A Bibliometric Analysis of 21st Century Research Trends in Early Childhood Education

Rouhollah Khodabandelou, PhD[1], Golnar Mehran, PhD[2], Vahid Nimehchisalem, PhD*[3]

[1]Department of Education, Faculty of Psychology and Education, Alzahra University, Iran

E-mail: khodaband@gmail.com

[2]Department of Education, Faculty of Psychology and Education, Alzahra University, Iran

E-mail: gmehran@alzahra.ac.ir

[3]*Department of English Language, Faculty of Modern Languages and Communication, Universiti Putra Malaysia

43400 UPM Serdang, Selangor, Malaysia

Tel: +60389468721 (Office) +60176678715 (H/P)

Emails: vahid@upm.edu.my; nimechie@gmail.com

ABSTRACT

The importance of early childhood education (ECE) as a foundation for lifelong learning and human development has been examined from different points of view, including those of economists, child developers, psychologists, and educators. This study aimed to explore ECE research trends by employing bibliometric mapping and bibliometric analysis. All 6,730 Web of Science records from 2000 to 2016 were analyzed using social network analysis software. We further employed bibliometric analyses on a sample of 500 of the most cited articles to identify the articles with higher quality or impact. Major trends in early childhood education research showed variations across publication years, the identification of active research areas, and the most prolific authors. The results of the bibliometric mapping showed that education and curriculum-based research; health-, safety-, nutrition-, and physical activity-related research; and gender- and family-related studies are among the most valuable ECE research themes. Implications for research institutions, education policymakers, and educational researchers are discussed.

Key words: Early childhood education, Research trends, Bibliometric analysis, Bibliometric mapping, Literature review

1-INTRODUCTION

The issue of early childhood education (ECE) is very important, and it has been at the forefront of development agenda of many countries (Umayahara, Lanceta, & Krausz, 2016). Early childhood is a milestone in determining children's developmental trajectories (National Research Council and the Institute of Medicine, 2000). ECE has implications for success at all levels of education. For years, researchers from different fields have examined ECE. They have shown a significant impact of high quality ECE in predicting children's future success (Alitajer et al, 2016). For example, from the physiological and psychological perspectives, ECE has been found to have a significant effect on the development of children.

There is proof that in the case of disadvantaged children ECE can minimize the probability of their school failure and increase their life chances and well-being (Shahbazi,Bemanian,saremi, 2017). Therefore, ECE provides a practical opportunity to fill the achievement gap between disadvantaged and advantaged children. A child's social–emotional and cognitive skills grow rapidly in early childhood. Therefore, an assumption that seems logical is that ECE is a feasible solution to compensate for a lack of the essential skills, such as academic language proficiency, that the child failed to acquire at home. That is perhaps why it is believed that the level of human capital of a country might be increase by provision of high quality ECE. Therefore, effective implementation of ECE in any community can positively affect its future in a variety of aspects.

Due to the importance of early childhood, international organizations such as UNESCO and the World Bank have made some efforts to promote ECE programs. For example, 123 projects, with a total value of about $900 million, were financed by the World Bank on early education between 1984 and 2015 (Agirdag et al., 2015). In addition, in line with the Education 2030 agenda, UNESCO also supports national, regional and international ECE expansion and enhancement programs (UNESCO, 2013). However, according to the Global Partnership for Education (2016), an estimated 250 million children worldwide face "silent exclusion," meaning they are either out of school or enrolled but learning little. According to UNESCO (2013), over 88 percent of African children currently do not access to ECE programs. Thus, one of the main goals of UNESCO and the Global Partnership for Education is to improve and make more equitable children's learning

outcomes through quality teaching and learning (GPE, 2016). UNESCO advocates ECE programs that particularly focus on high quality learning, and promote children's holistic development (UNESCO, 2013).

A concomitant need exists for reviewing the evolving nature of ECE research owing to its significance. ECE research, therefore, must go beyond basic topics; such as, educator characteristics, children's experience, and curriculum development (Sheridan, Edwards, Marvin, & Knoche, 2009). According to Rahimi, Koseoglu, Okumus, and Liu (2016), in line with researchers in other disciplines, researchers in the area of ECE have been exploring the knowledge domain, epistemology, and/or intellectual structure of the fields of study to discover the way in which they have evolved over time. Today many areas have reached some maturity level (Bemanian,Shahbazi,2017) which allows monitoring and assessing the evolution of certain topics in diverse areas of inquiry with the support of technology and advanced computer software. Hence, bibliometric studies are increasingly used to map the structure of the specific field of study. The aim of bibliometric analysis is to examine the related studies by analyzing the keywords, content, and citations and to describe publication trends, both within and across disciplines. As seen in other fields of study, attempts have been made to illustrate the maturity level of research in ECE as a foundation for future life success. The current study was conducted to determine the knowledge domain, academic foundation, intellectual structure, and social structure of ECE literature, and to identify and rank the scholars, publications, and institutions with the highest productivity levels.

