Review articles in educational research: A bibliometric analysis

Artículos de revisión en investigación educativa: un análisis bibliométrico

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Abstract

The rapid advancement of scientific knowledge creates the need to synthesize existing knowledge and review articles play an important role in this regard. This study aims to provide a comprehensive review of review articles in educational research. To this end, 12163 review articles published between the years 1956 and 2022 in the "Education & Educational Research" category in the Web of Science Core Collection were analyzed by bibliometric method. It has been found that the number of review articles showed a high rate of increase between 1996 and 2012. The number of review articles published since 2013 is higher than the number of such articles in the previous 57-year period and accounts for 57% of the literature. The most influential publication in the literature has been found to be Hattie and Timperley's study on feedback.The most productive and influential journal has been found to be Review of Educational Research. The most prolific author has been found to be Hwang G.J., while the most influential author has been found to be Dochy F. While the University of Wisconsin contributed to the literature the most, the University of Michigan has been found to have the highest publication impact. With 131 countries contributing to the review literature, the USA is the most productive country with the highest publication impact. The systematic review and meta-analysis methods have been found to be more prominent. Five main themes have been identified in the Review literature. It was found that the East and the West collaboration more with each other, with the USA, England Australia, and Canada

playing a unifying role between these two blocs. The USA provided the most collaboration.

Keywords: education, research, review, bibliometric.

Resumen

El rápido avance del conocimiento científico crea la necesidad de sintetizar el conocimiento existente y los artículos de revisión desempeñan un papel importante en este sentido. Este estudio tiene como objetivo proporcionar una revisión exhaustiva de los artículos de revisión en la investigación educativa. Para ello, se analizaron mediante el método bibliométrico 12163 artículos de revisión publicados entre los años 1956 y 2022 en la categoría "Education & Educational Research" de la Web of Science Core Collection. Se ha constatado que el número de artículos de revisión mostró una alta tasa de incremento entre 1996 y 2012. El número de artículos de revisión publicados desde 2013 es superior al número de artículos de este tipo en el período anterior de 57 años y representa el 57% de la literatura. La publicación más influyente en la literatura ha resultado ser el estudio de Hattie y Timperley sobre la retroalimentación.La revista más productiva e influyente ha resultado ser Review of Educational Research. El autor más prolífico ha sido Hwang G.J., mientras que el autor más influyente ha sido Dochy F. Mientras que la Universidad de Wisconsin es la que más ha contribuido a la bibliografía, la Universidad de Michigan es la que más publicaciones ha publicado. Con 131 países que han contribuido a la literatura de revisión, EE.UU. es el país más productivo y con mayor impacto de publicación. Los métodos de revisión sistemática y metaanálisis han resultado ser los más destacados. En la bibliografía de la revisión se han identificado cinco temas principales. Se ha constatado que Oriente y Occidente colaboran más entre sí, y que EE.UU., Inglaterra, Australia y Canadá desempeñan un papel unificador entre estos dos bloques. EE.UU., fue el país que más colaboró.

Palabras Clave: educación, investigación, revisión, bibliometría.

Introduction

Scientific knowledge has increased rapidly all over the world, with thousands of new articles, reports, and other materials being published physically and via the Internet every day (Linnenluecke et al., 2020; Siddaway et al., 2019; Zupic & Čater, 2015). As it has throughout history, science is developing; however, the pace of this development is much higher today than in the past. The number of scientific and technical journals increased from about one million in 2000 to about two and a half million in 2018 (World Bank, 2022). This

trend has led to an unsystematic proliferation of information in many different sources and academic disciplines.

This growth necessitates a synthesis and integration of the knowledge on the topic of interest, and the collection and evaluation of available evidence (Tranfield et al., 2003). Here, review articles have the potential to serve that purpose. The holistic evaluation and synthesis of new knowledge are becoming increasingly difficult due to a large amount of data and limitedness of time. Scientists struggle to identify studies on their topic of interest, critically examine the content and quality of available evidence, and synthesize existing results (Linnenluecke et al., 2020).

There are many types of reviews in the literature. Table I shows some review types in the literature. Review articles can address a wide range of research questions. As with primary research, review articles may utilize a variety of approaches and methods (Newman & Gough, 2020). Before 1980, almost all review articles were based on narrative reviews, which represents a more traditional approach (Baumeister, 2013). Traditional literature reviews often lack completeness and rigor and do not follow a specific methodology (Snyder, 2019).

Table I. Some review types

systematic review	meta-analysis	meta-synthesis	narrative synthesis	textual narrative syntehesis	systematic narrative synthesis
thematic synthesis	meta-study	meta-narrative	critical interpretive synthesis	qualitative meta-summary	realist review
systematic scoping review	systematic quantitative review	systematic mixed studies review	systematic mapping review	rapid review	network meta-analysis
living systematic review	living meta-analysis	semi-systematic review	qualitative systematic review	critical review	integrative review
bibliometric review	mixed methods review	literature review	critical review	comparative review	theoretical review
review of reviews/ umbrella review/ tertiarty review/ synthesis of reviews/ review of systematic reviews/ review of meta-analyses/ synthesis of reviews/ review of systematic reviews/ review/meta-review/systematic meta-review/meta-meta-analysis					

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In recent years, traditional review studies have been replaced by ones that follow a specific methodology and follow a replicable, transparent process. There are many methods in the literature such as systematic review, meta-analysis, meta-synthesis, and systematic narrative synthesis. The common feature of these methods is that they help to review existing research using open, accountable, and rigorous research methods (Gough et al., 2017). Systematic reviews are regarded methodical, comprehensive, transparent, and replicable (Siddaway et al., 2019). Meta-analysis is a quantitative method used to combine the findings of multiple studies that employ comparable methods to examine the same question. In contrast, the narrative review can utilize many different methods and processes and combine findings from studies addressing different questions (Baumeister, 2013). Semi-systematic review is used to identify themes, perspectives, and issues in a research discipline or methodology, or to identify components of a theoretical concept. The integrative review aims to generate new knowledge by critiquing and synthesizing the literature on a topic in a way that allows new theoretical perspectives to emerge (Torraco, 2005). Meta-synthesis integrates qualitative research findings to identify themes, concepts, and theories that produce new conceptualization or offer a fuller understanding of the phenomenon under study (Thorne et al., 2004).

