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Bibliometric Analysis of Educational Research in Turkey: 1981-2020 WoS Articles*

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ABSTRACT

The aim of this research was to develop a comprehensive understanding related to the evolution of educational research in Turkey. For this purpose, bibliometric analyses were conducted on 6,731 SSCI articles in order to determine the general trends of Turkey-addressed educational research. According to the results of the analysis conducted with the VOSviewer program, the first article in the last 40 years of educational research was published in 1981. The number of articles increased rapidly since 2007 and reached the highest number in 2012. The most frequently used keywords in articles were teacher education, science education, higher education, gender, reliability, self-efficacy, validity, attitude, and academic achievement. In addition, although Turkey-addressed educational research' core topics tended to become obvious, differences were found in the core topics' components. This research revealed that Turkish educators were interested in misconceptions until 2005, validity and reliability during 2006-2015, attitude and motivation since 2006, and academic achievement and self-efficacy during 2011-2020. Teacher education and science education remained popular for 40 years. It was found that education researchers interested in higher education for the last 15 years and focused on distance education, teacher candidates, and professional development for the last 5 years. The most productive author in educational research was Ö. Geban. The most cited author for his articles was M. Çalık. The most productive authors' specialties were science education and instructional technology education. The most cited authors in the articles' references were Ş. Büyüköztürk and A. Bandura. In addition, this study revealed that 49.1% of the articles were published in journals with the address "Turkey". The most productive universities in educational research were *Hacettepe University* and *Middle East Technical University*. The most cited articles' distinctive features were the use of instructional technologies in these researches.

Keywords: Bibliometric analysis, educational research, Turkey, Web of Science, WoS

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1. INTRODUCTION

In today's world, there are rapid developments in science and technology. The most important parameter that determines the competitiveness of societies is science and technology. Undoubtedly, one of the most important indicators of productivity in science is international scientific publications (Tonta, 2017, p. xi). In parallel with the developments in knowledge accumulation, there is a rapid acceleration in scientific articles' count since the 2000s.

As in other disciplines, increase in the number of articles within the scope of education discipline in recent years both complicates the educational researchers' studies and brings along facilitating methods. In the national and international education literature, there are many articles that analyze documents within the scope of education discipline, education' sub-disciplines and education' activity fields by using content analysis, bibliography, scientometric and bibliometric methods (e.g.: Akşan & Baki, 2017; Chang, Chang & Tseng, 2010; Çalık, Ünal, Coştu & Karataş, 2008; Göktaş et al., 2012a; Tsai & Wen, 2005).

1.1. Researches Focusing on Education Discipline

Educational researchers conducted content analysis of 2,115 articles published during 2005-2009 in educational journals with the address "Turkey" (Göktaş et al., 2012b). These journals were in Social Science Citation Index (SSCI) and TR Index. Thus, the trends of educational research revealed in terms of research types, methods, topic fields, data collection tools, sample and data analysis methods. It was stated that descriptive studies were frequently preferred in educational research and most of the articles were published in educational technologies, science education, guidance and psychological counseling

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and mathematics education. In another study, 7,681 articles related to teacher education and educational sciences were examined using the bibliometric analysis methods (Koza-Çiftçi et al., 2016). The findings showed that teachers, students, education, primary education and teaching were frequently used in the articles' titles. Additionally, Huang et al., (2020) analyzed 19,084 articles published in nine fields directly related to education discipline using bibliometric methods. In another study conducted simultaneously with this current study, the general appearance of educational research originating from Turkey were revealed using bibliometric analysis methods (Gülmez, Özteke & Gümüş, 2021). The researchers reported number of articles by year, the most popular journals, the citations of journals, authors, documents and institutions, co-citations of institutions and authors and the most preferred keywords. In another study of the author, more than 90,000 educational research articles were analyzed using bibliometric analysis methods (Tosun, 2022).

1.2. Researches Focusing on Education' Sub-Disciplines

Sözbilir and Kutu (2008) revealed the trends of research topics and methodologies of science education articles published in educational journals with the address "Turkey". In this context, 413 science education research articles were analyzed. The content analysis of each article was performed with "the article classification form" developed by the researchers. It was reported that science education was a new research field for Turkey since the 1990s, and the most articles published in 2005. In another study of the same researchers, 1,249 science education articles published in 67 different journals were examined (Sozbilir, Kutu & Yasar, 2012). 444 graduate theses were analyzed within the scope of document review to reveal the evolution of science education in Turkey (Çalık, Ünal, Coştu & Karataş, 2008). In another document review study, 173 science education articles published in e-journals were examined in terms of their methods (Bacanak, Değirmenci, Karamustafaoğlu & Karamustafaoğlu, 2011).

There are studies by foreign authors to reveal the evolution in the development of science education. The researchers conducted the content analysis for 802 articles published in top science education journals (Tsai & Wen, 2005). The articles reviewed according to authors' nationalities, types of research and topics. In the study, it was reported that science educators from the USA, Canada, UK and Australia had contributed to most articles and the topics of concepts and conceptual change were interested in during 1998-2002. Following this research, the researchers performed a content analysis of 869 articles published during 2003-2007 (Lee, Wu & Tsai, 2009). In another study, automatic content analysis of science education articles published in top journals was performed using scientometric methods (Chang, Chang & Tseng, 2010). It was stated that the interest in conceptual change and concept maps decreased slightly in the 2000s. Additionally, it was reported that professional development, analogies, nature of science and socio-scientific issues attracted science educators' attention in the following years.

In a study within the scope of educational sciences, researchers analyzed 181 articles using thematic, methodological and statistical analysis techniques (Doğan & Tok, 2018). The articles were examined in terms of their topics and methodologies. It was reported that the most productive institution was *Hacettepe University*, that the most quantitative research methods were used in the research and that the research was usually conducted with students. In another study, the researcher thematically examined 211 doctoral dissertations (Karadağ, 2009). The findings showed that theme in most doctoral dissertations was achievement and attitude.

In a study within the scope of computer and instructional technologies education, researchers conducted a content analysis of the articles published in "Turkish Online Journal of Educational Technology-TOJET" during 2003-2007 (Alper & Gülbahar, 2009). In another study, 259 master theses related to instructional technologies were examined in terms of format, content and method variables (Şimşek et al., 2009). It was reported that the survey method was used in 80% of the theses and surveys, tests and scales were used as data collection tools. Additionally, Göktaş et al., (2012a) examined 460 SSCI articles via content analysis. The articles mostly focused on educational environments and technology. It was reported that survey was mostly used as data collection tool, convenience sampling was mostly used as sampling technique, and descriptive analysis technique were mostly used as data analysis technique.