A considerable amount of literature has been published on ECE. These studies have provided important information on the nature of early childhood and offer important insights into ECE. Since children are inherently different, the nature of the research in early childhood differs from research on adults (Einarsdóttir, 2007; Punch, 2002). In this vein, Punch (2002) identified seven potential differences, including: not imposing the researcher's own perceptions, validity and reliability, clarity of language, research context and setting, building rapport, analysis and care not to impose inappropriate interpretations, and using appropriate research methods.

Although extensive research has been carried out on early childhood education, no single study exists that synthesizes and reviews the research in this area. Hence, to provide a general overview of ECE research over the past 17 years, this study was conducted. More

specifically, our objective was to determine the academic foundation, intellectual structure, social relationships, and knowledge domain in this field via the bibliometric analysis and bibliometric mapping of studies in the area of ECE. To address this objective, these research questions were postulated:

1. What are the common trends in ECE research in terms of the number of studies, their descriptive attributes, and their citations?

2. Based on the number of publications, who are the most prolific authors, institutions and countries in the area of ECE?

3. In ECE research among countries and institutions what patterns of cooperation exist?

4. What are the most productive themes in the related literature, and in what ways did they evolve?

This article is the first of its type that reviews early childhood education research based on social network analysis. The results shared in this review highlight the potential gaps and the most important areas of research in early childhood education. The study is significant as it reviews a large amount of research in the field of early childhood education.

2. LITERATURE REVIEW

As mentioned earlier, this study employed the bibliometric method. In one of the earliest definitions, Broadus (1987) defined bibliometric analysis as "the quantitative study of physical published units, or of bibliographic units, or of the surrogates for either" (p. 376). The terms has also been defined as organizing, classifying, and quantitatively evaluating the publication patterns (Gupta, 1988). Likewise, bibliometric analysis also can be considered a tool to analyze the evolution of the intellectual structure and social structure of a field of study such as ECE (Rahimi et al., 2016). In order to do so, statistical techniques are used for analyzing themes, methods and samples in the previous studies obtained from different sources of publication, such as books, articles, and conference proceedings.

As mentioned above, the bibliometric technique uses mathematical and statistical analysis methods to analyze the obtained data. In this regard, bibliometric analysis uses "interdisciplinary research fields to extend to almost all scientific fields" (Glanzel, 2003, p. 3). As suggested by Zupic and Čater (2015), bibliometric analysis is an alternative to traditional literature review methods. They added, in comparison with traditional

methods, the bibliometric method increases the objectivity of review studies. The importance of bibliometric studies is highlighted by a considerable amount of literature. For instance, Skinner (2015) noted that bibliometric studies enable scholars to identify when major changes in the field occur. Likewise, analyzing the keywords as one, the bibliometric measures indicate the influence on the field of the concept or topic contained in those keywords.

In this vein, Ritzhaupt, Stewart, Smith, and Barron (2010) articulated that changes in keyword usage over time indicate changes in research topics due to competing topics or paradigm shifts in the field. Bibliometric studies have been widely applied recently to evaluate research papers and provide information on the growth trends (Chuang, Chuang, Ho, & Ho, 2011; Rahimi et al., 2016). Bibliometric studies allow the researcher to obtain reliable indicators related to quality (Góngora Orjuela, 2010). In these studies, citation indices are analyzed and based on the results highly cited publication titles, authors, as well as the most productive countries and institutions are identified (Shakiba, Zavvari, Aleebrahim, & Singh, 2016). In this study, bibliometric data was extracted from the Web of Science (WOS), which is the most popular database used to capture and measure the number and quality of academic publications and provides a strong database.

