Overview of Educational Research from Turkey Published in International Journals: A Bibliometric Analysis

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Abstract

The purpose of this study is to examine educational research from Turkey published in international education journals with bibliometric analysis method. For this purpose, the documents published in journals covered by the Web of Science's (WoS) SSCI, SCI-Expanded and AHCI indexes were reached. A total of 6312 articles were included in the analysis after the necessary exclusion criteria were applied for elimination. Descriptive analysis and bibliometric analysis methods were used to analyze the data. According to the analysis that are conducted based on the WoS citations of the reviewed articles, it is seen that the authors who work in the fields of educational technology and science education stand out in terms of productivity and impact. In terms of the institutions where the authors work, Hacettepe University ranked first regarding the number of articles and Middle East Technical University ranked first regarding the number of citations. According to the co-author analysis of institutions, it is seen that state universities that are based in Ankara form strong co-authorship ties with each other and with other Anatolian universities. Four major clusters emerged in the co-citation (author) analysis. The cluster located in the center of the map mostly consists of researchers working on research methods. The other dense cluster is seen to be composed of researchers focusing on educational psychology, measurement and evaluation, and statistics. It is seen that the third big cluster consists of researchers working on topics of self-regulation, motivation, self-efficacy, goal and achievement orientation and the fourth cluster consists of researchers working in the field of science education. The concepts that become apparent in the clusters emerged from the co-word analysis are student, education, attitude, technology, achievement, performance, science education, efficacy, teacher and knowledge. It is recommended that more detailed reviews of specific fields or subjects identified in this study should be carried out by field experts.

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Introduction

Research in the field of education from the past to the present has been based on many different justifications and theoretical sources. For example, investing in education or the importance of education has been discussed in many studies within the framework of education's impact on human capital or its contribution to economic growth (Spring, 2008). Similarly, the relationship between education and the social world of people has led to high interaction between educational research and social sciences such as sociology, philosophy and psychology. Therefore, it is seen that educational research is spread over a wide spectrum in many countries. In this context, discussions on the content, purpose and scope of educational research are important in revealing its current status and making predictions for the future. This is possible by examining key concepts and sources that are frequently used in relevant research (Pring, 2013).

When examining educational research from Turkey in general, it is seen that there are many different fields and topics of study. For example, teacher training, professional development, student achievement, teaching methods and techniques, technology integration, program development and curriculum studies, assessment and evaluation, management and leadership, comparative education and similar topics are increasingly included in the educational literature in recent years. However, it is seen that there are a limited number of systematic review studies that reveal the general outlook and content of educational research conducted in Turkey. In addition, existing review studies generally focus either on a specific field (Çiltaş, Güler, & Sözbilir, 2012; Doğan & Tok, 2018; Erdem, 2011; Göktaş et al., 2012) or on a specific subject within a field (Baran & Bilici, 2015; İzci, 2018; Özdemir, 2018), mostly limited to meta-analysis or descriptive content analysis. However, bibliometric based reviews that include analysis such as research productivity, citation rankings, and the association of concepts or citations have the potential to significantly contribute to the literature (Gordon et al., 1984). The current study, therefore, differs from the above-mentioned existing studies as it uses bibliometric method and focuses on educational research in general.

The bibliometric method generally aims to reveal the citation paths within scientific literature or publications of academics (Börner, Chen, & Boyack, 2003). Bibliometric method has been used in different fields in Turkey from the past to the present (Al & Afzali, 2006; Al & Coştur, 2007; Al & Tonta, 2004; Becerikli, 2013; Besimoğlu, 2015; Hotamışlı & Erem, 2014; Kıdak, Demir, & Özdemir, 2017; Muslu, 2018; Tabak, Barbak, & Öztürk, 2016). However, its use in education has been limited to a small number of studies conducted in the last few years (Danışman et al., 2016; Gümüş, Bellibaş, Gümüş, & Hallinger, 2019; Özkaya, 2019; Selvitopu, Kaya, & Taş, 2018; Şeref & Karagöz, 2019; Yalçın & Yayla, 2016). In addition to this, it is seen that many of the reviews conducted using the bibliometric method focus only on a specific field or subject of educational research, similar to the review studies mentioned above. The available two comprehensive bibliometric studies focused on all articles related to educational sciences and teacher education fields published in Turkey-based journals using ULAKBİM database (Karadağ et al., 2017; Koza-Çiftçi et al., 2016). A recently published thesis also examined educational research from Turkey by using Web of Science (WoS) database (Tür, 2019). However, this study, which is conducted with a descriptive perspective and limited to trend and co-authorship analyses, does not include citation, co-citation and co-word analysis, which are among the most popular bibliometric methods. In addition, current science mapping methods have not been used in any of the bibliometric studies that focus on educational research in general. In this context, the current study contributes to the literature by revealing overall situation of research from Turkey published in educational journals included in international indexes (WoS: SSCI, SCI-expanded and AHCI), with the help of visual maps. The research questions guiding the study are as follows:

1. What are the year and journal distributions of relevant publications?
2. What are the citation rankings of relevant publications, authors, journals and institutions?
3. What pattern of institutional cooperation has emerged?
4. What pattern of co-citation author network has emerged?
5. What pattern of co-word network has emerged?

Literature Review

Historical Development of Educational Research

The development of educational research has been largely dependent on the development of disciplines such as philosophy, psychology, sociology, anthropology, and history. The strong ties between other disciplines and educational research created an excessive identification with these disciplines at first. However, educational research has reached a certain intensity over time, gained an identity and began to leave its initial dependent status (Coxe, 1946; Kemmis & Grotelueschen, 1977).

Considering the developments in educational research from the past to the present, studies using historical, comparative and case study methods were relatively few in the late 1800s and early 1900s. It is seen that there were many articles using questionnaire, correspondence and interview methods during this period. From 1910 to the 1930s, a significant increase was observed in the use of statistical methods in educational research. In addition, studies in different fields of education became more apparent on those dates. For example, more emphasis was placed on management, child psychology, educational measurement and statistics (Frankei & Davis, 1931). It is also seen that psychometric tests were widely used in educational research conducted until the 1960s. With the rapid development of the qualitative paradigm after the 1970s, a range of ethnographic and naturalist methodologies emerged and began to be widely used in educational research in different fields (Grenfell & James, 2004). Besides that, since the 2000s, studies on educational technology have started to increase rapidly (Göktaş et al., 2012; Hsu et al., 2012; Selwyn & Facer, 2014; Şimşek et al., 2008). Studies on student achievement and cross-cultural comparisons have also become more visible with the developments related to statistical methods and international student assessments, such as PISA and TIMSS (Baroutsis & Lingard, 2017; Carnoy, Khavenson, & Ivanova, 2015; Gorur, 2016; Wiberg, 2019).

Educational research has played an important role in influencing and informing educational policies and practices. It can also be said that developments in educational research have formed the basis of many educational reforms over time. In addition to this practical effect, researchers generally benefited from previous studies in forming their conceptual and theoretical frameworks, so the past studies also constitute the basis for new ones (Onwuegbuzie & Daniel, 2003). In general, it can be said that studies aimed at reviewing existing educational research in specific time intervals by using different perspectives are very important in terms of future research, policies and practices (Dunkin, 1996). In this context, different review methods such as descriptive content analysis, meta-analysis and bibliometric analysis have gained an important place in different fields of educational research.

Systematic Review Studies in Educational Research

As in many other fields, systematic review studies are gaining more and more importance in the field of education. Compared to traditional literature reviews, systematic review studies are preferred because they are quite comprehensive as well as less biased and more transparent (Andrews, 2005). The systematic review approach initially emerged in the field of medicine and rapidly spread to fields such as librarianship and education (Hong & Pluye, 2018). The first systematic review studies conducted in education generally focused on topics such as the organization of classes (ability grouping), class size, teaching methods, special teaching practices and student achievement (Davies, 2000; Kulik & Kulik, 1989; Slavin, 1984). However, the distribution of the studies were spread to different fields from preschool education (Correia, Camilo, Aguiar, & Amaro, 2019; Camilli, Vargas, Ryan, & Barnett, 2010; Freudenstein & Howe, 1999) to higher education (Crompton & Burke, 2018; Falchikov & Goldfinch, 2000; Esen, Bellibaş, & Gümüş, 2020; Falchikov & Goldfinch, 2000; Rodríguez-Hernández, Cascallar, & Kyndt, 2020) overtime.