In addition to three sub-disciplines of education (science education, educational sciences and computer and instructional technologies education), there was research that revealed the evolution of development in education' other sub-disciplines. İncekara (2009) examined the current situation and trends of studies related to geography education. In another study, researchers examined 359 mathematics education articles published in 32 different journals via content analysis (Çiltaş, Güler & Sözbilir, 2012). Additionally, the content analysis of 861 articles related to distance education was performed (Bozkurt et al., 2015). These articles published in seven journals during 2009-2013. The results were reported according to the research fields, theoretical and conceptual framework, most used keywords, variables, research methodologies and most cited authors.

1.3. Researches Focusing on Education' Activity Fields

Researchers examined 40 studies related to inquiry based teaching via content analysis (Kızılaslan, Sözbilir & Yaşar, 2012). The findings showed that inquiry-based teaching is a new research field for Turkish educators. It was reported that it is mostly practiced in middle school science courses. Ültay and Çalık (2012) conducted a thematic review of the studies related to context based learning in chemistry education. In another study, researchers analyzed 40 theses related to problem based

learning (PBL) in science education using content analysis method (Tosun & Yaşar, 2015). Additionally, the same authors carried out a content analysis of 104 PBL articles in science education field (Tosun & Yaşar, 2013). PBL' effect investigated in these studies. In another study, articles related to the use of augmented reality in science education examined via content and bibliometric analysis (Arici, Yildirim, Caliklar & Yilmaz, 2019). Bibliometric analysis of 147 articles was performed in this study. In another bibliometric analysis study, 596 studies related to foreign language teaching in early childhood analyzed with the VOSviewer program (Yilmaz, Topu & Takkaç-Tulgar, 2019). Additionally, researchers analyzed 1,035 articles focused on gifted students using the CiteSpace 4.0 program (Gürlen, Özdiyar & Şen, 2019). These articles were published in Web of Science (WoS) database during 1956-2016. The researchers evaluated that the results of their study may be useful for new researchers in this field. In another study, 154 curriculum studies examined via content analysis (Akşan & Baki, 2017). The researchers evaluated the studies in terms of year of publication, methodologies, research purposes and results. It was reported that the most basic problems in a good curriculum are overcrowded classrooms, insufficient course time, lack of quality materials, and in-service trainings. In addition, within the scope of education' activity fields, studies related to metacognition (Baş & Özturan-Sağırlı, 2017) and cooperative learning (Dirlikli, Aydın & Akgün, 2016) examined via content analyses.

1.4. The Importance of the Study

In the national and international educational research literature, there were a limited number of studies examining and evaluating all documents published within the scope of the education discipline (e.g.: Göktaş et al., 2012b; Gülmez, Özteke & Gümüş, 2021; Huang et al., 2020; Koza-Çiftçi et al., 2016, Tosun, 2022). Content analysis and bibliometric analysis methods were used to evaluate these studies. Due to the limited time problem, which is the most important obstacle in the implementation of content analysis method, the analyses were limited to certain year intervals. Thus, overall picture in educational research could not be fully illustrated with a limited number of studies. Researchers stated that this situation causes the results of educational studies to be scattered (Göktaş et al., 2012b). Turkish educators analyzed articles related to teacher education and educational sciences using bibliometric analysis methods (Koza-Çiftçi et al., 2016). These articles published during 2005-2014. Additionally, articles published on nine topics directly related to education were analyzed in another bibliometric analysis study (Huang et al., 2020). These articles published during 2000-2017. In another bibliometric analysis study conducted simultaneously with this current study, the researchers examined Turkey-addressed educational studies that indexed in SSCI, Science Citation Index Expanded (SCI-Expanded) and Art and Humanities Citation Index (AHCI) (Gülmez, Özteke & Gümüş, 2021). This current study was restricted to SSCI journals. In addition, educational articles published in 2020 were also included in this current bibliometric analysis. On the other hand, these two studies' some research questions were different from each other. Additionally, this study investigated distribution of the most popular keywords over the years, development of educational research over the years, core topics that become visible over the years and the most cited articles' distinctive features.

In educational research literature, there were many studies examining research within the scope of education' sub-disciplines via content and thematic analyses (e.g.: Bozkurt et al., 2015; Çiltaş, Güler & Sözbilir, 2012; Göktaş et al., 2012a; İncekara, 2009; Karadağ, 2009; Sözbilir & Kutu, 2008; Tsai & Wen, 2005). Although evaluations were made according to different criteria in these studies, they were usually focused on methodologies and research topics of the studies. Additionally, there were many studies examining research within the scope of education' activity fields via content and thematic analyses (e.g.: Akşan & Baki, 2017; Baş & Özturan-Sağırlı, 2017; Dirlikli, Aydın & Akgün, 2016; Kızılaslan, Sözbilir & Yaşar, 2012; Tosun & Yaşar, 2013; 2015; Ültay & Çalık, 2012). In few studies within scope of education' activity fields, the bibliometric analysis method was used alone or in combination with the content analysis method (e.g.: Arici, Yildirim, Caliklar & Yilmaz, 2019; Gürlen, Özdiyar & Şen, 2019; Tosun, Senocak & Taskesenligil, 2021; Yilmaz, Topu & Takkaç-Tulgar, 2019). The evolution of educational research was revealed a narrow framework in these studies.

Predicting the topics that will be interested in future educational researches depends on knowing the development of educational research in past years. The number of articles published in educational research is increasing every day in our country and in the world. The interdisciplinary and multidisciplinary nature of educational research makes it difficult for researchers and policymakers to develop a comprehensive understanding related to evolution of educational research. Researches are required in which educational studies published in certain year intervals are compiled and collected, analyzed using current methods and their results are shared with the reader. It is important to compare the evolutions of educational research in Turkey and in the world. For this, it is necessary to reveal the evolution of Turkey-addressed education researches over the years. The invaluable contributions of aforementioned studies are not ignored. This study differs from other studies in terms of the size of articles count and width of the time interval. In present study, 6,731 Turkey-addressed educational articles were analyzed via bibliometric analysis methods. These articles published in the WoS database during 1981-2020. It is hoped that the results of the research will make different contributions to educational research literature. In addition, this study' conclusions will contribute to educational policy makers to determine sustainable education policies and to editors of education-related journals to produce new policies.

1.5. The Purpose of the Study

The purpose of this study was to develop a comprehensive understanding related to evolution of educational research in Turkey. For this aim, bibliometric analyses were conducted on 6,731 SSCI articles in order to determine the general trends of Turkey-addressed educational researches. These articles were in category of "Education & Educational Research-E&ER" of WoS. The most readable and highly visible parts of scientific article are title, abstract and keywords. The quantitative number of articles and limited time of the researchers make it difficult to read all articles in the relevant field. Therefore, researchers have to quickly select among articles to read. The main selection criteria for researchers in the database are article titles, keywords and words in abstract. These components of article are showcase of scientific article reports. The abstract is a "fragment" of scientific article. Effective keywords are article-specific terms. Additionally, it is important to know the most productive education researchers. Thus, new researchers can be referred to popular research fields. In this context, the following research questions were investigated in this article.