Review types are quite diverse and new methods are emerging. Review studies, when done well, offer new and valuable contributions to knowledge (Siddaway et al., 2019). They combine many studies and produce value a single study cannot do by itself (Baumeister, 2013). Review studies also provide a solid foundation for advancing knowledge and developing theory (Webster & Watson, 2002), and help identify areas where more research is needed and therefore set directions for future research. They can provide insight and guidance to implementers and policy makers (Linnenluecke et al., 2020).

The benefits of review articles have led to their widespread use in many scientific disciplines. Review articles have been published in medicine (Brooks et al., 2020), management (Zhang & Parker, 2019), environmental science (Ferronato & Torretta, 2019), linguistics (Dehghanzadeh et al., 2021), finance (Roychowdhury et al., 2019), history (Islam et al., 2021), technology (Bodkhe et al., 2020), and many other disciplines.

Review articles are widely published in the field of education as in many other disciplines. In educational literature, review articles have been published on many topics such as virtual reality (Akcayir & Akcayir, 2017), teacher leadership (Wenner & Campbell, 2017), learning (Morris, 2020), higher education (Salam et al., 2019), experimental learning (Morris, 2020), augmented reality (Sirakaya & Sirakaya, 2022), and peer bullying (Thompson et al., 2020).

The number of review articles in education literature is in an increase. The growth of the literature has created the need for a holistic examination of review articles in the field of education. However, there is no research in the literature that holistically and comprehensively addresses review articles in educational research. This study aims to examine review articles in educational research holistically using bibliometric analysis. To this end, the study aimed to evaluate the contribution made to the education literature through review articles on the basis of author, country, institution, and publisher, and to reveal the patterns and intellectual structure in the literature. This is thought to provide researchers with a general overview of review studies in the field of education. Accordingly, the study seeks to answer the following research questions:

RQ 1: What is the basic bibliometrics of review articles in educational research? In order to reveal the intellectual structure of the literature, we focused on the following bibliometrics: (1) Number of publications and citations over time, (2) Most cited publications, (3) Most productive and influential journals, (4) Most productive and influential authors, (5) Most productive and influential institutions, (6) Most productive and influential countries, (7) Basic concepts in the literature

RQ 2: What are the themes that were identified in review articles in educational research?

RQ 3: What is the extent of the collaboration between countries in terms of review studies in educational research?

This research contributes significantly to educational research in two ways. Firstly, it highlights the importance of review studies in educational research, which has become increasingly crucial due to the rapid growth of scientific knowledge in recent years. Secondly, this study sheds light on the publication performance and impact of journals, authors, and institutions,

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providing valuable information for future educational research policies. Thirdly, it reveals the intellectual structure of the knowledge base on which educational research is founded and identifies the main themes of the field. This approach provides direction for future research on knowledge gaps in educational research. Furthermore, conducting a study through review studies is more valuable as they synthesise information from multiple similar studies. This approach creates more robust evidence compared to analysing individual studies. Conducting a bibliometric analysis using review studies in educational research can provide general information about the field of education, guide future research, and inform decision-making processes.

Method

In this research, the bibliometric analysis method was used to examine the review articles in the field of education with a comprehensive and holistic approach, to identify the general overview and trends of the publications, and to reveal the collaboration interactions and intellectual structure. Bibliometric analysis is a popular and rigorous method used to explore and analyze large volumes of data. While this method enables us to unpack the evolutionary nuances of a specific field, while also at the same time shedding light on the emerging areas in the field in question (Donthu et al., 2021). This type of systematic review reveals trends that have emerged in the literature over time and offer empirical foundations for charting the way forward (Hallinger, 2021). Managing the rich source of data in a particular field and discovering the underlying structure of the field requires the use of bibliometric methods (Zupic & Čater, 2015).

Identification of Resources

In this study, the Web of Science Core Collection (WOS) database was utilized for a comprehensive review of review studies. The WOS database is a

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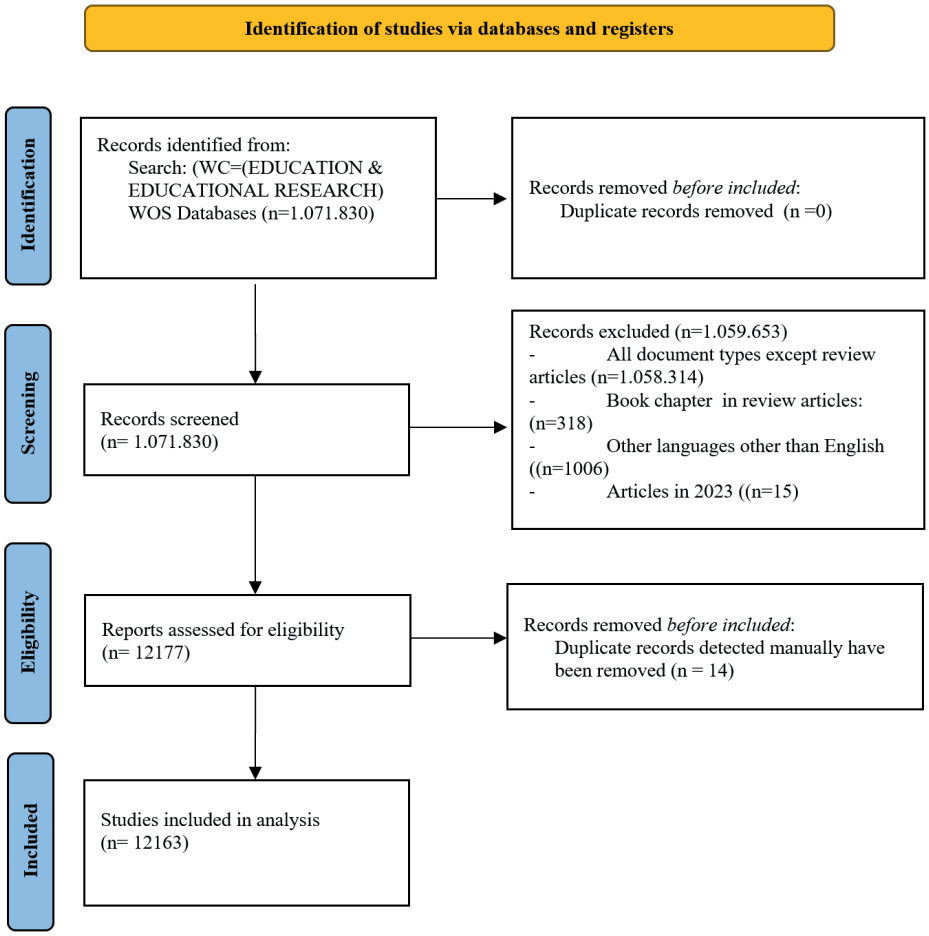
large database containing approximately 86 million publications in over 21 thousand peer-reviewed journals in 254 subject categories (Clarivate, 2023). The WOS database was selected as it contains a large number of review articles in educational research.

