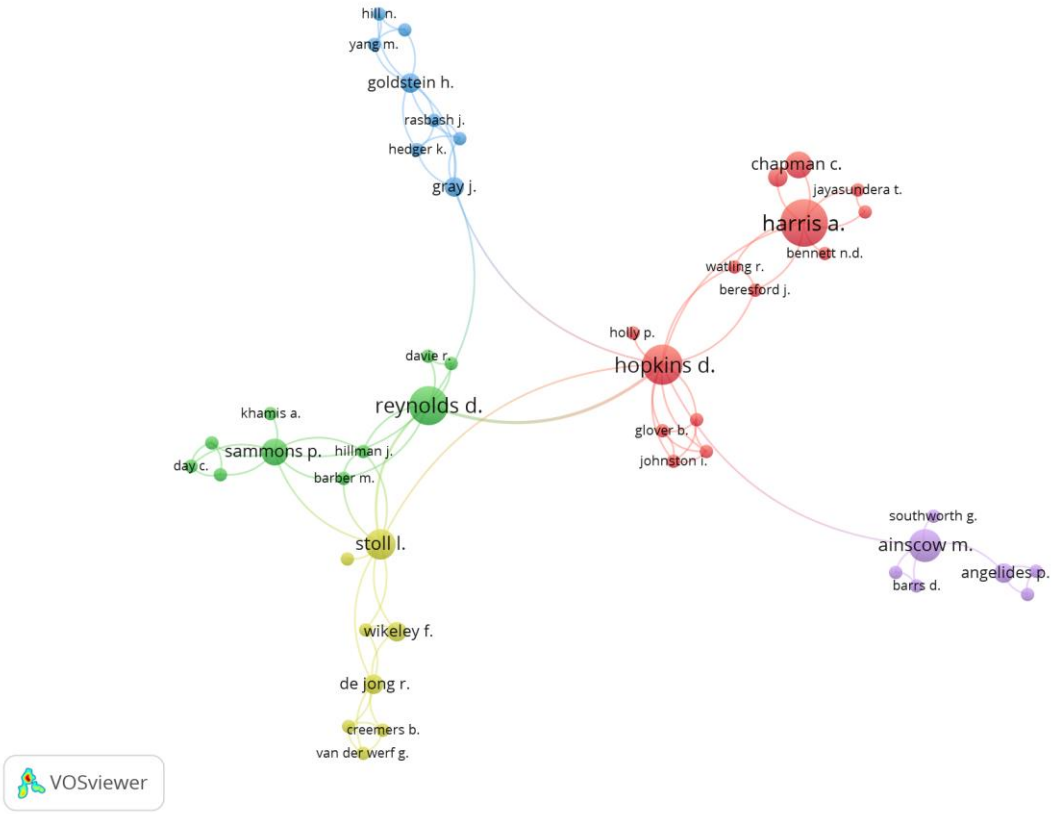

Figure 5. Network visualization of co-authorship by the author of school improvement, 1916–2023

Based on figure 5, it is clear that the co-authorship network by the author consists of 5 clusters. The first cluster (red) has the most co-authorship networks, consisting of 14 authors, with Harris A. and Hopkins D. as the dominant author. The second cluster (green) has a co-authorship network of 10 authors, with Reynolds D. and Sammons P. as the dominant author. The third cluster (blue) has a co-authorship network of 8 authors, but no dominant authors exist in this cluster. The fourth cluster (yellow) has a co-authorship network of 8 authors, with Stoll L. as the dominant author. The fifth cluster (purple) has a co-authorship network of 7 authors, with Ainscow M. as the dominant author. It can be seen that the dominant authors in each cluster are the top 5 co-authorships. Co-authorship is still an essential indicator of collaborative work and an appropriate means of studying patterns of cooperation (Jalali et al., 2023; Santos & Santos, 2016). The more extensive the co-authorship network of an author is seen to have the most significant impact on the development of the knowledge base. (Heller et al., 2023).

Co-occurrence Analysis

Keywords represent the core content of the literature, and high-frequency keywords effectively reflect research hotspots in the field (Zhu et al., 2022). Co-occurrence analysis to analyze the structure and development of the scientific literature (X. Chen et al., 2016). As shown in Figure 6, each keyword is represented by a node sized proportionally to its frequency. A more significant number of links indicates a keyword occurring more frequently. The thickness of the joint reflects the strength of the connection. Network analysis between keywords with a minimum threshold of 4 published articles per keyword, 40 out of 832 selected keywords.