- Which is the distribution of articles' counts published within the scope of educational discipline over the years?
- Which is the distribution of the most popular keywords in articles published within the scope of education discipline over the years?
- Which are the most preferred words in articles' abstracts published within the scope of the education discipline?
- Who are the most productive authors in articles published within the scope of education discipline?
- Which are the most preferred journals for publishing articles within the scope of educational research?
- Which are the most cited journals in articles' references published within the scope of education discipline?
- Which are the most productive universities in articles published within the scope of education discipline?
- What are the most cited articles' distinctive features from articles published within the scope of education discipline?

2. METHODOLOGY

According to Falkingham and Reeves (1998), content analysis is one of the methods used to evaluate increasing publication stacks. Other methods include bibliography, scientometric method and bibliometric analysis methods. Bibliographic researches provide the reader with information about studies in the related field. The scientometric method is a sub-field of the bibliometric method. The bibliometric analysis method is very useful (Pesta, Fuerst & Kirkegaard, 2018) and is often used to quantitatively analyze scientific publications (Chen et al., 2016). Bibliometric methods reveal researches' current status and predict its future trends (Vogel & Masal, 2015). Document analysis was carried out in this present research and 6,731 articles were examined via bibliometric analysis methods.

2.1. Article Selection Process

There were over 71 million documents in WoS database (Access date: November, 2021; without any time and publication language limitation). About 43 millions of these were in article type. There were 256 categories in WoS. Four of these categories were related to education discipline. These were "E&ER", "Education Special", "Psychology Educational" and "Educational Scientific Disciplines". Among these categories, the most documents within the scope of education discipline were published in the journals in the "E&ER" category. The number of SSCI articles published in journals in the E&ER category was over 235,000 (Access date: November, 2021).

In this study, WoS database was used for document review. Turkey-addressed articles in WoS were accessed using the "basic search" option. 539,879 articles identified after the first general screening. Since 2021 was not completed, it was not included in this study. Since articles within the scope of education discipline were examined, research was restricted to the E&ER category. Thus, 10,479 articles were identified. Afterwards, research was restricted to SSCI articles in WoS. As a result, 6,731 articles were identified within the scope of the research (Access date: October, 2021). The article selection process is presented in Figure 1.

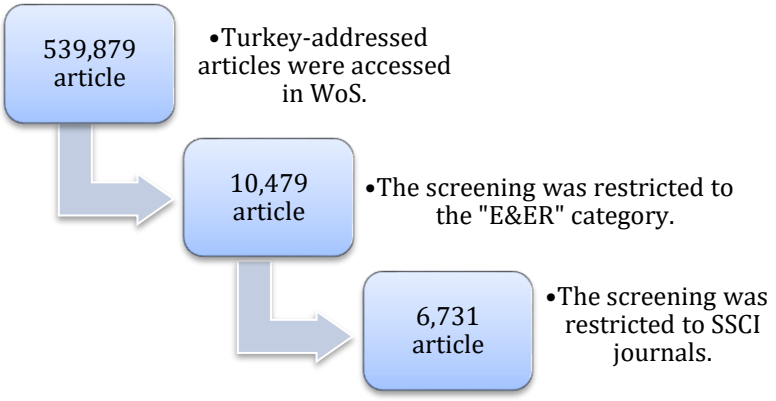

Figure 1. Article selection process

2.2. Data Editing

The articles for bibliometric analysis were saved in the "Plain Text" format via "market list" option in WoS. While files were saved for detailed searches, publication years of articles were also taken into account. 5-year time intervals were created for analyzes according to years. For this purpose, diagnostic information for 107 articles published until 2005 was recorded in 1 file; diagnostic information for 1,256 articles published during 2006-2010 was recorded in 3 files; diagnostic information for 3,178 articles published during 2011-2015 was recorded in 7 files and diagnostic information for 2,190 articles published during 2016-2020 was recorded in 5 file. In addition, a separate file created for 147 most cited articles. Afterwards, these files were uploaded to VOSviewer for bibliometric analyses. The diagnostic information about bibliometric analysis articles was limited to the information provided by WoS.

2.3. Data Analysis

The articles analyzed via the VOSviewer program. International scientific publications are among important indicators of scientific productivity. Additionally, these publications' indexes are among quality indicators of studies. Because of SSCI is one of WoS indexes, this was primary reason for using WoS database in this study. Another reason for choosing WoS database was that WoS, SCOPUS and PubMed data files can be analyzed via VOSviewer program. In this study, the distribution of articles' counts over the years, the most popular keywords, the most preferred words in articles' abstracts, the most productive authors, the most preferred journals for publishing articles, the most cited journals in articles' references, the most productive universities and the most cited articles' distinctive features were revealed via bibliometric analysis. Although there is information about articles titles in WoS, title analysis for WoS database cannot be performed using the VOSviewer program. This situation was considered as limitation of research. The bibliometric analysis process is summarized in Figure 2.

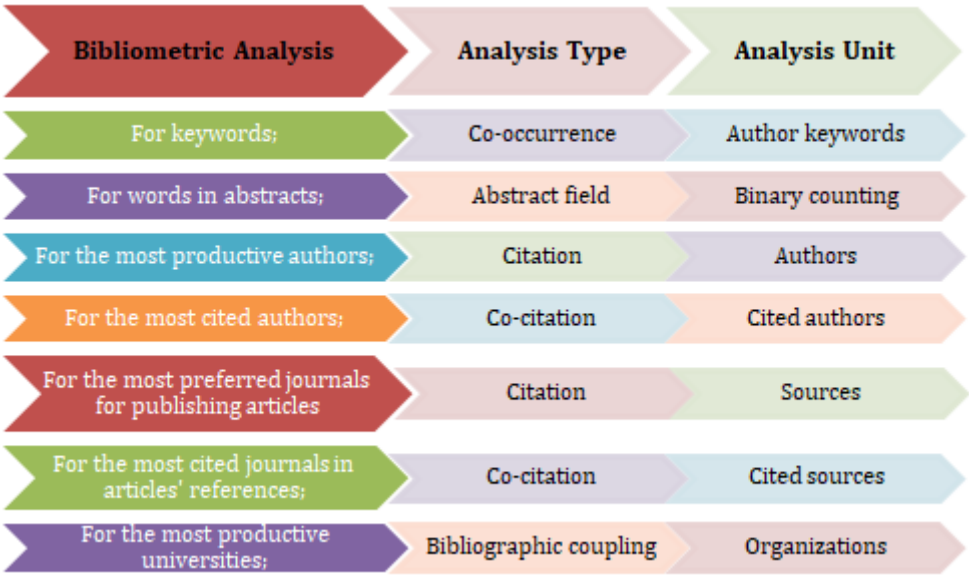

Figure 2. Bibliometric analysis process

In order to determine the most popular keywords, "co-occurrence" selected as analysis type and "author keywords" selected as analysis unit. By selecting "abstract field" as analysis type and "binary counting" as analysis unit, the most preferred words in articles' abstracts were determined. The remaining analyzes were carried out according to the steps in Figure 2.