In determining the publications, the following search strategy was employed in performing a search on the WOS database (on January 05, 2023):

(WC=(EDUCATION & EDUCATIONAL RESEARCH) and Review Article (Document Types) and Book Chapters (Exclude-Document Types) and English (Languages) and 2023 (Exclude-Publication Years)

First, the category "Education & Educational Research" was selected in the WOS database. This search yielded 1,071,830 publications. Then the Review Article filter was applied, and 13,516 publications were found. Since we wanted to focus only on articles, a total of 318 "Book reviews" were excluded. English was then chosen as the language of publication, leaving 12,192 articles. Then, three publications with the publication year of 2023 were excluded and there remained 12,189 review articles. During the data cleaning phase, 12 publications with the publication year of 2023 and 14 duplicate publications were identified in the data set and these were removed from the data set, leaving a total of 12,163 publications to analyze. Figure I shows the PRISMA scheme that this research follows (Moher et al., 2009).

Figure I. PRISMA Flowchart



Data Extraction and Analysis

Bibliometric data on 12,189 publications were downloaded from the WOS database in the form of plain text in 25 parts. This data document contained descriptive information such as author, title, year of publication, citation data,

etc. The downloaded data files were merged into a single plain text. The plain text data file was then converted into MS Excel format for analysis in both R and Vosviewer, the former of which was also used for data control. The data cleaning process was performed on the MS Excel document.

One of the most important considerations before starting bibliometric analysis is data cleaning. The documents retrieved from the databases need to be corrected for problems such as duplicate phrases, spelling and typographical errors, and lack of important information. Because although bibliometric data is reliable in most cases, sometimes there may be more than one version of the same study. Also, the references sometimes contain multiple versions of the same publication and different spellings of an author's name (Zupic & Čater, 2015). Cleaning the data before bibliometric analysis is important for the reliability of the findings. Therefore, in this study, the data were cleaned through a rigorous process before analysis. First, the MS Excel document was examined and metadata such as year, publication title, and author name were reviewed. 564 documents did not have a publication year. These publications have not yet been published but are in early access. Since it is not clear when these publications were published, year data could not be coded. In addition, although the year filter was applied during the search, 12 publications were found to be from 2023. These publications were excluded from the dataset.

The second operation was to check for duplicate data. As a result of the detailed examination of the data, 14 publications were identified as duplicates and these publications were removed from the dataset. Thirdly, spelling differences were checked and corrected. In bibliometric data, concepts that mean the same thing and are spelled differently are often found. In this study, spelling differences and instances of miswriting such as misspellings (e.g. "USA" and "USA.;"), words spelled differently having the same meaning (e.g. "Goethe univ" and "Goethe univ Frankfurt"), and singular and plural spellings (e.g. "systematic review" and "systematic reviews" or "adolescents" and "adolescents" or "5-college" and "college"), were brought together in the "thesaurus file" for analysis using Vosviewer and in the "synonyms text" for analysis using R. Thus, the scattered data were merged and the accuracy of the data was ensured.

MS Excel, Vosviewer, Bibliometrix, and Biblioshiny software pack-

ages in the R tool were used for data analysis. Vosviewer is a software tool for creating and visualizing bibliometric networks (Van Eck & Waltman, 2014). The Bibliometrix R package is an open-source software tool that provides tools for quantitative research in scientific methodology (Aria & Cuccurullo, 2017). Biblioshiny is a secondary development of the Bibliometrix-based Shiny package in the R language. Biblioshiny covers the core subject matter of Biliometrix and enables bibliometric analysis and visualization through a web-based interface (Xie et al., 2020).

In this study, answers to three research questions were sought. Basic bibliometric analyses were conducted to answer the first question of the study. In these analyses, the number of publications was used as a measure of productivity, and the number of citations and citations per publication were used as measures of impact. The ratio between the number of documents and the total number of citations is one of the best measures of the impact of publications and contributors to a field (Saravanan et al., 2022).

For the second research question, co-occurrence word analysis was performed. This analysis is used to identify the most frequently studied topics of a given area or subject and to reveal the conceptual themes of the said area (Donthu et al., 2021; Hallinger & Kovačević, 2021). Co-occurrence word analysis counts the titles, keywords, and abstracts of publications in the database. It also calculates the co-occurrence of these words in the title, keyword, and abstract (Zupic & Čater, 2015). Vosviewer uses keyword co-occurrence matrices to create a science map by visualizing similarities between words (Van Eck & Waltman, 2014). This analysis reveals conceptual themes in the literature (Su & Lee, 2010; Zupic & Čater, 2015). The close proximity of word nodes in the resulting science map indicates that they are thematically similar (Zupic & Čater, 2015). The word groups formed in the science map are shown in the form of colored clusters, and these clusters are regarded as the themes of the field under study (Su & Lee, 2010; Zupic & Čater, 2015).

The country co-authorship analysis was performed to answer the third research question. Two scientists co-authoring a paper are considered to be linked. These connections between two or more scientists form co-authorship networks. Co-authorship networks develop over time between researchers across research fields. Scientists from different research fields, institutions,

and authors from different geographical regions can be a part of a particular co-authorship network, or one scientist can be involved in different co-authorship networks (Uddin et al., 2012). Collaboration network analysis provides information on potential partnerships for future research in a studied area (Xu et al., 2022).

Results

The General Overview of the Publications

The general overview of review articles in education literature is shown in Table II. A total of 12,163 Review articles on education, published in the period between 1956 and 2022, were examined. These articles were contributed by 22,827 authors from 131 countries. While the average number of co-authors per paper was found to be 2.33, the rate of international research collaboration was found to be 11.72. The number of Review articles was found to increase by 5.89% on average annually.