Table 1. Top 17 Co-occurrence by author keywords of school improvement, 1916–2023 (ranking by total link strength)

Rank	Keyword	Occurrences	Total Link Strength
1	school improvement	150	134
2	leadership	34	43
3	distributed leadership	13	24
4	school leadership	19	22
5	accountability	16	17
6	educational reform	7	16
7	principals	9	16
8	school effectiveness	15	15
9	improvement	12	14
10	school reform	11	14
11	change	7	13
12	innovation	5	12
13	collaboration	8	11
14	educational policy	8	11
15	organizational learning	6	11
16	principal	6	11
17	professional development	9	11

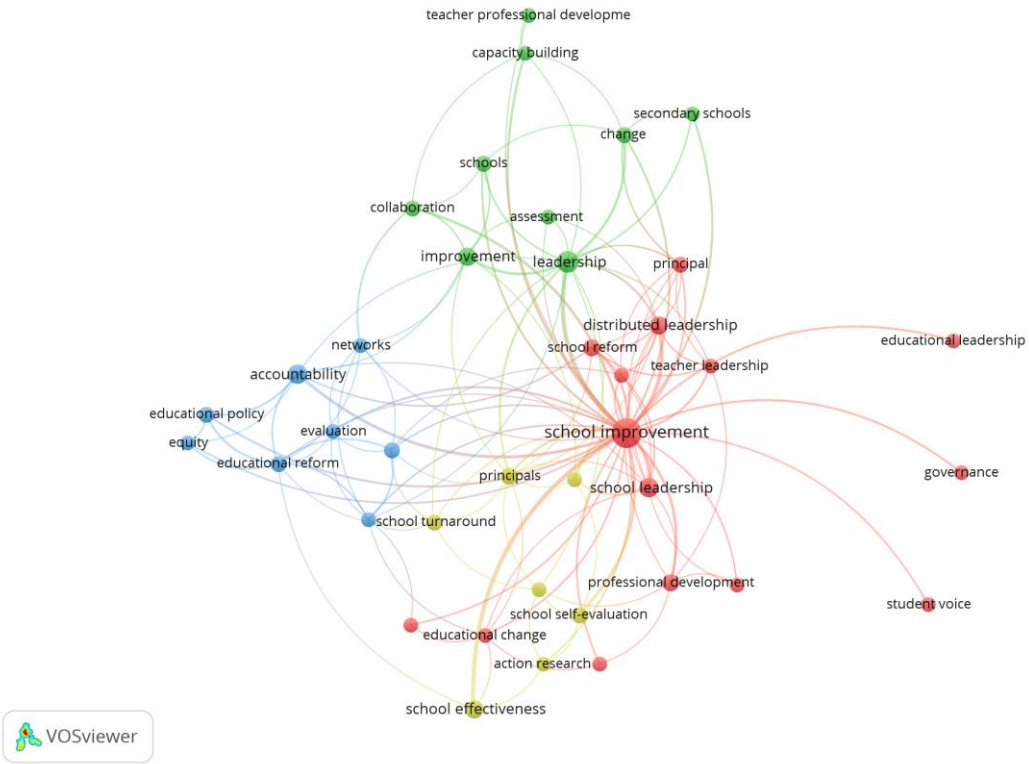

Figure 6. Keywords network visualization of school improvement (threshold four occurrences, display 40 keywords)

The most occurrence of keywords, namely: school improvement, leadership, distributed leadership school leadership, accountability, educational reform, principals, school effectiveness, improvement, change, change, innovation, collaboration, educational policy, organizational learning, principal, and professional development. Other keywords only have total link strength below 11. The total link strength in VOSviewer refers to the total linkage value between two or more items in the analyzed dataset. In the context of citation analysis of scientific articles, total link strength describes how strong the relationship between articles citing one another is. Total link strength can be calculated by adding weight values or linkage scores between each pair of articles. Linkage weight is usually calculated based on the number of times an article cites another article or the quality rating of the cited article. By calculating the total link strength, VOSviewer can help users identify the most critical articles in a field of study and visualize the knowledge network formed between related articles (Van Eck & Waltman, 2010). The keywords that appear most often in the co-occurrence analysis indicated that these keyword(s) are the central theme of knowledge development or; a keyword with the most links is drawn as a core keyword (Cardoni et al., 2023; M.-C. Kim, 2023; Tian & Huber, 2020).