Although systematic review studies have had an important place in the international education literature for many years, the related studies have started to increase especially with the popularity of meta-analysis method and have a relatively short history in Turkish literature. For example, Selçuk Palancı, Kandemir, and Dündar's (2014) review of articles published in the journal of "Education and Science" between 2013 and 2017 revealed that there were very few review studies. However, in recent years, it has been observed that the use of different systematic review methods, especially meta-analysis and descriptive content analysis, in the educational literature increased significantly (Altunay, 2017; Alkan, 2017; Cansoy & Polatcan, 2018; Cevher & Yıldırım, 2020; Demir & Koçyiğit, 2018; Gül & Sözbilir, 2015; Günay & Aydın, 2015; Kaya, 2016; Üstün & Eryılmaz, 2014; Yılmaz, 2019).

Given the role of positivist understanding in the development of educational research in Turkey and the fact that quantitative research often used in the related research (Fazlıoğulları & Kurul, 2012; Karadağ, 2009; Yıldırım, 1999), meta-analysis method has been frequently used in different fields of education such as educational sciences (Ayaz & Söylemez, 2015; Körük & Özabacı, 2018; Ural & Bümen, 2016), educational technology (Dinçer, 2015; Esgin, Elibol, & Dağlı, 2016; Tekedere & Göker, 2016) and subject education (Aktamış, Hiğde, & Özmen, 2016; Alkan ve Bayri, 2017; Balcı, 2012). Review studies using descriptive content analysis have also become more visible in the educational literature in recent years. These studies are especially popular in some fields, such as educational technology (Göktaş et al., 2012; Kılıç-Çakmak et al., 2016; Tosuntaş, Emirtekin, & Süral, 2019), science education (Bağ & Çalık, 2017; Karamustafaoğlu, Boz, & Değirmenci, 2020), educational administration (Bellibaş & Gümüş, 2019; Koşar, Er, Kılınç, & Koşar, 2017; Turan, Karadağ, Bektaş, & Yalçın, 2014), education programs and teaching (Ozan & Köse, 2014), guidance and psychological counseling (Seçer, Ay, Ozan, & Yılmaz, 2014) and mathematics education (Albayrak & Çiltaş, 2017). In addition, review studies on various topics such as teacher education (Yücel Toy, 2015), scale adaptation and development (Gül & Sözbilir, 2015; Öztürk, Eroğlu, & Kelecioğlu, 2015), multicultural education (Günay & Aydın, 2015), educational technology (Yıldırım, Kurşun, & Göktaş, 2015) and organizational citizenship (Yılmaz, Altınkurt, & Yıldırım, 2015) were included in the special issue of "Content Analysis and Meta-Analysis" published in "Education and Science".

Although the visibility of systematic review studies in the Turkish educational literature has increased in recent years, it can be said that bibliometric studies are still quite limited. It is observed that existing bibliometric studies are limited to a few fields. For example, there are few studies using bibliometric method in the field of educational administration. Gümüş et al. (2019) recently conducted a bibliometric review of educational administration research to draw a general picture of the related research in Turkey. Özdemir's (2019) study in the same field focuses on the articles related to leadership and student achievement. Gökçen and Arslan (2019) focused on studies in the field of Turkish education published in international journals. Another study in the same field examined related publications included in the WoS database by using more comprehensive analyses (Şeref & Karagöz, 2019). Özkaya (2019) conducted a bibliometric analysis of the studies in STEM education. In another study, bibliometric analysis was applied to the articles on the use of augmented reality in science education (Arıcı, Yıldırım, Çalıklar, & Yılmaz, 2019). In the study of Yılmaz, Topu, and Takkaç-Tulgar (2019), bibliometric analysis of studies on foreign language teaching in early childhood education was conducted. Similarly, bibliometric studies focusing on mathematics education (Özkaya, 2018) and social studies education (Sönmez, 2020) were found. In addition, two theses based on bibliometric analysis, one focused on 'education and educational sciences' in general (Tür, 2019) and the other focused on 'measurement and evaluation in education' (Ukşul, 2016), were completed recently. As it is seen, bibliometric method has been used in different areas of education, especially in the last few years.

Bibliometric

The "Bibliometric" method, which reveals the general trends of scientific publications and the relationships among these publications based on bibliographic data, was first used by Wyndham Hulme with the name of "Statistical bibliography". This concept was used to examine the book or other media communication tools using mathematical and statistical methods (Pritchard, 1969). The use of bibliometric method is becoming widespread in various disciplines to show the changes and development in science by revealing the quantitative analysis of scientific publications (Koza-Çiftçi et al., 2016), to analyze the links of any study with other studies (Zupic & Cater, 2015) and to reveal general trends in any subject or field (Bornmann & Mutz, 2015; De Bakker, Groenewegen, & Den Hond, 2005; Fahimnia, Sarkis, & Davarzani, 2015; Gümüş, Bellibaş, Esen, & Gümüş, 2018; Hallinger & Suriyankietkaew, 2018; Liu, Zhan, Hong, Niu, & Liu, 2012).

With the advances in scientific mapping and visualization tools, it is seen that the use of bibliometric method is gradually increasing in order to reveal the connections among journals, documents, authors, institutions, key terms and words by mapping scientific studies (Börner et al., 2003; Zupic & Cater, 2015). In recent years, bibliometric method is frequently used in tourism (Cheng, Edwards, Darcy, & Redfern, 2018; Hall, 2011), business (Acedo, Barroso, Casanueva, & Galán, 2006; Fischbach, Putzke, & Schoder, 2011), education (Begeny et al., 2018; Diem & Wolter, 2013; Gümüş, Gök, & Esen, 2020; Hallinger, Gümüş, & Bellibaş, 2020; Khodabandelou, Mehran, & Nimehchisalem, 2018), agriculture (Velasco-Muñoz, Aznar-Sánchez, Belmonte-Ureña, & López-Serrano, 2018), and in many different disciplines.

Why Bibliometric Method?

Zupic and Cater (2015) shed light on the superior aspects and features of the bibliometric method in their studies. According to them, it is possible to analyze hundreds or even thousands of studies in depth with bibliometric method. At the same time, bibliometric studies also include graphical representations for the research area (Börner et al., 2003). The bibliometric method provides important information to researchers about the intellectual and conceptual structure of the field by revealing information about periodicals, documents, authors and concepts related to a particular field (Üsdiken & Pasadeos, 1995; Zupic & Cater, 2015).

The bibliometric method increases the impartiality of literature reviews. It provides information to the researchers about the appearance of their studies as well as showing what types of studies other researchers working in the field have focused on. When these data are clustered and analyzed, it shed light on the structures and social networks in the field. In addition, it helps journal editors to evaluate past publications, design new policies, and make decisions (Zupic & Cater, 2015).

The bibliometric analysis method has many advantages that will contribute to the literature, as well as some limitations as in every method. For example, Bornmann (2014) draws attention to the inadequacy of bibliometric method, especially in revealing social effects, and focuses on web-based measurements called "Altmetrics" which are measured on social media. In addition, bibliometric studies often focus on a large number of documents, so they do not provide detailed information on the relevant studies and their results. However, the contributions of the bibliometric method such as analyzing thousands of studies together, revealing author, word and citation relationships, and using visual mapping (Zupic & Cater, 2015) should not be ignored.