Table II. Basic Information about Publications

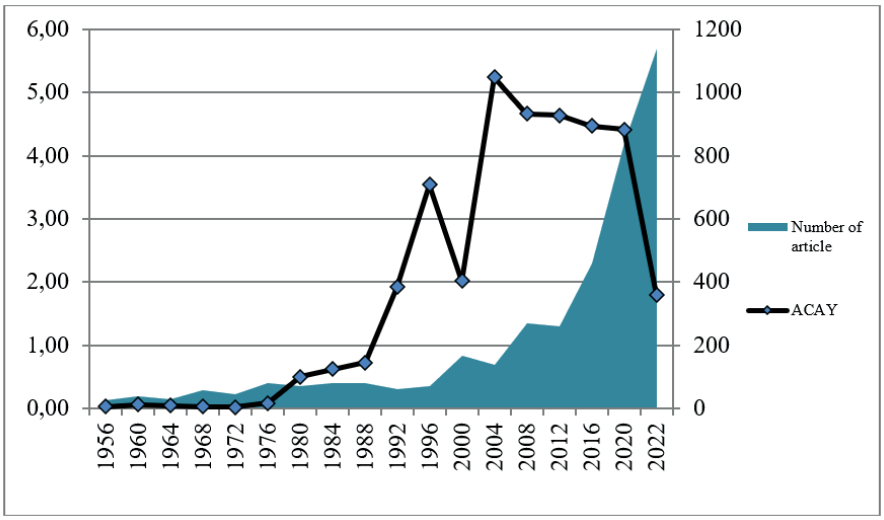
Timespan	1956-2022
Publications	12163
Review Articles	11599
Review articles, Early access	564
Annual Growth Rate %	5,89
Document Average Age	15,3
Average citations per document	31,7
References	622833
Authors	22827
Countries	131
Single-authored documents	4183
Co-Authors per Document	2,33
International co-authorships %	11,72

The number of publications by years and the average number of cita-

tions per year is shown in Figure I. From 1956 to 1996, the number of Review studies increased at a slow pace and remained generally stable. From 1996 to 2012, there has been a significant increase in the number of relevant publications. Yet, after 2013, the number of review articles showed a much more considerable increase. The number of articles published since 2013 is higher than in the previous 57 years and accounts for 57% of the literature. The first reason for this phenomenon is the increase in the number of scientific publications and the need for further synthesis of the literature as a result of the rapid progress of scientific knowledge. This can be seen as a factor that leads to an increase in the number of review articles. The second could be the increase in the number of scientific journals. According to the Journal Citations Reports by Clarivate, while there were 161 scientific journals in four education categories in the "Science Citation Index Expanded" and "Social Science Citation Index" in 2002, it increased to 315 in 2012 and 924 in 2021. From 2012 to 2021, the number of scientific journals in the education category nearly tripled (Clarivate, 2022).

Since older articles are known to receive more citations, the average number of citations per article per year (AC_{AY}), which is a year-adjusted measure of impact, has increased significantly over the years. The reason for the decline in the last year can be shown as the lack of citations of publications not yet indexed in WOS.

Figure II. Number and Impact of Review Articles
AC_{AY}: Average citations per article per year. Note: Early access review articles (n=564) are not included in the figure above.



Most Cited Publications in Review Literature

Table III shows the list of the ten most cited publications among the Review articles. Among the Review articles, Hattie and Timperley's (2007) study on feedback received the highest number of citations. In the said study, a conceptual analysis of feedback was presented and the evidence for its impact on learning and achievement was reviewed. Furthermore, a feedback model was proposed that identifies the characteristics and conditions that render feedback effective. This study also ranks first in terms of total citations per year (TCY). This shows that this study is still among the most cited papers and therefore feedback is still a leading subject in education literature. The second most cited paper was found to be Fredricks et al. (2004). This study reviewed the definitions, measures, antecedents, and consequences of school engagement. The publication ranks second in the TCY ranking. As far as most cited articles are concerned, it is seen that five articles were published in "Review

of Educational Research".

Table III. Most cited publications

Author(s)	Publication	Journal	TC	TCY
Hattie, J., & Timperley, H. (2007).	The power of feedback	*Review of Educational Research*	4544	267
Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004).	School engagement: Potential of the concept, state of the evidence	*Review of Educational Research*	4078	204
Mishra, P., & Koehler, M. J. (2006).	Technological pedagogical content knowledge: A framework for teacher knowledge	*Teachers College Record*	3168	176
Kirschner, P. A., Sweller, J., & Clark, R. E. (2006).	Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching	*Educational Psychologist*	2888	160
Stanovich, K. E. (1986).	Matthew effects in reading - some consequences of individual-differences in the acquisition of literacy	*Reading Research Quarterly*	2695	71
Tinto, V. (1975).	Dropout from higher education - theoretical synthesis of recent research	*Review of Educational Research*	2625	54
Ladsonbillings, G. (1995).	Toward a theory of culturally relevant pedagogy.	*Educational Research Journal*	2456	85
Sirin, S. R. (2005).	Socioeconomic status and academic achievement: A meta-analytic review of research.	*Review of Educational Research*	2152	113
Hidi, S., & Renninger, K. A. (2006).	The four-phase model of interest development.	*Educational Psychologist*	1766	98
Shute, V. J. (2008).	Focus on formative feedback.	*Review of Educational Research*	1759	110

TC: total citation, TCY: total citations per year

The Most Productive and Influential Journals in Review Literature

Table IV shows the list of the top 20 most productive and influential journals in the Review literature. Considering the number of publications, it is seen that the most productive journal is "Review of Educational Research" (RER). Of all review publications, 5.3% were published in this journal. The first rea-

son for this is that the journal has been published since 1931. The second reason is that this journal only publishes review articles. The second journal, Educational Research Review (ERR), has been active since 2006 and 2.4% of the review studies were published in this journal.

Taking a look at the journals in terms of the average number of citations per publication (CPP), which is an indicator of impact, RER ranks first. "Reading Research Quarterly" journal comes second. According to the h-index, which is an indicator of impact and productivity, RER comes first and ERR second. Overall, these 20 journals were found to feature 27.2% of all review articles and offer a potential haven for researchers interested in publishing review articles on education.