Keyword network visualization for school improvement reveals 4 clusters. Each cluster represents a subfield of scientific analysis. Cluster 1 (red) consists of 10 keywords: school improvement, school leadership, educational leadership, professional development, and educational change. School improvement correlates to school leadership (Andreoli et al., 2020); school improvement correlates to professional development (Klein & Schwanenberg, 2022; Shavard, 2022); school improvement correlates to educational change (Waite, 2010); and school improvement correlates to educational leadership (Gonzales et al., 2022). Cluster 2 (green) consists of 9 keywords: leadership, improvement, collaboration, assessment, capacity building, and teacher professional development. School improvement correlates to collaboration (Pino-Yancovic et al., 2020), school improvement correlates to capacity building (W.-Y. Chen, 2017), and school improvement correlates to teacher professional development (Hoque et al., 2011). Cluster 3 (blue) consists of 8 keywords: accountability, educational policy, educational reform, innovation, and organizational learning. School improvement correlate to educational policy (Reynolds, 2016), school improvement correlates to innovation (Santamaría & Santamaría, 2016), school improvement correlate to organizational learning (Davis-Singaravelu, 2022); and school improvement correlate to educational reform (Bahamonde & Bahamonde, 2018). Cluster 4 (yellow) consists of 7 keywords: school change, school effectiveness, school self-evaluation, and school turnaround. School improvement correlate to school effectiveness (Antoniou et al., 2022), school improvement correlate to school turnaround (VanGronigen & Meyers, 2020), and school improvement correlate to school change (Au & Raphael, 2019; Murillo & Krichesky, 2012). Cluster 5 (purple) consists of 5 keywords: distributed leadership, organizational change, school reform, and teacher leadership. School improvement correlate to distributed leadership (Zala-Mezö et al., 2020), school improvement correlate to organizational change (Beckmann et al., 2022), school improvement correlate to school reform (Peurach et al., 2016), and school improvement correlate to teacher leadership (Zhang et al., 2014). Each keyword forms a network of co-occurrence keywords normalized into a difference matrix using the cosine distance measure, where each cluster has its core or topic that is different from one another (Cho & Kim, 2023; E. J. Kim & Seomun, 2023; Zaytsev et al., 2023).

Analysis of Frequently Cited Literature

Ranking articles by citation is a classic bibliometric method for revealing the most influential articles in the field (Zhu et al., 2022). Table 2 shows the top 10 most frequently cited articles in the scientific analysis of school improvement from 1916 to 2023.

Table 2. The top 10 most frequently cited documents/articles on scientific analysis of school improvement

Rank	Documents/Articles	Citations	Ref.
1	A theoretical and empirical investigation of teacher collaboration for school improvement and student achievement in public elementary schools	344	(Goddard et al., 2007)
2	Collaborative leadership and school improvement: understanding the impact on school capacity and student learning	317	(Hallinger & Heck, 2010a)
3	The leadership of Inquiry: Building and Sustaining Capacity for School Improvement	249	(Copland, 2003)
4	Instructional Program Coherence: What It Is and Why It Should Guide School Improvement Policy	229	(Newmann et al., 2001)
5	School Culture, School Effectiveness, and School Improvement	202	(Hargreaves, 1995)
6	Teacher led school improvement: Teacher leadership in the UK	199	(Muijs & Harris, 2006)
7	Leadership for Learning: Does Collaborative Leadership Make a Difference in School Improvement?	192	(Hallinger & Heck, 2010b)
8	Social justice and school improvement: improving the quality of schooling in the poorest neighborhoods	138	(Lupton, 2005)
9	Predictable Failure of Federal Sanctions-Driven Accountability for School Improvement—And Why We May Retain It Anyway	128	(Mintrop & Sunderman, 2009)
10	The Past, Present, and Future of School Improvement: Towards the Third Age	123	(Hopkins & Reynolds, 2001)

The document citation network in a scientific analysis of school improvement from 1916 to 2023 revealed that there were 596 documents with a threshold of 40 citations of documents, and only 65 documents met the criteria. However, out of 65 documents, only 63 are mapped visually in figure 7 because some of them are not related to each other.