3. FINDINGS

The first research question was "Which is the distribution of articles' counts published within the scope of educational discipline over the years?". The distribution of 6,731 Turkey-addressed educational research articles published in SSCI journals over the years is given in Figure 3.

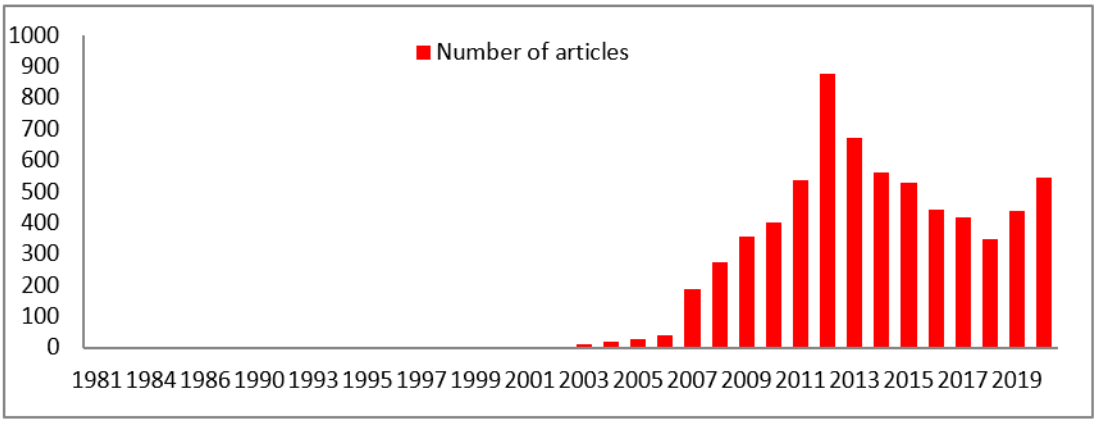

Figure 3. Number of articles published over the years

Figure 3 showed that Turkey-addressed first article was published in 1981 (in the last 40 years of educational research). This article titled "Computer assisted teaching of FORTRAN" was published in *Computers & Education* journal by T. Balman from Boğaziçi University (Balman, 1981). The total number of articles published until 2005 was only 107. The number of articles was 1,256 articles during 2006-2010, 3,178 articles during 2011-2015 and 2,190 articles during 2016-2020. The number of articles increased rapidly since 2007 and reached the highest number in 2012. The number of articles decreased since 2013 and it started to increase again in 2019.

3.1. The Most Popular Keywords

In order to determine the frequently used keywords in articles, minimum number of occurrences of a keyword was chosen as 40. Thus, 43 keywords were determined. The top 10 keywords were teacher education (*f*=192), Turkey (*f*=171), science education (*f*=151), higher education (*f*=149), gender (*f*=123), self-efficacy (*f*=117), reliability (*f*=112), attitude (*f*=109), validity (*f*=106) and academic achievement (*f*=106). The map created after analysis is presented in Figure 4. While the concepts of misconception, cooperative learning, attitude, validity, reliability, gender, teacher education, motivation, pre-service teachers and primary school were frequently used in the first years, self-efficacy, academic achievement, nature of science, content analysis, distance education, early childhood education, professional development, technology integration, structural equation modeling, scale development and higher education were frequently used in articles towards the last years.

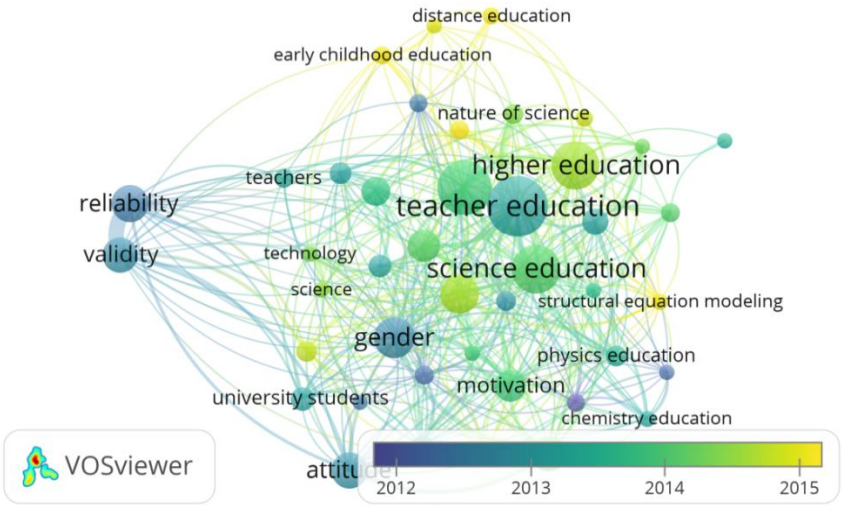

Figure 4. Most used keywords in articles

After the keyword analysis, 6 clusters formed. The density visualization graph is presented in Figure 5. The components of first cluster were academic achievement, attitude, environmental education, gender, high school students, motivation, pre-service teachers, scale development and university students. In this cluster, especially academic achievement, attitude, gender, self-efficacy and motivation had potential to be core topics. The second cluster' components were education, primary school, professional development, teacher candidates, science, social studies, teacher, teacher education, technology and Turkey. The undisputed core topic of this cluster was teacher education. Content analysis, distance education, early childhood education, mathematics education, nature of science, preschool education and teacher education were included in third cluster. All components in this cluster had potential to be core topics. Analysis results showed that the components of fourth cluster were critical thinking, higher education, interactive learning environments, physics education, problem solving, structural equation modeling and technology integration. This cluster' core topic was higher education. The components of fifth cluster were chemistry education, cooperative learning, misconceptions and science education. The core topic of this cluster was science education. Finally, the components of sixth cluster were reliability and validity and these were core topics of cluster.