Table IV. The most productive and influential journal

Rank	Journal	NP	PRPT	TC	CPP	h index
1	Review of Educational Research	648	5,3	87514	135,1	290
2	Educational Research Review	294	2,4	18801	63,9	130
3	BMC Medical Education	211	1,7	4442	21,1	58
4	Education Sciences	186	1,5	1216	6,5	27
5	Frontiers in Education	168	1,4	605	3,6	21
6	Reading Teacher	161	1,3	282	1,8	14
7	British Journal of Sociology of Education	146	1,2	1187	8,1	30
8	Language Learning	134	1,1	7997	59,7	88
9	Etr & D-Educational Technology Research and Development	134	1,1	3968	29,6	61
10	Phi Delta Kappan	134	1,1	412	3,1	17
11	Computers & Education	131	1,1	11522	88,0	106
12	Reading Research Quarterly	118	1,0	10742	91,0	103
13	Educational Researcher	118	1,0	6001	50,9	76
14	Teaching and Teacher Education	117	1,0	5459	46,7	73
15	Education and Information Technologies	117	1,0	1639	14,0	38
16	Academy of Management Learning & Education	100	0,8	7669	76,7	86
17	MINERVA	99	0,8	900	9,1	28

18	Teachers College Record	98	0,8	7084	72,3	84
19	Language Teaching	97	0,8	3452	35,6	58
20	Interactive Learning Environments	93	0,8	1399	15,0	35
	Total (T), mean (m)	3304 (T)	27,2 (T)	182291 (T)	55,2 (m)	71,15 (m)

NP: number of publications, TC: total number of citations, CPP: citations per publication, PRTP: publication rate in total publications. The ranking on the list was made based on the NP value.

The Most Productive and Influential Authors in Review Literature

Table V shows the productivity and impact values of 20 authors who published more than 10 review articles. Among the Review article authors, Hwang G.J. was found to be the most prolific, followed by Giorgis C. and Johnson N.J. The most influential author according to the CPP value was found to be Dochy F., followed by Slavin R.E. and Hew K.F. The h index is a widely used indicator as a measure of productivity and impact. The most productive and influential authors in terms of the h index were found to be Hwang, G.J., Hallinger P., Slavin R.E., and Tsai C.C.

Table V. The most productive and influential authors

Rank	**Author**	**NP**	**TC**	**CPP**	**h_index**
1	HWANG GJ	39	1056	27,1	16
2	GIORGIS C	30	25	0,8	2
3	JOHNSON NJ	30	25	0,8	2
5	TSAI CC	21	1188	56,6	13
4	HALLINGER P	21	581	27,7	13
6	SLAVIN RE	14	1699	121,4	13
7	KRISHNA LKR	14	160	11,4	8
8	BURGESS A	13	309	23,8	9
9	ZOU D	13	186	14,3	7
10	APPLE MW	13	109	8,4	4
11	MASON S	12	150	12,5	8

13	LIVINGSTON N	12	11	0,9	2
12	KURKJIAN C	12	10	0,8	2
14	SCHON I	12	8	0,7	2
15	DOCHY F	11	2879	261,7	11
16	MELLIS C	11	272	24,7	8
17	ROBERTS C	11	149	13,5	8
18	HEW KF	11	957	87,0	7
19	LEE K	11	209	19,0	4
20	DIETERICH DJ	11	7	0,6	1

NP: number of publications, CPP: citations per publication.

The Most Productive and Effective Institutions in Review Literature

Table VI shows the institutions that have contributed the most to the Review literature and their impact. The institution that publishes the most review articles is the University of Wisconsin, USA. In second place is the University of Illinois in the USA and in third place is the University of Toronto in Canada. In terms of impact, the highest CPP value, i.e. the most impactful institution, was found to be the University of Michigan. Stanford University ranked second and the University of Wisconsin ranked third. In general, the prominence of the universities in the USA among the universities in the top 10 is striking. The universities in the USA were found to achieve high productivity and impact.

Table VI. The most productive and influential authors

Rank	Affiliations	Country	NP	PRPT‰	TC	CPP
1	University of Wisconsin	USA	125	103	8647	69,2
2	University of Illinois	USA	122	100	7433	60,9
3	University of Toronto	Canada	97	80	6456	66,6
4	Ohio State University	USA	91	75	3869	42,5
5	University of Michigan	USA	91	75	10699	117,6
6	University of Hong Kong	Hong Kong	88	72	2731	31,0
7	Penn State University	USA	84	69	5516	65,7
8	University of Georgia	USA	84	69	3843	45,8
9	University of North Carolina	USA	80	66	3991	49,9
10	Stanford University	USA	70	58	6352	90,7

NP: number of publications, TC: total number of citations, CPP: citations per publication, PRTP(‰): publication rate in total publications. The ranking on the list was made based on the NP value.

Most Productive and Influential Countries in Review Literature

Table VII shows the list of the most influential countries that have contributed the most to the Review literature. A total of 131 countries have contributed to the review literature, with the USA making the largest contribution. The United States was found to be nearly four times more productive than the UK in second place. This finding is parallel with that of Ivanovic and Ho (2019). After the USA, the UK, Australia, Canada, and China contributed the most. Six of the ten most productive countries are in Europe. Among the ten most productive countries, the USA has the highest publication impact, followed by the Netherlands and Belgium.

Table VII. The most productive and influential countries

Rank	Country	NP	TC	CPP
1	USA	7546	207538	27,5
2	UK	1891	36729	19,4
3	Australia	1548	17745	11,5

4	Canada	1081	20992	19,4
5	China	1045	10715	10,3
6	Spain	645	6099	9,5
7	Netherlands	595	15752	26,5
8	Germany	527	7185	13,6
9	Turkey	288	2676	9,3
10	Belgium	247	5857	23,7

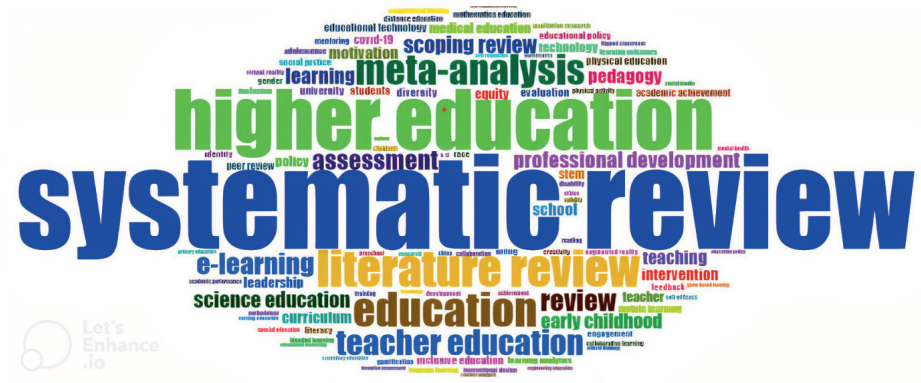
NP: number of publications, TC: total number of citations, CPP: citations per publication, PRTP: publication rate in total publications. The ranking on the list was made based on the NP value.