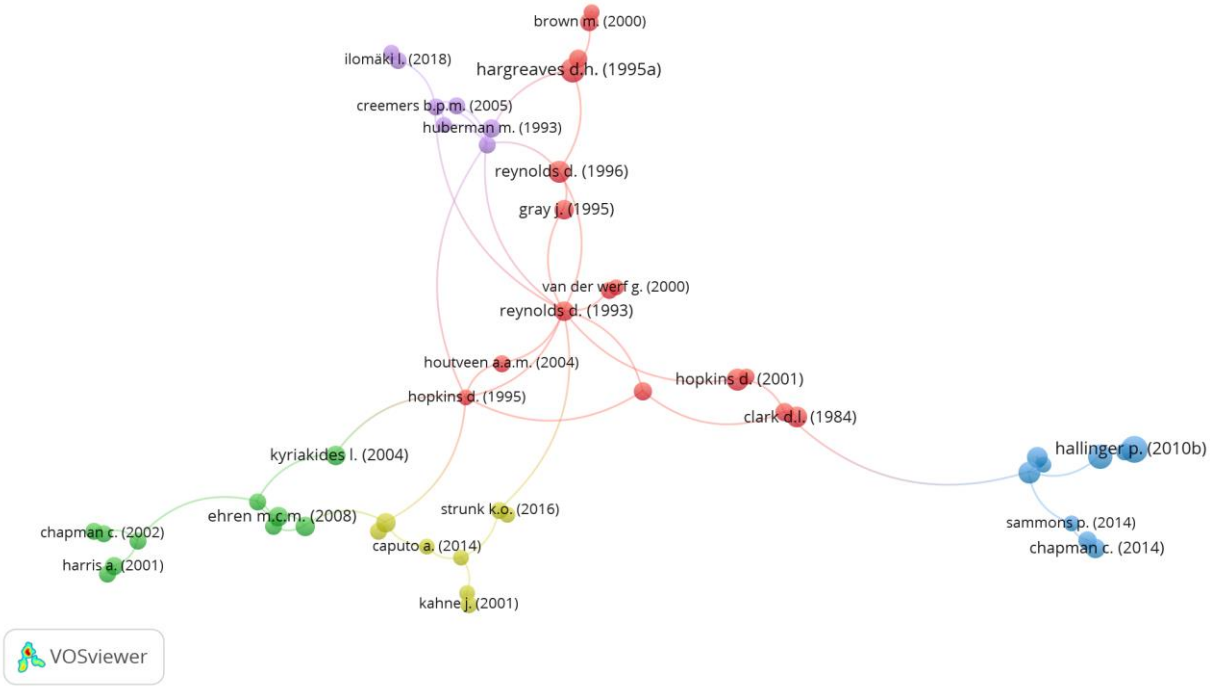

Figure 7. Documents co-citation map of school improvement, 1916–2023

(threshold 40 citations, display 63 authors).

Links in VOSviewer citations refer to the relationship between the scientific article cited and the article citing it. In this context, links refer to the influence and linkages between articles citing one another (Van Eck & Waltman, 2010). Documents with high co-citation analysis indicate that they can map the internal intellectual structure (e.g., different research themes) and a particular literature's structural and temporal dimensions (Kashani et al., 2023; Kirbac et al., 2023; Yan & Liao, 2023).

Implications of the Findings

The findings of the study have several implications for the field of education, research trends, and the future directions of research on school improvement: 1) The increase in the number of published documents on school improvement indicates a growing interest in this research area, particularly in the last three decades (Hallinger & Kovačević, 2019; Karakose et al., 2022). This rise in interest could be attributed to the increased awareness of the importance of school improvement in enhancing educational outcomes, the efficacy of teaching methods, and the overall quality of education. 2) The geographical distribution of the publications, with the United States, the United Kingdom, Australia, Canada, and the Netherlands leading the field, suggests the dominance of these countries in developing the knowledge base on school improvement (Hallinger & Kovačević, 2019). This geographical dominance could have implications for the universality of the research findings, as cultural, social, and policy differences across countries could affect the applicability of the findings in different contexts. 3) The collaborative relationships between authors in the field of school improvement research seem to be somewhat lacking, which might hamper the development and growth of this field (Heller et al., 2023). Future research could focus on promoting and enhancing collaboration between researchers for broader and more comprehensive insights into school improvement. 4) The co-occurrence analysis of keywords provides a valuable insight into the main focus areas in school improvement research. Keywords such as "school improvement", "leadership", "distributed leadership", "accountability", "educational reform", and "principals" reflect the primary research themes (Cardoni et al., 2023; Tian & Huber, 2020). This information can help future researchers identify the main areas of focus and gaps in the existing literature, thus guiding their research efforts. 5) The citation analysis indicates the most influential works in the field of school improvement, which could guide future researchers in their literature review and understanding of the field (Zhu et al., 2022). However, the co-citation analysis suggests a need for more interconnectedness and integration among the different research themes and directions in the field of school improvement (Kashani et al., 2023; Kirbac et al., 2023; Yan & Liao, 2023).

CONCLUSION

The analysis of school improvement research reveals several key findings. First, there has been a significant increase in published documents over time, with the highest productivity observed in 2020. The research has undergone different phases, starting with a period of low activity, followed by stable growth, rapid increase, and a current plateau period. Second, the research on school improvement involves multiple countries, with the United States and the United Kingdom being the most active contributors. However, there needs to be more collaboration among authors, indicating room for improvement in fostering partnerships. Third, the co-occurrence analysis of keywords highlights important themes in school improvement, such as leadership, accountability, and collaboration, which serve as the central focus of knowledge development in this field. The visualization of keyword networks further demonstrates distinct clusters representing different subfields of analysis. Lastly, the analysis of frequently cited literature identifies influential articles that have significantly contributed to the understanding of school improvement, including topics such as teacher collaboration, instructional program coherence, and school culture.

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