There have been studies conducted in bibliometric design in the educational literature for many years (Assefa & Rorissa, 2013; Budd, 1988; Marti-Parreño, Méndez-Ibáñez, & Alonso-Arroyo, 2016). However, although the presentation of bibliometric studies through visual maps has become widespread, especially in recent years, it is observed that such studies are limited to certain areas. This research offers an overview of the educational literature in Turkey. Both its comprehensive focus and the usage of visual mapping techniques differentiate this research from the previous bibliometric studies conducted in Turkey.

Bibliometric Analysis Methods

There are different methods that come to the fore in analyzing bibliographic data obtained from databases. Here, only the explanations of the basic methods used in the current study are included. These are; citation analysis, co-author analysis, co-citation analysis and co-word analysis.

Citation analysis:

Citation analysis is one of the most known and most frequently used analyses in bibliometric studies, focusing on published citations. Citation analysis is based on the assumption that a highly cited book or article is deemed important by researchers working in the field (Üsdiken & Pasadeos, 1995). Bibliometric studies generally present citation analysis of the most cited documents, authors, or journals in the field (Zupic & Cater, 2015).

Co-author analysis:

With the increasing expectations regarding both quality and quantity of academic publications, the numbers of multi-authored studies have been increasing (Hudson, 1996). In this context, collaborations in multi-authored studies have also been receiving increasing attention. Co-author analysis is considered as a measure of collaboration in scientific publications, and this indicates a strong social bond. In addition, situations involving collaborations among institutions and countries can be revealed by co-author analysis through bibliographic data that includes the institutions and geographical regions of the authors (Zupic & Cater, 2015).

Co-citation analysis:

Co-citation analysis is a type of document matching that measures the number of documents cited together in any pair of documents. In order to create a strong co-citation analysis, many authors must be cited together before. In this context, co-citation analysis focuses on the co-cited authors, sources or documents. It is assumed that there are strong relationships between authors, sources or documents with a high number of citations together. In addition, highly co-cited documents or authors also often get high numbers of citations individually (Small, 1973; Zupic & Cater, 2015).

Co-word analysis:

It is a bibliometric analysis technique that uses the words in the documents to create a conceptual structure and establish relationships. Title of the document, keywords, abstract or full text can be used in co-word analysis. However, two problems can be encountered when using keywords in co-word analysis. First, the journal's bibliographic data may not include keywords. Second, simply adhering to the keyword can cause a situation in which the validity of analysis depends on whether the person who indexed the document takes the relevant places in the text or not (indexer effect) (Zupic & Cater, 2015).

Method

In this study, research from Turkey published in SSCI, SCI-expanded and AHCI indexed educational journals was analyzed using bibliometric analysis.

Procedure

Three basic criteria were used to determine the studies to be included in the analysis. These criteria are: 1. The publication should be from Turkey (at least one author must be working in Turkey), 2. Publication should focus on education, 3. The publication should be in the research or review category. There are generally two basic approaches in the preparation of the data set for bibliometric studies (Zupic & Cater, 2015). One of them is conducting searches by using keywords or word groups and then determining relevant studies by detailed reading. This approach is generally used in studies that focus on a specific subject. The second approach is to select relevant journals and include all publications in those journals. It is seen that this approach, which is generally used in comprehensive reviews focusing on a research field, has been frequently used in different fields of education or country/region based studies in recent years (Begeny et al., 2018; Fejes & Nylander, 2014; Hallinger, 2020; Kovačević & Hallinger, 2020).

This study is done with the second approach, taking into account the scope and focus. In the WoS database, when all the journals in 'education and educational research' category are selected and countries of origin is filtered to Turkey, the general structure of the studies has been found (n = 6409). The final search and saving the data for further analyses were carried out on May 4, 2020. In the search process, there was no restriction regarding the starting year and the end of 2019 was determined as the end date. Given the resulting data size and the preliminary screening revealed the absence of unrelated work in the search results, all obtained studies assumed to be from Turkey and education oriented. Although this is a common practice and a small number of unrelated studies will not affect the general results of bibliometric analysis, the fact that all the studies obtained were not examined one by one in terms of suitability can be seen as a limitation regarding the creation of the data set. In order to meet the third inclusion criteria, studies such as editorials, book chapters, conference proceedings were determined (n = 97) and removed from the data set with the help of WoS's filtering features. No filtering was used regarding the language of the articles. In this context, 6312 Turkey-based articles from 224 journals, covered by selected indexes in any period, were included in the analysis (see Figure 1).
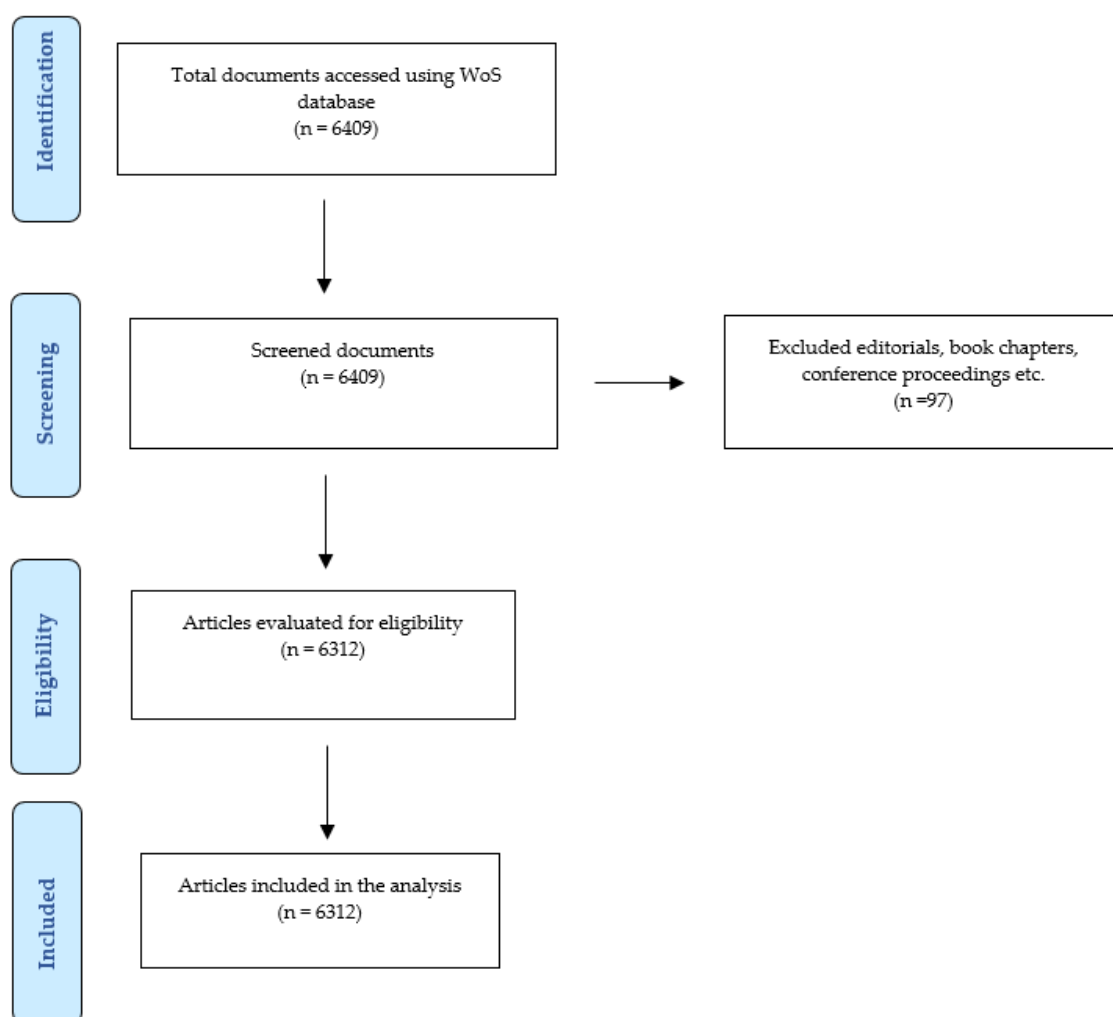

Figure 1. Flow Diagram Showing the Stages for the Determination and Selection of documents.