Basic Concepts in the Review Literature

Word Cloud analysis was performed to identify the key concepts in the Review literature. The 100 most frequently repeated author keywords that were detected as a result of the analysis are shown in Figure III. Figure III shows that "systematic review" is the most frequently repeated concept in the literature. Accordingly, it may be concluded that systematic review is a widely used method in the literature, although there are many types of reviews. The second prominent concept was found to be "higher education". Based on this fact, it can be inferred that review studies cover topics on higher education rather than the K-12 level. The concepts of "literature review" and "scoping review" are among other most repeated concepts. Each of these methods refers to a different type of review. Grant and Booth (2009) suggested that there are 14 different types of reviews. According to Grant and Booth (2009), the literature review is a general concept, and it aims to review new and current literature. A comprehensive search strategy may not include quality assessment and synthesis is generally narrative. A scoping review aims to identify the potential size and scope of available research literature. It involves a complete search strategy and no formal quality assessment. Synthesis is typically done in narrative form or in the form of tables. "Meta-analysis" is one of the main concepts in the respective literature, according to the figure. It can be inferred from here that meta-analysis is a method frequently used in review studies. Other most frequently used terms are "teacher education", "e-learning", "assessment", "professional development", "science education", "learn-

ing", "early childhood", and "pedagogy". Indeed, these concepts provide a scope of the issues examined in the review. They also serve as indicators that review methods are used in different contexts.

Figure II. Basic Concept Map. Note The font size of words is directly proportional to their frequency.



Themes of Review Literature

The second research question aims to reveal the themes of the review literature. A co-occurrence keyword analysis was performed to determine the thematic map of the Review literature and the results of the analysis are shown in Figure IV. Co-occurrence keyword analysis revealed five clusters in the review literature.

The first cluster is shown in green and the main concepts in this cluster are "higher education", "online education", "education technology", "mobile learning", "technology", and "pedagogy". The cluster mainly focuses on educational technologies. It can be said that the education level that is subject to the most scrutiny is higher education. "Systematic review" and "literature review" are at the center of both this cluster and the whole network. The main reason for this is that this study focuses on review articles. In addition, the fact that the largest node of the network is "systematic review" shows that systematic review methods are widely used in the review literature. This clus-

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ter features studies on the interaction between education and technology such as learning analytics (Gedrimiene et al., 2020), augmented reality (Akcayir & Akcayir, 2017), educational technologies in higher education (Bedenlier et al., 2020), internet of things in education (Kassab et al., 2020), and mobile learning (Crompton et al., 2016). There are also studies that address the role of technology in education from a pedagogical perspective (Burden et al., 2019; Chiu, 2021; Theelen & van Breukelen, 2022).

The second cluster is shown in red on the map and the main concepts it features are "teacher education", "professional development", "early childhood", "curriculum", "equity", "diversity", "identity", "gender", "social justice", and "race". In this cluster are studies on topics such as social justice and teacher education (Mills & Ballantyne, 2016), teacher education for equality (Liao et al., 2022), social justice, diversity, and equality (Gumus et al., 2021), teacher and social justice (Xenofontos et al.), gender differences (Fisher et al., 2020), and the development of teacher identity (van Lankveld et al., 2017). As is seen, this cluster also features studies on teacher training and professional development. There are also studies on race (McDermott et al., 2015) and diversity and equity (Lewis et al., 2019) in the context of education policy. Basically, this cluster examines issues such as diversity, equality, justice, and gender in education. In addition, it deals with teacher education and professional development issues and examines them in the context of educational policies.

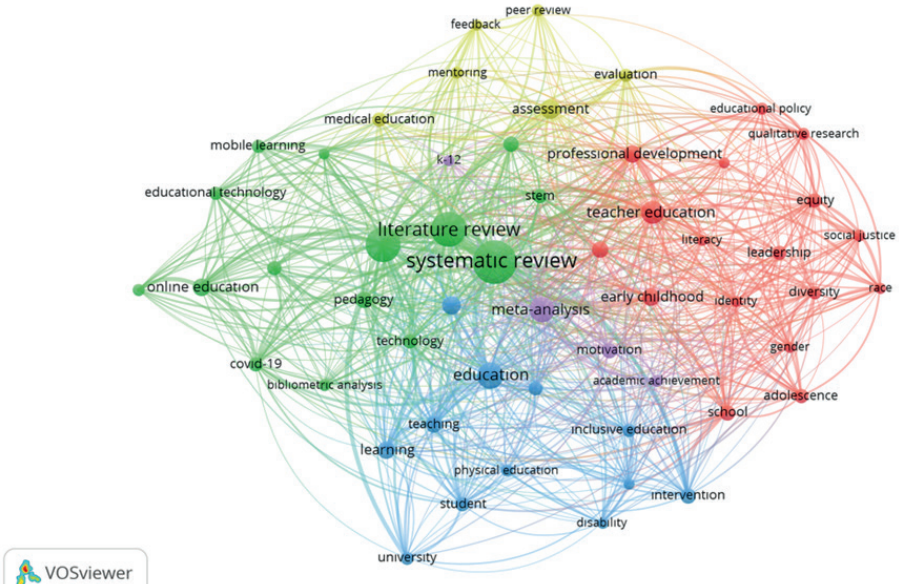
The third cluster is shown in blue on the map. The main concepts of this cluster are "education", "teaching", "learning", "student", "disability", "inclusion", "intervention", and "inclusive education". In this cluster, the concept of training is located near the center of the map and is therefore a central node of the map. This is because the subject under study is education. There are two main topics in the cluster. The first is learning and teaching, and the second is inclusive education. Student learning (Gao et al., 2020; Stenalt & Lassesen, 2022), teaching skills and knowledge to students with developmental disabilities (Apanasionok et al., 2019), teaching effectiveness for the education of students with disabilities (Iacono et al.), inclusive curriculum for students with disabilities or learning disabilities (Rendoth et al, 2022), teacher education for inclusive education (Tristani & Bassett-Gunter, 2020),

inclusion in physics education (Qi & Ha, 2012) are the main research topics of this cluster.

The fourth cluster is shown in yellow on the map. The main concepts of this cluster are "assessment", "evaluation", "peer review", "feedback", and "mentoring". The main focus of this cluster is measurement and evaluation in education. This cluster features studies on assessment practices and processes, such as the impact of student peer review on student outcomes (Mulder et al., 2014), student-centered feedback design (Ryan et al., 2021), the effectiveness of verbal feedback between students (Dickson et al., 2019), student voice in assessment and feedback (Sun et al., 2022), and theories in assessment and feedback research. In addition, research on the implications of these issues in medical education (Cook et al., 2017; Karthikeyan et al., 2019) and mentoring (Goh et al., 2022; Kow et al., 2020) are also of interest to this cluster.