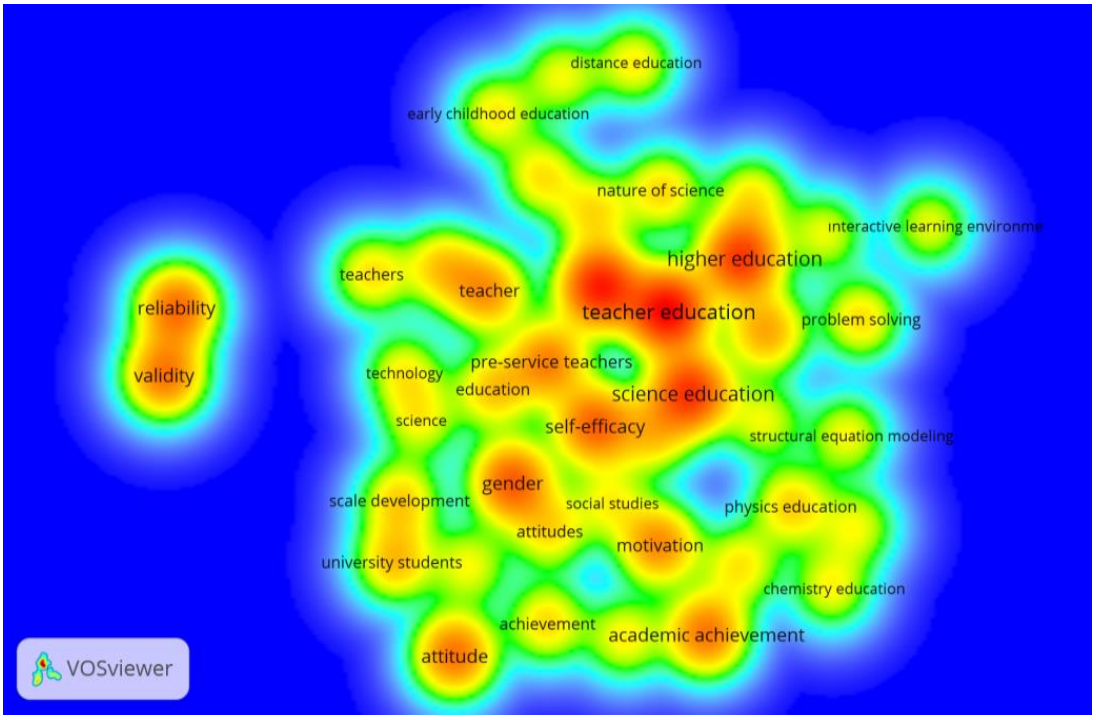

Figure 5. The density visualization graph of clusters

Additionally, the most used keywords in certain year intervals were determined and is presented in Figure 6. It was found that while misconceptions were studied until 2005, the effect of this topic decreased in the following years. The analysis results showed that teacher education and science education remained popular for 40 years. In addition, it was found that Turkish educators were interested in validity and reliability during 2006-2015, attitude and motivation since 2006, academic achievement and self-efficacy during 2011-2020. Additionally, interest in gender decreased since 2016. Figure 6 showed that education researchers interested in higher education for the last 15 years and focused on distance education, teacher candidates and professional development for the last 5 years.

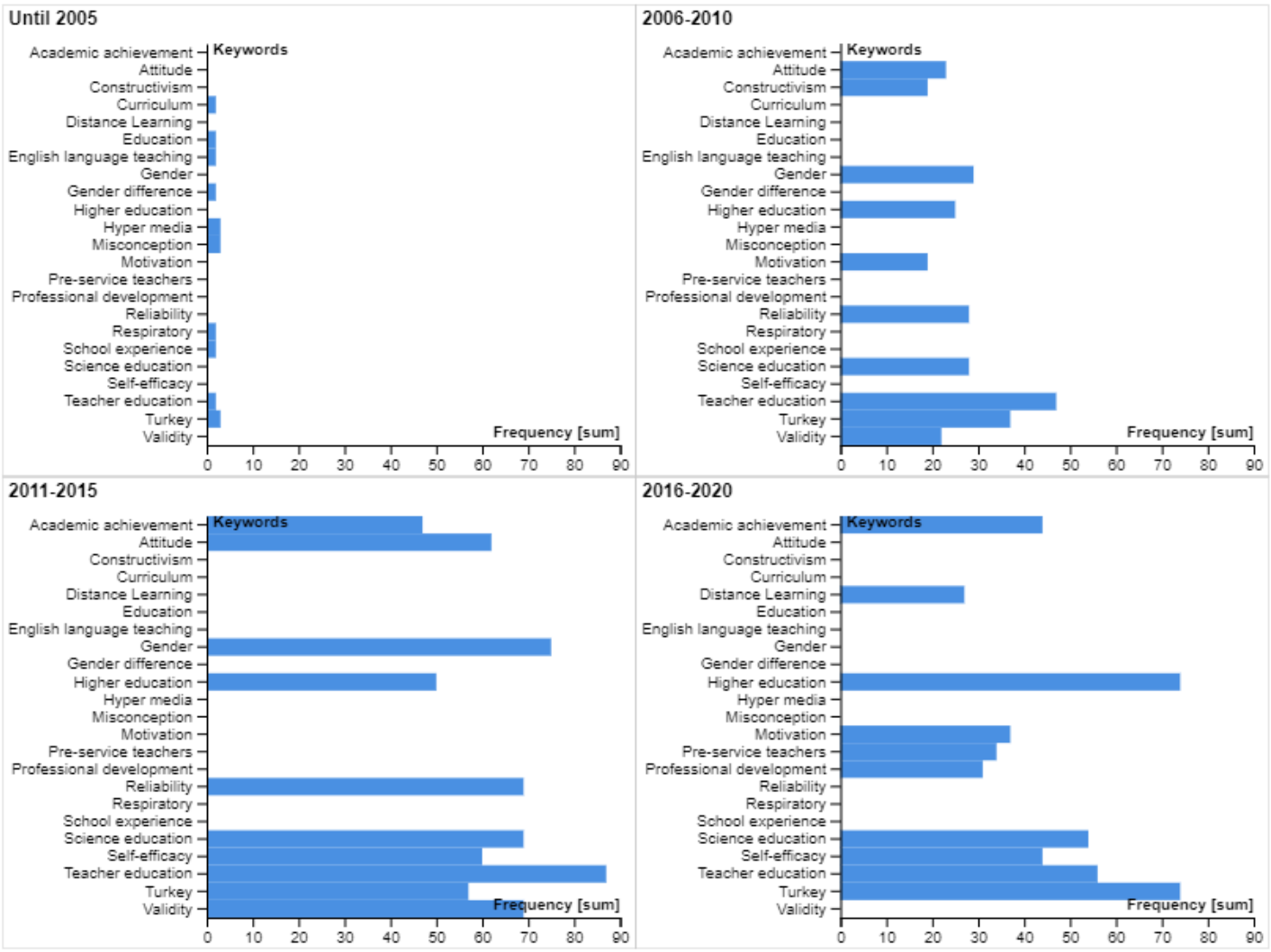

Figure 6. The distribution of most used keywords over the years

3.2. The Most Preferred Words in Articles' Abstracts

Minimum number of occurrences of a word in articles' abstracts was chosen as 500. Thus, 41 words were determined. After the word analysis, 3 clusters formed. The most preferred 10 words in articles' abstracts were study (*f*=5,852), student (*f*=3,669), data (*f*=3,064), analysis (*f*=2,681), teacher (*f*=2,613), research (*f*=2,155), education (*f*=2,085), level (*f*=2,037), group (*f*=1,795) and school (*f*=1,714). The map created after analysis is presented in Figure 7.