Analysis of the Data

The analysis of the data was first started with descriptive analysis. These analyses were carried out on WoS's own system. Bibliometric analyses were conducted using the VOSviewer program. Bibliographic information of 6312 documents downloaded from WoS was analyzed by uploading to

VOSviewer program. In this context, the citation (journal, author, institution, and document), co-author (institution), co-citation (author) and co-word analyses described above were used. Before each analysis, the relevant data was reviewed in detail and the essential data cleaning operations (combining the author, journal and institution names written by using different languages and characters or the same/closely related words (e.g., 'student' and 'students', 'success' and 'achievement')) were done by creating 'thesaurus files'.

Results

Descriptive Findings

Distribution of publications by years

When the trend of the relevant publications is examined, it is seen that the number of publications has increased with a certain determination from 1968 to 2006, but it has gained a significant acceleration between 2008 and 2016, especially revealing a great increase after 2007 (Figure 2). It is believed that the sudden increase in the second half of the 2000s was associated with new journals that are included in the relevant indexes from Turkey and other non-Western countries. It is seen that there has been a decrease in the number of publications since 2017. One of the reasons for this decline might be that some of the journals from Turkey were removed from the relevant indexes after 2012.
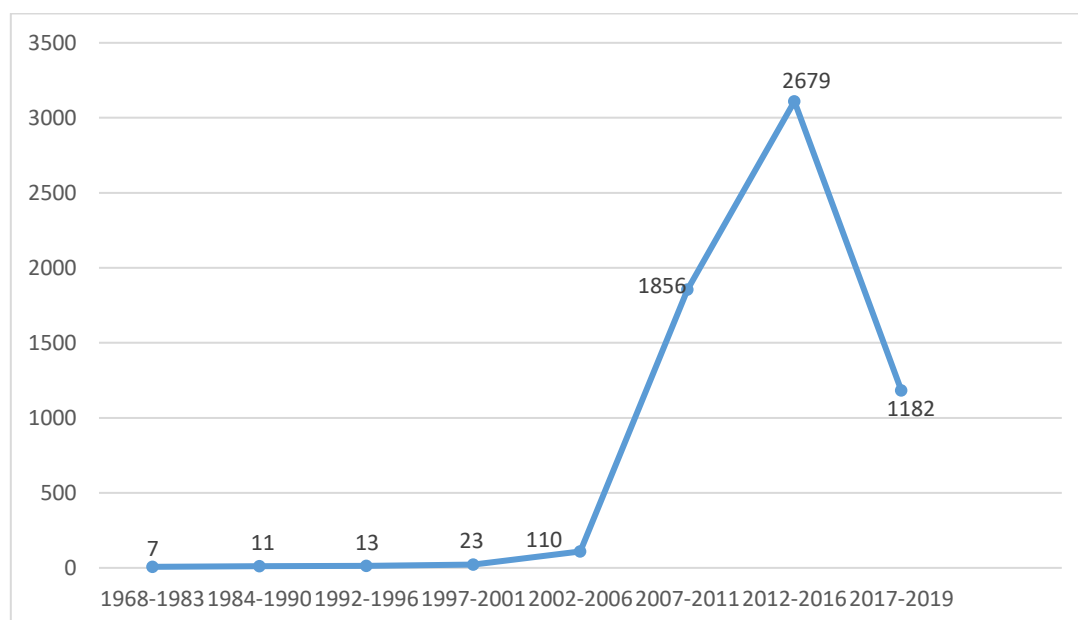

Figure 2. Distribution of Relevant Publications by Years

Most popular journals

When the publication distributions of the journals are examined, Turkey-based journals "Education and Science" and "Educational Sciences: Theory & Practice" seems to have over 1,000 articles. These journals are followed by "Hacettepe University Journal of Education" with 669 articles, and "Energy Education Science and Technology Part B-Social and Educational Studies" and "Eurasian Journal of Educational Research" journals with over 300 articles. In addition, "Eurasia Journal of Mathematics Science and Technology Education" and "Turkish Online Journal of Educational Technology" journals are listed with over 100 articles. There are also over 100 publications in two international sources, "Journal of Baltic Science Education" and "Computers & Education" journals. These journals followed by "Croatian Journal of Education", "Educational Technology & Society", "International Journal of Science and Mathematics Education", "International Journal of Science Education", "Chemistry Education Research and Practice", "Early Child Development and Care", "New Educational Review", "British Journal of Educational Technology" and "Asia Pacific Education Review", which published 50 or more articles from Turkey.

Table 1. Journal Distribution of Publications and Number of Citations

Journal name	Number of articles	Number of citations	Link strength	Number of citations per research
Education and Science	1044	3291	972	3,15
Educational Sciences: Theory & practice	1027	3311	938	3,22
Hacettepe University Journal of Education	669	2198	729	3,28
Energy Education Science and Technology Part B-Social and Educational Studies	332	4216	148	12,69
Eurasian Journal of Educational Research	322	1187	325	3,68
Eurasia Journal of Mathematics Science and Technology Education	215	832	253	3,86
Journal of Baltic Science Education	204	513	278	2,51
Turkish Online Journal of Educational Technology	184	1525	179	8,28
Computers & Education	128	4339	262	33,89
Croatian Journal of Education	88	118	83	1,34
Educational Technology & Society	82	1686	124	20,56
International Journal of Science and Mathematics Education	74	488	115	6,59
Chemistry Education Research and Practice	73	555	155	7,60
International Journal of Science Education	73	1279	206	17,52
Early Child Development and Care	64	82	24	1,28
The New Educational Review	56	97	28	1,73
British Journal of Educational Technology	53	1046	85	19,73
Asia Pacific Education Review	51	343	68	6,72

Bibliometric Findings
Citation analysis (Journal, Author, Institution and Document)

Bibliometric analysis was started with traditionally frequently used citation analysis. First, citation analysis of journals with the highest number of publications was conducted (Table 1). When the citations received by the publications in the mentioned journals are examined, it is seen that a few journals come to the fore. For example, although Computers & Education journal ranks in the middle of the list in terms of number of publications, it ranks first in terms of number of citations. In addition, when the number of citations per article is examined, it is seen that the articles in this journal receive high number of citations. It is also the journal with the highest impact value (2018 IF: 5.627) among the journals that are on the list. In terms of citation rankings per article, this journal is also followed by a few high impact educational technology and science education journals. There is an interesting situation regarding the citations of the "Energy Education Science and Technology Part B-Social and Educational Studies" journal. This journal, which publishes many articles and has a very high number of citations per article, has a very low link strength. In other words, the journal's co-citation power with other journals is quite weak despite the high number of articles and citations. It is known that this Turkey-based journal was removed from WoS for publishing many articles for a fee and having too many self-citations. Therefore, it is necessary to evaluate the relevant citation numbers with this knowledge. Finally, despite the fact that three Turkey-based journals with high numbers of publications also have high numbers of total citations, it is seen that their number of citations per publication is not at the desired level. In addition, "Education and Science" journal stands out as the journal with the highest link strength among all journals.

Second, the citation rankings of the authors of publications that included in this review and the institutions where these authors work were examined based on WoS citation data. Table 2 shows the number of publications and citations of the most productive and influential authors in the field of education. The first 30 authors with at least three publications in the relevant indexes are listed

according to the number of citations. When the table is examined, it seems that the authors who work in the fields of educational technology (e.g., Y.K. Usluel, K. Çağıltay, Y. Göktaş, E. Şendurur) and science education (e.g., M. Çalık, O. Geban, S. Sungur) come to the fore. In addition, as shown in the table some scholars who are working abroad also found their place in the table because of their research collaborations with academics working in Turkey.