The fifth and smallest cluster of the map is presented in lilac. There are two main concepts in this cluster: "academic achievement" and "motivation". This cluster focuses on research topics such as academic achievement and motivation (Dekker & Fischer, 2008), motivation at the K-12 level (Potvin & Hasni, 2014), the role of interpersonal relationships in students' motivation and academic achievement (Martin & Dowson, 2009), the effect of need supportive teaching on adolescents' motivation.

Figure IV: Co-occurrence map of keywords (threshold 50 co-occurrences, display 54 keywords)



Collaboration Interaction between Countries

The third research question aims to reveal the cooperative interaction between countries that have contributed to the review literature. To this end, country-co authorship analysis was conducted. The number of nodesaffects the readability of the science map produced in Vosviewer. To ensure readability, the collaboration analysis included 97 countries with at least three publicationsand at least one collaborative author. The country collaboration network map is shown in Figure V. The country that cooperated the most is the USA. This is followed by England, Australia, Canada, and China.

When the collaboration map is examined, it is seen that countries in the East such as China, Taiwan, Malaysia, Singapore, Japan, and Thailand cooperate more among themselves and form a cluster. In addition, countries in the West, such as the Netherlands, Germany, Spain, Switzerland, Switzerland, Portugal, and France cooperate more among themselves. USA, England,

Australia, and Canada are at the center of the network, connecting the eastern and western clusters.

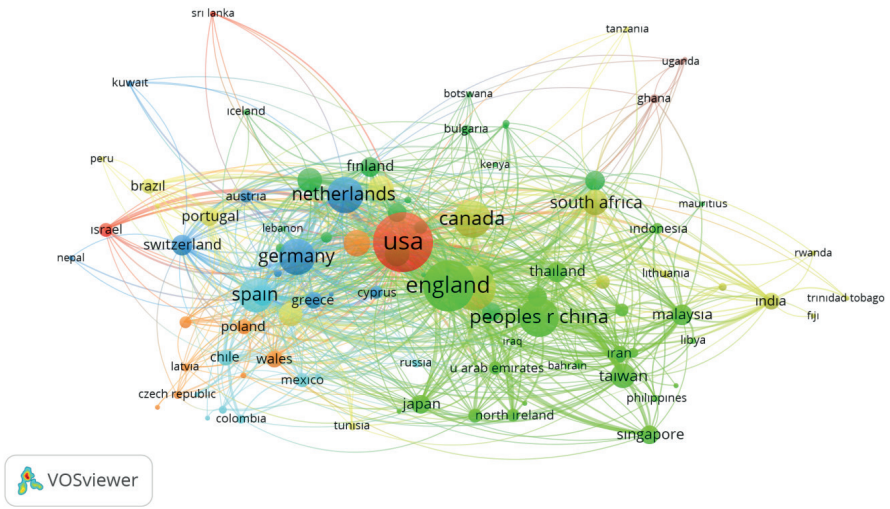


Figure V. Country co-authorship analysis (N= 131 countries, threshold minimum number of 3 publications and at least one link, display 97 countries).

Discussion and Conclusions

This study comprehensively analysed educational research by considering review articles. With long-term data covering the period between 1956 and 2022, this research has revealed the contributions to educational research, the productive and influential authors, journals, institutions and countries, the thematic structure of the field and the collaboration network. The findings of the study provide a comprehensive synthesis of the current state of educational research, as well as recommendations for the advancement of educational research.

According to the findings of this study, it was revealed that review

studies in education reached a significant growth trend between 1996 and 2012, but the most important growth occurred after 2013. This growth of review studies in the last thirty years is actually parallel to the growth of educational research. It can be said that this is actually the case for many disciplines. Because review studies occur as a result of increasing literature volume. As more publications are made in a field, both the literature grows and the subject matter diversifies. This situation reveals the need to synthesise more topics, fields or a discipline. This is also true for educational research. While there were approximately 7000 publications in the WOS database between 1980 and 2003, there has been a significant increase in the number of publications since 2005 and has continued to increase. This growth volume of educational research has resulted in the growth of review studies. Such a finding indicates that the number of publications in educational research will increase more in the coming years and therefore review studies will also increase more.

The Word Cloud analysis of this study reveals which review methods are more dominant in the review studies that are constantly growing in the educational literature. When a search is made in the WOS database as systematic review, it is seen that systematic review studies are not a dominant review methodology, especially until 1990. Until these years, it can be said that traditional review studies were a popular review methodology in scientific fields. However, since the beginning of the 1990s, systematic review methodology has shown a growing trend in the global literature and has become a review methodology that is used more and more every year. This situation is also valid for educational research. The results of this study revealed that systematic review and meta-analysis methodologies are the two most commonly used review types in educational research, respectively. The reason for the widespread use of systematic review methodology in educational research may be due to the significant differences between it and traditional literature. The traditional review deals with a wide range of topics and handles the studies in the literature subjectively, lacking a systematic methodology. However, the systematic review method seeks to answer a specific research question. In addition, it follows a rigorous, transparent, structured and reproducible process. Therefore, since the systematic review method is a more scientific

method than the traditional review in terms of both its scope and the methodological process it follows, it has been accepted and widely used in educational research as in other fields.

The findings of the thematic analysis of educational research focused on five themes in particular. The first of these is studies on educational technologies. This theme includes topics such as computer assisted education, online learning, digital education tools. The development of technology in recent years has resulted in the enrichment of educational technologies. Educational technology applications that aim to improve the quality of education such as facilitating and enriching students' learning and providing digital information literacy have an important place in educational research. Chen et al. (2020) revealed that educational technology research has shown a significant increase in recent years. Especially blended learning, online social communities, socialised e-learning, mobile supported language learning and game-based learning have gained importance in recent years. It seems inevitable that innovative applications in education will emerge in the coming years, especially as artificial intelligence and machine learning applications develop.