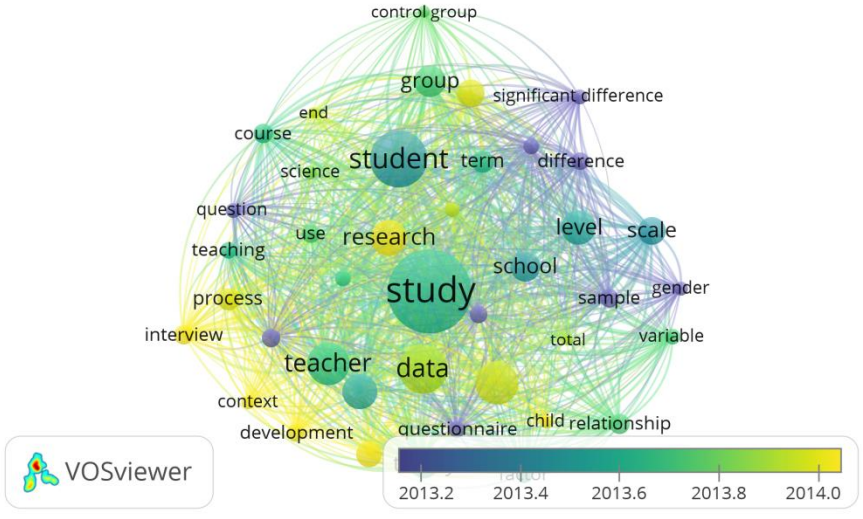

Figure 7. The most preferred words in articles' abstracts

While the gender, sample, attitude, significant difference, question, problem, study, student, level, group, education and teacher were frequently used in the first years, data, analysis, child, research, interview, context, participant and process were frequently used in articles' abstract towards the last years.

3.3. The Most Productive Authors

The most productive authors are presented in Table 1. The most productive author in educational research was Ö. Geban (36 articles). The most cited author for his articles was M. Çalık (699 cited). Many of the most productive authors were science education and computer and instruction technologies education specialists.

Table 1.
The Most Productive Authors

Authors	Number of Articles	Number of cited	Field of expertise
O. Geban	36	547	Science education / chemistry education
M. Usak	32	314	Unspecified
A. Eryilmaz	30	492	Science education / physics education
Y. Goktaş	30	469	Computer education and instructional technologies
M. Calik	29	699	Science education / chemistry education
M. Erdogan	28	312	Unspecified
S. Sungur	27	544	Science education
K. Çagiltay	26	568	Computer education and instructional technologies
S. Yildirim	26	412	Computer education and instructional technologies
J. Cakıroglu	24	327	Science education
E. Karadag	24	181	Educational sciences

In this study, the most cited authors/institutions in articles' references were determined. For this, the minimum number of citations for the authors/institutions was chosen as 300. Thus, 16 authors/institutions were determined. These authors/institutions were Ş. Büyüköztürk (*f*=959), A. Bandura (*f*=878), J.W. Creswell (*f*=547), M.B. Miles (*f*=536), N. Karasar (*f*=451), OECD (*f*=449), B.G. Tabachnick (*f*=436), M.Q. Patton (*f*=423), A. Yıldırım (*f*=393), J.R. Fraenkel (*f*=371), J. Cohen (*f*=358), P.R. Pintrich (*f*=342), Ministry of National Education-MoNE (*f*=337), H. Simsek (*f*=333), R.E. Mayer (*f*=303) and M. Calik (*f*=303). The most important distinctive feature of studies (sources) by the above-mentioned authors was that they contain information about research methods, and structural equation modeling in education.

3.4. The Most Preferred Journals for Publishing Articles and the Most Cited Journals in Articles' References

The other a research question was "Which are the most preferred journals for publishing articles within the scope of educational research?". For this, the minimum article' count published in journals was chosen as 50. Thus, it was determined that 26 education research journals met this threshold. The map is presented in Figure 8. The most preferred journals for publishing articles were *Education and Science* (4,580 cited, 1,115 article), *Educational Sciences-Theory & Practice* (5,007 cited, 1,022 article), *H.U. Journal of Education* (2,673 cited, 666 article), *Eurasian Journal of Educational Research-EJER* (1,488 cited, 322 article), *Energy Education Science and Technology-Part B* (1.383 cited, 248 article), *Journal of Baltic Science Education-JBSE* (823 cited, 216 article), *EURASIA Journal of Mathematics, Science and Technology Education-EJMSTE* (1,298 cited, 215 article), *Turkish Online Journal of Educational Technology-TOJET* (1,825 cited, 183 article), *Computers & Education* (5,849 cited, 131 article) and *Early Child Development and Care* (230 cited, 99 article). When the analyses were deepened, it was found that 49.1% of the articles were published in Turkey-addressed educational journals (*Education and Science, Educational Sciences-Theory & Practice, H.U. Journal of Education, EJER, TOJET*).

In addition, this study determined the most cited journals in articles' references published within the scope of education discipline. For this, the minimum number of citations of the journal was chosen as 2000. Thus, it was determined that eight education research journals met this threshold. It was found that the most cited given to theses (*f*=7,125). Additionally, the most cited journals in articles' references were *Journal of Research in Science Teaching-JRST* (*f*=4,746), *International Journal of Science Education-IJSE* (*f*=4,204), *Computers & Education* (*f*=3,488), *Science Education-SE* (*f*=2,989), *Energy Education Science and Technology-Part B* (*f*=2,735), *Teaching and Teacher Education* (*f*=2,156) and *Journal of Educational Psychology* (*f*=2,101).