Table 2. Author Rankings

No	Author	Number of articles	Number of citations	Link strength
1.	Çalık, Muammer	31	737	103
2.	Usluel, Yasemin K.	13	531	13
3.	Çağıltay, Kürşat	21	412	11
4.	Geban, Ömer	31	405	50
5.	Göktaş, Yüksel	29	391	52
6.	Şendurur, Emine	4	387	2
7.	Akbulut, Yavuz	18	382	13
8.	Uşak, Muhammet	33	332	47
9.	Yükseltürk, Erman	13	322	3
10.	Sungur, Semra	26	317	14
11.	Yıldırım, Zahide	17	315	19
12.	Yıldırım, Soner	20	313	29
13.	Tekkaya, Ceren	16	293	18
14.	Çepni, Salih	14	283	66
15.	Akyol, Zehra	4	266	1
16.	Erdoğan, Mehmet	28	264	40
17.	Uzunboylu, Hüseyin	14	264	2
18.	Gülbahar, Yasemin	17	262	14
19.	Akın, Ahmet	21	262	2
20.	Yılmaz-Soylu, Meryem	3	258	0
21.	Garrison, D. Randy	3	252	1
22.	Çakıroğlu, Jale	23	251	18
23.	Eryılmaz, Ali	26	246	9
24.	Günel, Murat	13	246	12
25.	Boz, Yezdan	20	221	31
26.	Özçelik, Erol	7	219	4
27.	Oztaş, Fulya	9	213	30
28.	Ayas, Alipaşa	12	208	41
29.	Kondakçı, Esen U.	18	205	25
30.	Akçayır, Murat	3	200	2

Table 3 shows the publications and citation rankings of the institutions where the authors work. When the table is examined, Middle East Technical University (METU) stands out as the most productive institution in terms of number of citations. Although Hacettepe University is the most productive institution in terms of the number of publications, it is remarkable that there is a difference of almost two times with METU in terms of number of citations. This situation is related to the high number of citations of articles published in some high-impact journals, as seen in the journal analysis above. The fact that the institutions in the top thirteen have over 1000 citations shows the effectiveness of these institutions in terms of citation impact. The presence of universities in different regions on the list can also be seen as an important indicator of the visibility and efficiency of these institutions. Some institutions from abroad also found their place in the table, similar to author table, because of research collaborations.

Table 3. Citation Ranking of Institutions

No	Institution	Number of articles	Number of citations	Link strength
1.	Middle East Technical University	478	7279	832
2.	Hacettepe University	687	3674	724
3.	Karadeniz Technical University	208	2342	676
4.	Gazi University	418	2243	648
5.	Anadolu University	229	1868	203
6.	Atatürk University	171	1660	535
7.	Selçuk University	125	1658	488
8.	Bilkent University	110	1446	205
9.	Boğaziçi University	132	1234	148
10.	Dokuz Eylül University	191	1148	264
11.	Ankara University	267	1111	245
12.	Abant İzzet Baysal University	160	1057	262
13.	Marmara University	205	1037	188
14.	Sakarya University	172	964	197
15.	Pamukkale University	154	914	161
16.	Çukurova University	113	712	91
17.	Indiana University	24	679	47
18.	Fırat University	63	674	175
19.	Akdeniz University	111	665	168
20.	Ondokuz Mayıs University	96	628	189

Table 4 contains the number of citations of the 15 most cited articles among the articles included in the review according to WoS data.

Table 4. Most Cited Articles

	Article	Number of citations
1	Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*(2), 423-435.	384
2	Mazman, S. G., & Usluel, Y. K. (2010). Modeling educational usage of Facebook. *Computers & Education*, *55*(2), 444-453.	293
3	Ozkan, S., & Koseler, R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computers & Education*, *53*(4), 1285-1296.	231
4	Tüzün, H., Yılmaz-Soylu, M., Karakuş, T., İnal, Y., & Kızılkaya, G. (2009). The effects of computer games on primary school students' achievement and motivation in geography learning. *Computers & Education*, *52*(1), 68-77.	223
5	Akçayır, M., & Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, *20*, 1-11.	159
6	Akyol, Z., & Garrison, D. R. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology*, *42*(2), 233-250.	147

Table 4. Continued

	Article	Number of citations
7	Ardac, D., & Akaygun, S. (2004). Effectiveness of multimedia-based instruction that emphasizes molecular representations on students' understanding of chemical change. *Journal of Research in Science Teaching*, *41*(4), 317-337.	137
8	Phipps, S., & Borg, S. (2009). Exploring tensions between teachers' grammar teaching beliefs and practices. *System*, *37*(3), 380-390.	126
9	Yukselturk, E., & Bulut, S. (2007). Predictors for student success in an online course. *Journal of Educational Technology & Society*, *10*(2), 71-83.	125
10	Şendağ, S., & Odabaşı, H. F. (2009). Effects of an online problem based learning course on content knowledge acquisition and critical thinking skills. *Computers & Education*, *53*(1), 132-141.	118
11	Aydin, S. (2012). A review of research on Facebook as an educational environment. *Educational Technology Research and Development, 60*(6), 1093-1106.	118
12	Akbulut, Y., & Cardak, C. S. (2012). Adaptive educational hypermedia accommodating learning styles: A content analysis of publications from 2000 to 2011. *Computers & Education*, *58*(2), 835-842.	117
13	Baran, E. (2014). A review of research on mobile learning in teacher education. *Journal of Educational Technology & Society*, *17*(4), 17-32.	117
14	Irzik, G., & Nola, R. (2011). A family resemblance approach to the nature of science for science education. *Science & Education*, *20*(7-8), 591-607.	117
15	Inal, Y., & Cagiltay, K. (2007). Flow experiences of children in an interactive social game environment. *British Journal of Educational Technology*, *38*(3), 455-464.	113

When the most cited articles are examined, it is seen that most of the articles are in the field of educational technology. In addition, six of the 15 most cited articles were published in Computers & Education journal. Other articles in the list are seen to be studies on subjects such as learning, learning styles, science education, and foreign language education.

Co-author analysis (Institution)

Co-author analysis for institutional cooperation is presented in figure 3. In general, it is seen that the public universities established before 1992 are predominantly located on the map, and a few foundation universities find a place on the map. Several universities from abroad, notably the United States of America and the Turkish Republic of Northern Cyprus, are also located in the cooperation network. In institutional collaborations, it is generally seen that there is a tendency for doctoral students to continue their relations with the institutions they graduated from. In addition, the state universities in Ankara play a central role in the institutional cooperation map and they form strong co-authorship ties with each other and with other Anatolian universities. In particular, it is seen that METU has a strong cooperation with many universities with high publication and citation statistics. This is understandable considering the leading role of METU in the Academic Staff Training Program (ÖYP) and the locomotive role it plays in training academics for many universities in general. It is also seen that there are strong co-authorship ties among some other universities in the same province and region, especially in Istanbul.
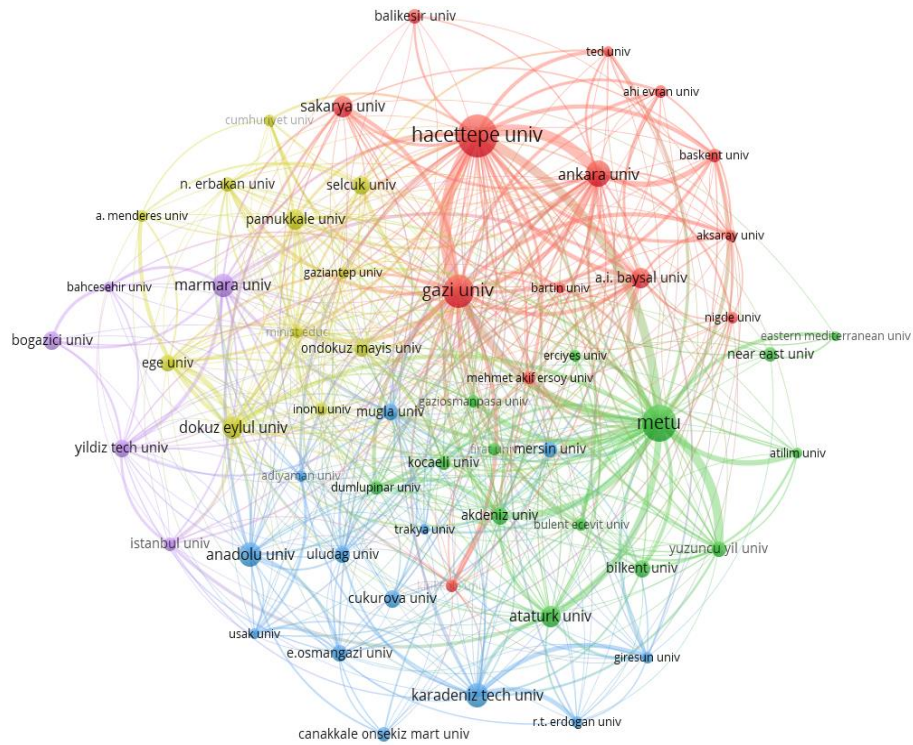
Figure 3. Institutional Cooperation Network (57 institutions with at least 40 documents)