Another theme includes studies related to teacher education. Professional development of teachers, who are the basic cornerstone of education, has been a subject of interest for many years. For this reason, theoretical and practical applications of teacher education have been criticised and tried to be improved in certain periods (Darling-Hammond, 2006; Grossman et al., 2009). Studies on teacher education have focussed on issues such as how teachers learn, what they contribute to the learning process, how educational policies affect teachers' professional lives at the school level, and teachers' social networks (Avalos, 2011). As a result, teacher education is a subject whose policies and practices are evaluated according to changing global, national and regional conditions.

One of the emerging themes in educational research is studies focusing on the ethnic, cultural and demographic structures of education such as gender, social justice, diversity and race. Access to education and educational resources around the world, the imbalance between literacy rates, the diver-

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sity created by internationalisation, the psychological aspects of education according to gender, diversity in multicultural education and racial factors are among the important topics of educational research. Researchers argue that education can play a key role in eliminating inequalities between different groups and contribute significantly to the construction of society (Arar et al., 2017; Berkovich, 2014; Shields, 2010). For this reason, educational research has been addressed from many perspectives in the context of gender, social justice, diversity and race.

The third cluster includes topics on teaching, learning and students. This cluster, which covers the most fundamental topics of educational research, focuses on student learning, types of learning, emerging learning environments, the changing nature of teaching methods, and student achievement. Recent studies on this theme have emphasised the use of digital technologies in teaching and learning, e-learning environments and quality, virtual learning, augmented reality, flipped classroom, game-based learning, and other diverse and emerging learning environments. This situation can basically be seen as a result of the development of technology and at the same time the search for alternatives to traditional learning approaches.

The fourth cluster includes studies on Assessment and evaluation. Assessment and evaluation in education includes studies on measuring student performance and evaluating the effectiveness of educational programmes and educational policies at institutional, regional, national and global levels. Assessment and evaluation in education determines the level of learning outcomes and enables a critical review of existing policies. Developing effective strategies and policies in education plays an important role in improving the education process. This theme is a topic that is currently being analysed according to changing and evolving regional and global conditions. Especially in recent years, assessment and evaluation in online education, which is mandated by COVID-19, has been frequently examined. In addition, new student assessment approaches have been proposed to improve the quality of education (Liu et al., 2022).

The last cluster in educational research is on academic achievement and motivation. Academic achievement is one of the most frequently analysed topics in educational research from various perspectives. Determinants

of academic achievement, barriers to academic achievement, differences between students' academic achievement at regional and national level, differences between students' achievement ethnically and racially are the topics examined within this theme. However, studies in which academic achievement is associated with motivation are also included in this theme. The relationship between academic achievement and motivation, the interaction between motivation and career goals, teaching motivation among teachers and its effects, tools to increase academic achievement and motivation were also examined within the scope of this theme.

This study revealed the countries that contribute the most to educational research. The most productive countries are USA, UK, Australia, Canada and China. One of the reasons behind the high productivity is that USA, UK, Australia, Canada are English speaking countries. The reason behind China's productivity is that it has a large higher education system. Basu (2010) found that the number of scientific journalsin a country has an impact on its scientific productivity. Therefore, the factor behind the USA being the most productive country may be linked to the number of USA-based journals indexed in the WOS database. Lee and Bozeman (2005) found a positive relationship between international collaboration and scientific productivity. Another reason behind the high productivity of the countries on the list, the USA in particular, may be that they engage in international collaborations more. The USA is also the country with the highest publication impact. It is known that highly cited articles are authored by researchers from different countries (Aksnes, 2003; LanchoBarrantes et al., 2012). In addition, while author collaboration is expected to produce more citations, this is also related to the type of collaboration (Tahamtan et al., 2016). International co-publications gain more citations than domestic co-publications (Goldfinch et al., 2003). One of the reasons behind the high publication impact of the USA can be associated with the results of this research.

A clearer picture is obtained when co-authorship co-operation and productivity between countries are evaluated together. The top five rankings in the collaboration network are aligned with the top five countries in the list of the most productive countries. Therefore, it can be said that countries that cooperate more are more productive. This is consistent with the results of

previous studies (Aksnes, 2003; Goldfinch et al., 2003; Lancho Barrantes et al., 2012; Lee & Bozeman, 2005; Wagner et al., 2019). In the collaboration map, it is seen that countries located in a similar geography cooperate more among themselves and form a cluster. Nomaler et al. (2013) investigated the effect of geographical distance on citation frequency and concluded that as the geographical distance increases, the number of citations also increases. The fact that the USA, England, Australia, and Canada are in a position to unite the East and the West, i.e. that they have cooperated with countries far away, can be attributed to the high publishing impact ofthese countries. The collaboration map shows that numerous countries cooperate less frequently. Since many countries with fewer connections can be seen in the collaboration map, it can be said that there's room for further international collaboration. The expansion of the co-authorship network, i.e. the development of international collaboration, is important for the development of the field.

This study has some practical implications for researchers, academics, administrators and policy makers. First, awareness of the growth trends and themes in review articles in educational research can guide researchers in identifying their own research focus. Understanding the collaborative structure revealed by this study can improve the diversity of research results by enhancing potential cross-national research collaboration. Recognition of influential authors and institutions can support collaborative efforts, and recognition of influential journals can shed light on publication opportunities for researchers. This study, which reveals the current structure of educational research, has enabled researchers to recognise and bring to light issues that have remained in the background. The results of the study emphasise the need for decision-making by a wide range of stakeholders, to encourage more collaboration, to increase potential cooperation between isolated countries, and to advance the field of education. In addition, this study reveals the current use of review methodology in the field of education, allowing researchers to recognise the wide range of these methodologies. Researchers can bring new research questions to the agenda by integrating the thematic and methodological trend of educational research.

In future research, the temporal change of themes in educational research can be analysed periodically. In addition, changes in methodological

and content trends in review studies in recent years can be addressed by using a more in-depth qualitative method. Themes in educational research, review methodologies, collaboration patterns at cultural and regional level can help to identify differences in educational research. Particularly at the disciplinary level, contributions to educational research from other disciplines and which aspect of education these contributions have been made more can be a new research question.

This study has some limitations. First, this study is based on the WOS database. This means that the Scopus database was ignored. The possible effect of this limitation on the study is that the findings may change if the Scopus database is included. However, since WOS and Scopus have similar content despite their differences, such a limitation may need to be tested in future research. Second, bibliometric studies are by nature a method that analyses a large collection of data. Therefore, it is not possible to make inferences about the quality of studies for large data sets. Third, as in many previous bibliometric analyses, this study focuses on English language publications. This limitation ignores contributions from studies in other languages and may affect the findings in a certain direction.

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