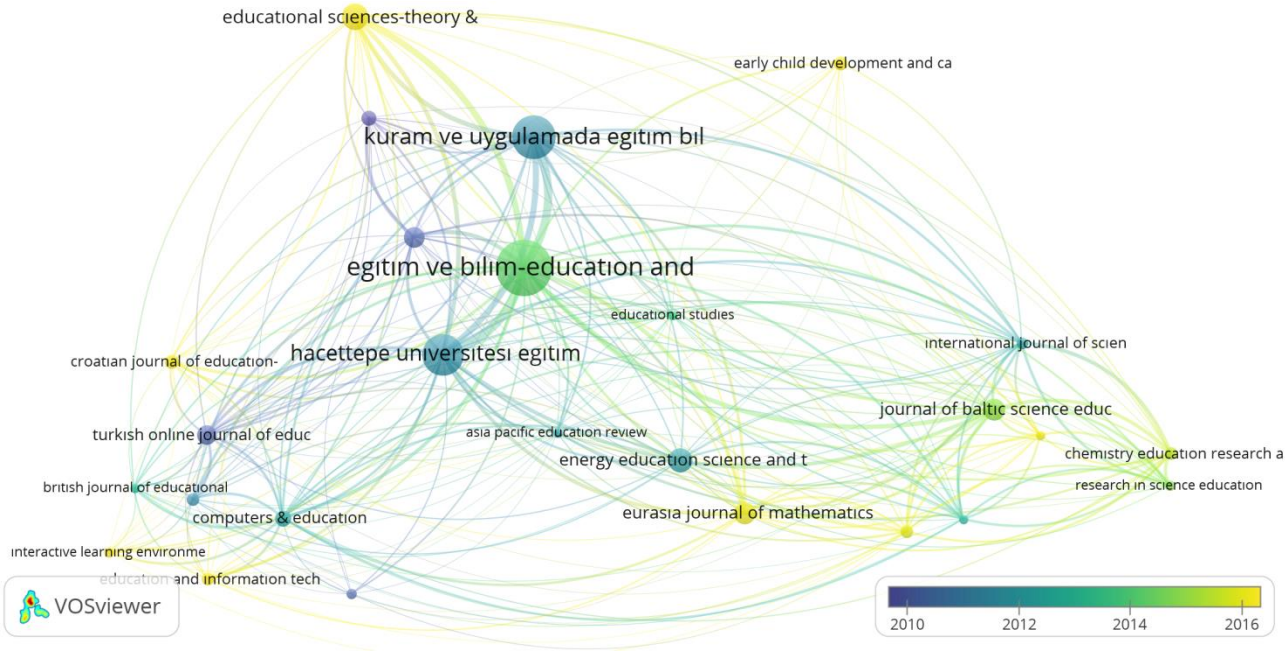

Figure 8. The most preferred journals for publishing articles

3.5. The Most Productive Universities/Institutions

The most productive institutions' articles counts are presented in Table 2. The most productive universities in terms of number of articles and citations were *Hacettepe University* and *Middle East Technical University.* 52.1% of articles belonged to teaching staff working in the first 11 institutions (10 of them are universities, 1 is MoNE) that published the most articles. Additionally, 3.2% of articles included teachers working in MoNE.

Table 2.
The Most Productive Institutions

Universities / Institutions	Number of articles	Percent (%)	Number of cited
Hacettepe University	739	11.0	5,092
Middle East Technical University	568	8.4	9,917
Gazi University	445	6.6	2,613
Ankara University	294	4.4	1,704
Anadolu University	251	3.7	2,633
Marmara University	230	3.4	1,565
Karadeniz Technical University	214	3.2	2,371
Ministry of National Education (MoNE)	214	3.2	953
Dokuz Eylül University	198	2.9	1,476
Sakarya University	181	2.7	1,302
Atatürk University	175	2.6	2,090
Total	3,509	52.1	31.716

3.6. The Most Cited Articles' Distinctive Features

In this study, the most cited articles' distinctive features from 6,731 articles published within the scope of education discipline determined. For this, the minimum number of citations was chosen as 50. Thus, it was determined that 147 education research articles met this threshold. The most cited articles' diagnostic information is presented in Table 3. The most cited articles' distinctive features were the use of instructional technologies in these researches. These articles were often published in technology-focused educational journals. Additionally, the frequently used keywords in these articles were interactive learning environments (*f*=9), computer-mediated communication (f=7), Turkey (f=7), media in education (f=6), teacher education (f=6), pedagogical issues (f=5), learning/teaching strategies (f=5) and human computer interface (f=5).

Table 3.
The Most Cited Articles' Distinctive Features

Yazarlar	Number of Cited	Dergi
Ertmer, Ottenbreit-Leftwich, Sadık, Sendurur & Sendurur, 2012	536	Computers & Education
Mazman & Usluel, 2010	336	Computers & Education
Ozkan & Koseler, 2009	276	Computers & Education
Tuzun, Yilmaz-Soylu, Karakus, Inal & Kizilkaya, 2009	259	Computers & Education
Akyol & Garrison, 2011	190	British Journal of Educational Technology
Phipps & Borg, 2009	177	System
Yukselturk & Bulut, 2007	163	Educational Technology & Society
Baran, 2014	158	Educational Technology & Society
Irzik & Nola, 2011	157	Science & Education
Sendag & Odabasi, 2009	153	Computers & Education

4. CONCLUSION and DISCUSSION

This study presented results of bibliometric analysis of Turkey-addressed educational research articles. The analyzed SSCI articles were in the E&ER category of WoS. Thus, the overall picture was revealed about evolution of educational research in Turkey. The bibliometric analysis results showed that Turkey-addressed first educational article was published in 1981. The topic of this article was computer-assisted teaching. For the next 25 years, the total number of articles published in E&ER category of WoS was only 107. Turkish educator's article counts increased rapidly since 2007 and it reached the highest number in 2012. Although the articles counts decreased during 2013-2018, it started to increase again in 2019. Turkey-addressed International Scientific Publications Incentive Program of TÜBİTAK was established in 1993 to encourage researchers and to increase the impact, visibility and quality of Turkey-addressed international scientific publications (Tonta, 2017). While the effect of this incentive program in other disciplines was observed in the early 2000s, its effect in the education discipline may be a decade overdue. Additionally, it is considered that the restructuring of education faculties in 1997 contributed to the increase in the number of articles. The performances and collaborative tendencies of education researchers learning abroad with scholarships of MoNE and Council of Higher Education may have positively affected the increase in articles counts. The decrease in articles counts during 2013-2018 can be explained with removing of Turkey-addressed SSCI journals from this index. *Educational Sciences-Theory & Practice, H.U. Journal of Education* and *EJER* were removed from SSCI in 2018, 2015 and 2013, respectively. Considering the annual publication numbers of these journals preferred by Turkish educators, the reason for decrease in articles counts during 2013-2018 becomes obvious.

The analysis results showed that Turkish education researchers' top topics were teacher education, science education, higher education, gender, reliability, self-efficacy, validity, attitude and academic achievement. Turkish educators were interested in topics such as misconception, cooperative learning, attitude, validity, reliability, gender, teacher education, motivation, pre-service teachers and primary school in the first years of educational research. In recent years, these topics were replaced with self-efficacy, academic achievement, nature of science, content analysis, distance education, early childhood education, professional development, technology integration, structural equation modeling, scale development and higher education. It was found that while misconceptions were studied until 2005, the effect of this topic decreased in the following years. In a study examining science education research trends, it was reported that interest in concept learning and conceptual change during 1998-2002 shifted towards students' context learning (Lee, Wu & Tsai, 2009), social, cultural and gender topics (Tsai & Wen, 2005) during 2003-2007. Additionally, Chang, Chang & Tseng, (2010) stated that interest in conceptual change and concept maps decreased in the 2000s. Another conclusion of this study was that teacher education and science education remained popular for 40 years. This result can be interpreted as teacher education and science education have potential to form clusters. Another finding of this research was that Turkish educators were interested in attitude and motivation since 2006 and academic achievement and self-efficacy during 2011-2020. Additionally, interest in gender decreased since 2016. Another conclusion of the study was that academic achievement, attitude, gender, self-efficacy and motivation had potential to be core topics. In another study, the author examined educational research trends over last half century and he reported that core topics of educational research until 2000s were assessment, constructivism, gender and curriculum (Tosun, 2022). Additionally, it was stated that motivation has potential to be core topic of educational research after the 2000s. Turkish educators were interested in validity and reliability during 2006-2015. The results showed that education researchers' interest in developing and adapting data collection tools increased during this period. According to results of this study, validity and reliability also had potential to form a cluster. In addition, it was observed that education researchers interested in higher education for the last 15 years and focused on distance education, teacher candidates and professional development for the last 5 years. According to the results of Hung et al., (2020)'s study, one of the core topics of educational research during 2000-2017 was higher education. All these results showed that, although Turkey-addressed education research' core topics tended to become obvious; there were differences in their components. Additionally, it can be said that there are similarities and differences between the core topics of educational research in Turkey and all over the world.