Co-citation analysis (Author)

When the co-citation analysis, conducted based on the all publications included in the review, was examined, it was found that 97,605 authors cited in relevant publications. When more than 100 citation criterion was set as the cut-off point, the number of authors was found 137.
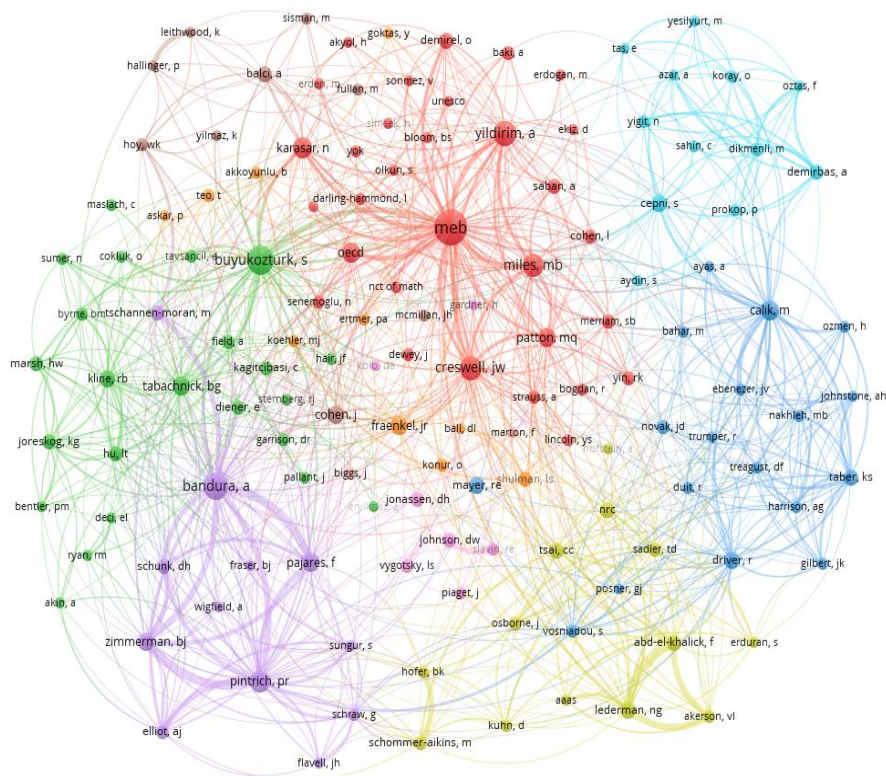

Figure 4. Co-citation (author) Network

As seen, several clusters are formed on the map. Authors who have many citations together are gathered in the same cluster. Of these clusters, the blue, green, purple, and red clusters are larger and more distinctive than others. However, clusters seen as turquoise, yellow, orange and brown are observed to form less frequent and smaller clusters. When the entire map is examined, first, it seems that J.W. Creswell and the Ministry of National Education (MoNE) are located at relatively central place and associated with many different clusters. This shows that J.W. Creswell was cited in many different studies and contributed to the knowledge production in different fields of education. In addition, it seems that publications from different fields of education commonly refer to the resources of the Ministry of National Education.

When the red cluster, which is in the center of the map and one of the most intense clusters, is examined, it is found that most of the authors in this cluster are Turkish and foreign academics (J.W. Creswell, M.B. Miles, M.Q. Patton, S.B. Merriam, L. Cohen, A. Yıldırım, N. Karasar and A. Saban etc.) who work on research methods, mainly in qualitative research. In addition, this cluster includes institutions such as MEB (MoNE), UNESCO and OECD that provide reports and statistical information, and researchers known for their work on program development, learning and teacher education (B.S. Bloom, J. Dewey, L.D. Hammond, O. Demirel, S. Olkun, V. Sönmez, A. Baki, etc.). In this context, it can be said that the red cluster consists of researchers and institutions that are generally cited by scholars working in different fields. In addition, it can be said that many of the studies referring to this cluster are studies focusing on learning and teacher training, and they frequently use general statistical data and / or qualitative research methods.

The green cluster, which is another dense cluster, is seen to consist of academics (B.G. Tabachnick, R.B. Kline, J. Pallant, K.G. Jöreskog, J. Cohen, Ş. Büyüköztürk, C. Kağıtçıbaşı, A. Akın, etc.) working in educational psychology, measurement and evaluation, and statistics. It is understood that this cluster generally represents advanced statistics and scale development studies. In addition, considering their proximity and number of connections, it can be said that this cluster is in close relationship with the purple cluster. The purple cluster consists of researchers working on topics of self-regulation, motivation, self-efficacy, goal and achievement orientation (A. Bandura, P.R. Pintrich, D.H. Shunk, M. Tschannen-moran, F. Pajares, S. Sungur, etc.). Therefore, it can be said that education researchers who work on these topics are generally influenced by mentioned names and mostly conduct quantitative research by using advanced statistical methods.

When the blue cluster is examined, it is observed that the authors in this cluster mostly work in the field of science education (K.S. Taber, J.V. Ebenezer, J.K. Gilbert, M. Çalık, A. Ayas, H. Özmen, etc.). As study subjects, misconception, conceptual change, teaching strategies and curriculum issues come to the fore. When the studies of the authors in the yellow cluster are examined, it is seen that they generally focus on the field of science education similar to the green cluster, but certain subjects are more prominent. When the features that distinguish this group from the blue group are examined in depth, it is seen that the authors (F. Abd-El-Khalick, J. Osborne, N.G. Lederman, S. Erduran, T.D. Sadler, etc.) in this group generally focus on the nature of science, scientific questioning, socio-scientific issues and argumentation. Another large and distinct cluster on the map is the cluster identified in turquoise color. Figure 4 shows that the turquoise cluster is in close relationship with the blue cluster. Similar to the blue cluster, the authors in this cluster mostly have studies in the field of science education, biology education and educational technology (M. Yesilyurt, M. Dikmenli, S. Çepni, P. Prokop etc.). Unlike the study areas in the blue cluster, it is understood that the subjects of student attitudes and misconceptions stand out in the study areas in the turquoise cluster.

Between the green and red clusters and associated with both clusters, the relatively small brown colored cluster is seen to be composed of Turkish and foreign researchers (K. Leitwood, P. Hallinger, W.K. Hoy, M. Şişman, A. Balcı, K. Yılmaz, etc.) working in the field of educational administration. Thus, it can be said that the large proportion of educational administration studies from Turkey is affected by these researchers and use both quantitative and qualitative methods. When the study areas of the authors (L. Vygotsky, J. Piaget, R.E. Slavin, D.W. Johnson, etc.) in the pink colored cluster, which is one

of the other small clusters on the map, are examined, the topics of learning, learning styles and variables affecting the classroom environment (motivation, conflict, attitudes etc.) generally come to the fore. Finally, it is seen that the orange cluster, which mostly consists of researchers (M.J. Koehler, T. Teo, B. Akkoyunlu, P. Aşkar, Y. Göktaş, etc.) working on technology integration in education, is scattered across many parts of the map. It can be concluded that this group is close to the red cluster due to their study subjects such as technology-based teaching methods and learning, and they could not form a truly independent cluster because they receive citations from different disciplines.

Co-word analysis

When repeating keywords in the publications are analyzed, it is found that 6,653 different keywords are used. When the "being used at least 20 times" was determined as the cut-off point, 129 frequently used keywords were reached. When the map consisting of this frequently used keywords is examined, it is seen that five main clusters (red, blue, pink, turquoise and green) and relatively smaller clusters are formed. First, it is seen that yellow and orange clusters consisting of a few words, such as universities, Turkey, children, language, skills, acquisition, curriculum, etc., are often used by different disciplines. Therefore, it can be said that these words are common keywords used by different fields of education.
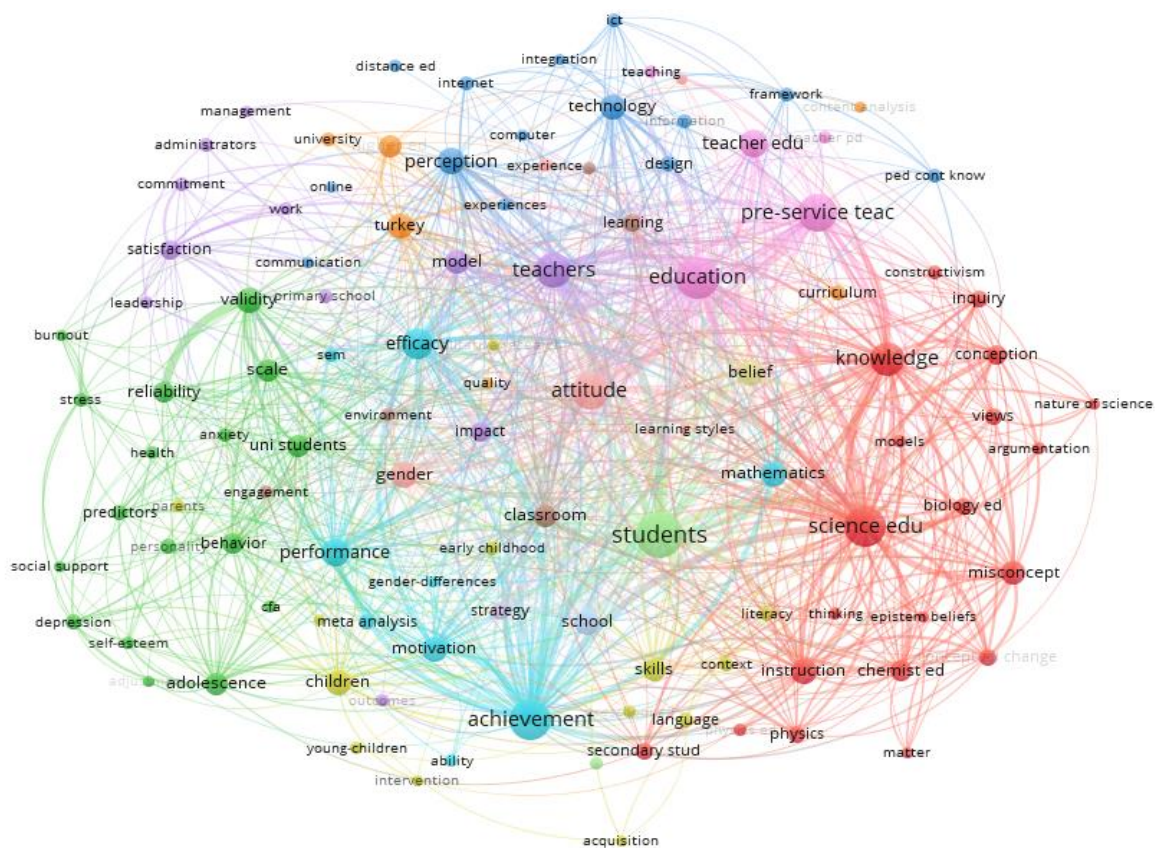

Figure 5. Analysis of Keywords

When the other clusters are examined, it is understood that the red cluster, which is a rather large cluster, focuses on science education. Concepts in this cluster such as physics, chemistry, biology education, and secondary school students show that this cluster represents science education studies mostly at secondary education level. When the frequently used concepts are examined, it is seen that these studies focus heavily on subjects such as comprehension, misconception, conceptual change, epistemological beliefs, and mental models. In this context, it can be said that this cluster generally focuses on paradigm change in science education. In the pink cluster just above this cluster, there are studies on more general subjects such as education, teacher education, and primary education teaching.

The turquoise cluster includes the words achievement, motivation, performance, efficacy, mathematics, SEM (structural equation model), and ability. It is thought that this cluster generally focuses on students' achievement, motivation and efficacy and can represent the fields of educational psychology and assessment and evaluation in general. In addition, the fact that the words efficacy, SEM, and mathematics in this cluster are far from the rest of the cluster shows that these words are also often used in different study subjects.

The green cluster includes the words personality, behavior, validity, reliability, stress, burnout, health, adolescence, depression, and social support. It can be said that this cluster mostly represents guidance and psychological counseling field. In addition, the concepts of motivation, performance and SEM in other clusters are located very close to this cluster. It is observed that these concepts are also frequently studied together.

When the purple cluster, which is relatively on the other corner of the figure is examined, it is seen that this cluster includes words such as leadership, management, commitment and administrators. This cluster is generally considered to represent the field of educational administration. In addition, two words belong to this cluster, teachers and model, are located near to the middle of the map. This situation shows that these concepts are also frequently used in other fields.

Finally, when the blue cluster is examined, it is seen that this cluster includes words such as perception, experience, computer, technology, distance education, and design. It is understood that this cluster represents the field of educational technology. The fact that the words education, teaching and teacher education in other clusters are partially close to this cluster shows that these concepts are also among the concepts that are frequently studied in the field of educational technology.

Conclusion and Discussion

In this study, research on "Education" from Turkey published in international journals have examined through descriptive and bibliometric analysis. According to the results obtained from the analyses, it is seen that relevant publications from Turkey was more stable from 1981 to 2007, and there was a rapid increase after 2007. When the most popular journals are analyzed, Turkey-based journals such as "Education and Science", "Educational Sciences: Theory and Practice", "Eurasian Journal of Educational Research" and "Hacettepe University Journal of Education" are come to the fore. These journals were also found as the most popular journals in Tür's (2019) study of the educational research published on WoS between 1968-2015. Similarly, Gümüş et al. (2019) found that Turkey-based journals are the most popular journals in the field of educational administration in their bibliometric analysis of studies from Turkey published in WoS. However, in accordance with the results of mentioned studies, it is found that there are relatively few publications in international journals with high impact factors. As emphasized in previous studies from different countries, this situation is thought to be related to problems such as language inadequacy, excessive course load and limitations in project funding experienced by researchers working outside of the Western countries (Hallinger & Hammad, 2019; Gümüş et al., 2019; Mertkan, Arsan, Inal Cavlan, & Onurkan Aliusta, 2017). Considering this finding with the removal of some Turkey-based journals from the core indexes of WoS, it can be said that there is a risk for the international visibility of future educational research from Turkey. The finding of this study confirms this risk by showing that the number of relevant publications in WoS has been in a serious decline after 2016. Providing necessary resources (time, funding, language support, etc.) to enable researchers to publish in high-impact international journals and developing an incentive mechanism to increase the numbers of high quality publications can contribute improving the current situation. In addition, the academic promotion criteria that prioritize the number of publications might direct academics to easily accessible Turkey-based journals. In this context, it can be said that there is a need for a system update that takes into account the impact factors of the journals.