The most preferred words in articles' abstracts were study, student, data, analysis, teacher, research, education, level, group and school. This is actually an expected result. Because, the word "study" when emphasizing the aim of the study; the words

"data" and "analysis" when describing the data collection tools; and the words "level" and "group" when describing the sample of the studies are frequently used terms in article abstracts. Another result of this study was that students and teachers were the focus of education research. Koza-Çiftçi et al., (2016) examined articles titles related to teacher education and educational science, and it was stated that the words "teacher" and "student" were frequently used in the titles. Additionally, this study found that the word "student" is used more than the word "teacher" in the abstracts of the articles. This can be interpreted that Turkish educators mostly prefer students in their researches.

The most productive author in educational research was Ö. Geban. The most cited author for his articles was M. Çalık. Many of the most productive authors were science education and computer and instruction technologies education specialists. This result is consistent with the results of the study conducted by Gülmez, Özteke and Gümüş (2021) simultaneously with this current study. Science education' historical development differs all over the world. Although the first researches in science education started in the first years of the twentieth century, it was accepted as an academic discipline before the 1960s in the USA and after the 1960s in other world countries. Sozbilir and Kutu (2008) reported in their study that science education was a new research field for Turkey since the 1990s. In Fensham's (2004) book, it was defined the criteria for accepting science education as a research field. These criteria included academic recognition, research journals, professional associations, research conferences, and research centers. The providing of these criteria for other sub-disciplines of education in Turkey may be overdue compared to the science education sub-discipline. This rationale may explain the productivity of science education researchers. In another study, researcher examined educational articles via bibliometric analysis methods and, he reported that one of the core topics of educational research after 2000s were interactive learning environments (Tosun, 2022). It is considered that education articles about instructional technologies have potential to create clusters and reveal new ideas -opening new horizons. Additionally, these articles may be published in high impact value journals. The analysis results showed that the most cited authors/institutions in articles' references were Ş. Büyüköztürk, A. Bandura, J.W. Creswell, M.B. Miles, N. Karasar, OECD, B.G. Tabachnick, M.Q. Patton, A. Yıldırım, J.R. Fraenkel, J. Cohen, P.R. Pintrich, MoNE, H. Simsek, R.E. Mayer and M. Calik. The most important distinctive feature of these authors' studies was that they contain information about research methods, and structural equation modeling in education. In relevant literature, it was reported that the most influential educational research publications focus on statistics and research methods (Panczyk et al., 2015). Additionally, A. Bandura is the pioneer of social learning theory and he received many citations from Turkey-addressed educational research articles. This result confirms that Turkish educators are interested in self-efficacy.

This study revealed that the most preferred journals for publishing articles were *Education and Science*, *Educational Sciences-Theory & Practice* and *H.U. Journal of Education.* These were journals addressed to Turkey. Koza-Çiftçi et al., (2016)' study reported that one-third of the articles related to teacher education and educational sciences published in four journals. The authors of the study explained this situation with Bradford's law. Turkish educators do not have language problems while publishing articles in these journals and these journals' acceptance rate is higher than SSCI journals with foreign addresses. These reasons may explain why Turkish educators prefer these journals. Another finding of this research was that the most cited journals in articles' references were *JRST, IJSE, Computers & Education* and *SE.* These journals publish articles related to science education and instructional technologies education. This result confirms the productivity of science education and computer and instructional technologies education specialists. Additionally, the most productive universities in terms of articles counts were *Hacettepe University* and in terms of citations counts were *Middle East Technical University*. This result is consistent with the results of the study conducted by Gülmez, Özteke and Gümüş (2021). The results of this study showed that about 40% (266 article) of the articles published in *H.U. Journal of Education* (666 article) were addressed to *Hacettepe University.* This result may be an important factor in *Hacettepe University'* productivity in terms of articles counts. In terms of citations counts, *Middle East Technical University* educators' productivity can be explained by their ability to publish articles in high impact factor journals. Additionally, it is pleasing that the MoNE is among the most productive institutions. This shows that the teachers working in the MoNE (3.2%) can obtain the ability to publish articles in SSCI journals.

Finally, the most cited articles' distinctive features determined in this study. The most cited articles' distinctive features were the use of instructional technologies in these researches. Additionally, these articles were often published in technology-focused educational journals. In another study, the researcher reported that interactive learning environments are one of the core topics of educational research after the 2000s (Tosun, 2022). Education articles related to instructional technologies have potential to create clusters and reveal new ideas. Additionally, these articles may be published in high impact value journals. Therefore, it is considered that it would be beneficial to continue studies in instructional technology education field.

5. RECOMMENDATIONS

Regarding scientific articles' visibility and quality, the most important indicator is their publication in SSCI journals. According to results of this current study, it was found that there was a decrease in Turkey-addressed educational researches articles counts during 2013-2018. Although there was an increase in articles counts since 2019, the number of articles published in 2012 could not be reached. It is necessary to reduce or even eliminate possible risks to Turkey-addressed educational research' effect, visibility, and quality. Therefore, obligations to publish articles in SSCI journals should be imposed for educational researchers. Additionally, these obligations should be applied in the associate professor application conditions and in the universities' regulations for promotion and appointment to faculty members. In this respect, it is considered that the results of this study will guide educational policy makers.

In this study, Turkish educators' SSCI articles were analyzed via bibliometric analysis, and the overall picture was revealed about topics they were interested in over the years. In this respect, it is thought that results of the research will make important contributions to new researchers. The evolution of Turkey-addressed educational researches published in SCOPUS journals can be revealed in future studies. Article titles could not be analyzed in this current study. This is the limitation of the study. Title analysis of articles published in SCOPUS journals can be done via the VOSviewer program. Considering this situation in future studies will contribute to the relevant literature.

In addition, the most productive researchers of Turkey-addressed educational researches were revealed in this study. It is considered that this result will guide new researchers to follow popular research topics. Another limitation of this study is that it only examines Turkey-addressed educational researches. The trends of educational research in the world can be revealed in future studies. Additionally, comparisons can be made between the trends of educational research in the world and in Turkey.

Research and Publication Ethics Statement

No data were collected from human participants during the study. This research article is a document review. The author followed ethical standards and rules during the research process.

Contribution Rates of Authors to the Article

The research was prepared by a single author.

Statement of Interest

There is no conflict of interest.

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