When the number of articles and citations of the most productive and influential authors in the field of education is examined, it is observed that the authors working in the fields of science education and educational technology stand out in terms of productivity. In addition, the fact that the most cited

articles are in the fields of science education and educational technology coincides with the number of article citations and author productivity. Selçuk et al. (2014) examined the publications in the journal of "Education and Science" and revealed that this journal mostly publishes articles in the fields of educational administration, educational psychology and curriculum development. When this finding considered together with the findings of the current study, it can be concluded that Turkey-based journals come to the fore in the fields of educational sciences, while the fields of science education and educational technology have more places in other journals. Some of the main reasons for this situation might be the low number of WoS indexed journals that focus on educational sciences, the long review periods and publication processes due to the high demand for educational journals publishing on different subjects, and higher language proficiency requirements for educational sciences.

The prominence of science education and educational technology in terms of the number of publications and citations indicates that effective cooperation and publication activities are needed in other fields of education. When the WoS data that used in this research examined in terms of the institutions that provide funds to reviewed studies, Scientific and Technological Research Council of Turkey (TUBITAK) comes first, followed by United States' National Science Foundation (NSF). It is a well-known fact that both institutions mainly support disciplines such as science, technology, engineering and mathematics (STEM). In this context, increasing projects and funds for the fields outside the mentioned disciplines will help emergence of research collaborations and high quality publications in those fields. In addition, the relatively low number of journals with high impact factors in the fields of educational sciences, and the longer time and effort required to publish in these journals might play a deterrent role. These reasons may have led to the prominence of science and technology fields, especially in the international literature.

When institutions are considered in terms of productivity, it is seen that METU and Hacettepe University rank ahead in terms of both citations and number of publications. Similarly, in the study of Selçuk et al. (2014), the universities with the highest number of publications were determined as Hacettepe, Ankara, Gazi and METU. Considering institutional collaborations, it is seen that cooperation networks have been formed especially around a few well-established state universities, and international collaborations are quite limited. Kosmützky and Krücken (2014), in their bibliometric analysis of comparative higher education, concluded that collaborative publications with international authors receive more citations than others. In this context, it can be argued that comparative education research can be useful to support international collaborations. Especially in recent years, comparative studies in education and psychology between Turkey and other countries have come to the fore (Aytac, Pike, & Bond, 2019; Thornberg & Oğuz, 2016). Increase in this type of international collaborations can contribute Turkey-based studies to have higher impact over time.

When the co-citation analysis is examined, it is seen that academics working on statistics and research methods as well as in fields such as science education, teaching and learning, and educational technology come to the fore. In the bibliometric study of Panczyk, Woynarowska-Sołdan, Belowska, Zarzeka, and Gotlib (2015), it was revealed that the scientific publications that have the most impact on educational research are generally conducted in the field of statistics and research methods. It is seen that research methods and statistics also have an important place in educational research from Turkey. Karadağ et al. (2017) conducted citation analysis of publications in the field of educational sciences and teacher training and concluded that the most cited books were about statistics and scientific research methods. In addition, it has been observed that the studies on science education and educational technology, which come to the fore, are divided into different sub-fields. Similar to the findings of this study, Alper and Gülbahar's (2009) study on research in the field of educational technology shows that the effects of computer-based education, internet-based education and integration of technology into education are the main research topics in this field. It can be said that similar detailed review studies are needed especially in fields such as science education, teaching and learning, language education, mathematics and educational psychology. Since such studies require in-depth knowledge of the relevant fields, it is recommended to be carried out by field experts.

Keyword analysis reflects the content analysis of the studies that are examined and enables the reveal of common recurrent concepts. It is seen that the concepts that become apparent in the clusters emerging in the analysis are student, child, education, attitude, technology, achievement, performance, science education, knowledge, teacher, perception and instruction. In the study of Lin, Lin, Potvin, and Tsai (2018), which investigated the research trends in science education with systematic content analysis, it was revealed that there were more focus on subjects such as teacher education, education, learning, curriculum, and educational technology. In the same study, it was revealed that science education researchers showed great interest in subjects such as students' conceptual understanding, alternative concepts and conceptual change. These findings coincide with the findings of the current study. In their bibliometric analysis of educational research journals, Zurita, Merigo, and Lobos-Ossandón (2016) mentioned seven basic classifications: educational studies, professional development and curriculum studies of teachers, education and technology, psychology and education, scientific disciplines and education, special education, social sciences disciplines and education. These classifications are also similar to clusters representing different fields and topics expressed in the findings of the current study.

Bibliometric analysis studies on education in Turkey has increased in recent years (Danışman et al., 2016; Karadağ et al., 2017; Yalçın & Yayla, 2016), but no study has been carried out specifically on the education research from Turkey published in international journals with the help of visual maps. Therefore, this study is expected to contribute to the literature in this context. Hallinger and Kovačević (2019), in their bibliometric analysis study on educational administration, stated that the international studies on educational administration now not only come from countries such as the USA, Canada and the UK, but also from countries in Asia, Latin America and Africa. The current study shows also that the Turkey-based educational research increased and became visible in the international literature. However, while some areas stand out (science education, educational technology etc.), some areas fall behind. At this point, the measures to be taken can help in the emergence of high quality international publications in different fields of the education.

Limitations and Recommendations

This study covers educational research from Turkey published in SSCI, SCI-expanded and AHCI indexed journals in WoS (except editor notes, book chapters and conference proceedings). In this context, not including publications from other databases such as ERIC and SCOPUS in the analysis can be seen as a limitation. However, the indexes used in this study were chosen due to their high validity in Turkey and at the international level. It may be suggested that similar studies can be conducted in the future by using different databases. Also, more detailed bibliometric studies can be conducted in different fields of education, taking into account the macro data presented in this research. In addition, methods such as content analysis and thematic analysis were not used in this study, so it can be suggested that different systematic review methods can be used together in future studies (Bellibaş & Gümüş, 2018).

It is seen that in some areas, visibility of Turkey based studies in international journals seems to be lower. Limitations in language, time devoted to research, and funding in general may have had an effect on this result. In this context, it may be suggested that higher education institutions should provide support for researchers in matters such as academic writing and foreign language training, language editing and translation. It is also important that university administrations and policy makers make more effort to support international collaborations and increase the necessary incentives. The inability of research in the field of education to benefit from research funds may also be an obstacle for publishing in high impact journals. In fact, when the grant situation of the publications included in this study is examined through WoS filtering options, it is seen that only 414 of 6312 publications received funding support. This situation reveals that the rate of benefiting from research funds for studies in the field of education is very low. Moreover, the prominence of the fields of science and technology, especially in terms of publications appeared in journals with high impact factor, may be related to the fact that researchers working in these fields benefit more from research funds. While the rate of those

receiving funding among all publications is around 7% in general, it is seen that this rate rises to around 20% for articles published in some journals with high impact factors focused on science education and / or educational technology (e.g. Computers & Education, Research in Science Education, Journal of Science Education and Technology). In this context, it may be beneficial for researchers working in other fields of education to be encouraged for project applications, to be educated on this subject and to be supported during the application process. In addition, it may be suggested to allocate more resources for social sciences in general and different fields of education in particular from the research funds provided by various institutions.

Finally, the significant part of the relevant publications in WoS database published by Turkey-based journals. However, most of these journals have been removed from the core indexes of WoS in the last few years. This situation poses a serious risk in the form of a decrease in the publications from Turkey included in the core indexes in the future. In this context, it may be suggested that relevant journals that are included in or aim to be included in international indexes should pay particular attention to the dimension of "internationalization", diversify their editors and editorial boards, try to include publications from different countries, and avoid rapidly increasing the number of publications.

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