Bibliometric analysis and bibliometric mapping are the two commonly used techniques used in bibliometric studies. Bibliometric analysis examines the significance of the papers and journals, according to different factors, some of which include the impact factor, citation index, number of publications, and document types. (Vošner, Kokol, Bobek, Železnik, & Završnik, 2016). From a different perspective, bibliometric analysis is viewed as "the quantitative analysis of the bibliographic features of a body of literature" (Howkins, 2001). On the other hand, bibliometric mapping is a technique that provides a structural overview of the publications (Vošner et al., 2016). Bibliometric mapping helps researchers visualize the production of research literature (van Enk, 2011). Visualization of similarities (VOS) is a widely used technique of mapping literature production (van Eck, Waltman, Noyons, & Buter, 2010). This technique can be implemented using the VOSviewer software (van Eck & Waltman, 2013).

Level 3

Over the past century, the field of early childhood education has grown and changed immensely. Accordingly, a wide range of topics and methodologies are studied by ECE

researchers and practitioners. For example, "family engagement with ECE teachers and programs" (Mitchell, Wylie and Carr, 2008) is a widely research topic in this area. Mitchell et al. (2008) analyzed the impact of ECE for children and families. Alderson (2011) investigated research trends of health education in early childhood context from the perspective of economics and equity. Ärlemalm- Hagsér and Sandberg (2011) concluded that sustainability education is increasingly practiced in early childhood. In another study, Agirdag et al. (2015) examined research trends in pre-school enrollment in Turkey. The data in Agirdag et al.'s (2015) study originated from the 2012 World Bank EdStats and PISA (Program for International Student Assessment) study. Their findings showed a high increment in pre-school enrollment in recent years. In another endeavor, Perlman et al. (2016; 2017) conducted a systematic review of ECE settings and child outcomes. They concluded that in ECE programs child-staff ratios are critical to high quality education.

In addition, EC Education (2008) highlighted staff professional development opportunities, qualified staff, small group size, and low child-staff ratios as key quality indicators. However, based on Perlman et al.'s (2017) recommendation, in order to support children's development it is important for researchers to identify aspects of the ECE environment. In this regard, robust teachers and educators' competences have been determined as indicators of high quality ECE programs as stated by the National Association for the Education of Young Children (NAEYC).

A search of the literature revealed few studies that investigated research trends of ECE from the bibliometric perspective. In one effort, 248 master's and doctoral theses were analyzed to detect the researched trends in science education for early childhood (Moon, Cheong, Park, and Cho, 2012). As their findings showed, research in developmental psychology, teaching-learning methods, and teacher education were respectively the main topics of the selected theses. Additionally, they found that most of the research topics were related to children, while few research studies focused on the parents. Interestingly, based on research type trends, experimental studies have attracted greater attention from researchers, compared to case studies and culture technology studies. In another study, Kamerman (2005) explored policy trends and identified issues of ECE in developed countries. Kamerman (2005) highlighted that in developed countries there are two important factors that bring ECE to the forefront, including (i) rising numbers of female

workers in the labor force and (ii) the idea that the cognitive, social, and emotional development of children is enhanced by a positive group experience.

Amodei, Jalongo, Myers, Onchwari, and Gargiulo (2013) listed and surveyed publication outlets (journals) in ECE in order to provide descriptive data for each journal. They concluded that within the area of early childhood, journals have diverse range of emphasis in reference to theory, research, and practice. Amodei et al. (2013) explained that journal articles are commonly evaluated based on the review process followed by the journal. Some practical advice was provided by Amodei et al. (2013) for researchers who sought to publish in the area of early childhood.

Recently, content analysis was employed to investigate the coverage of the major approaches to early childhood education in early childhood research journals published between 2010 and 2014 to investigate (Mahan et al, 2014). He examined two open access early childhood journals; the results of the study showed that the most frequently used approach was Head Start, followed by Reggio Emilia. The reason why the Head Start approach appeared most frequently could be the nature of this approach which easily allows the researcher to study an early childhood setting. An additional reason could be that Head Start Programs are widespread since they are federally funded.

As the review of the related literature indicates few studies have synthesized the previous research on ECE. It is crucial to review the literature related to ECE. It would critically summarize the current knowledge in the area under investigation (Coronado, Wurtzel, Simon, Riddle, & George, 2011), and it could support the researchers and practitioners in a growing body of knowledge. In addition, examining the literature in the ECE area provide an overview of the important aspects of the ECE research.

3. THEORETICAL BACKGROUND

From the theoretical perspective, bibliometric studies enable an understanding of the growth of contributions within a field, allowing scholars to identify the emergence of major research trends such as place of publications, productive authors, countries, and organizations (Kim, 2012). While a bibliometric approach can identify research trends and research topics, it does not provide information on the relationships between research topics and trends (Kim, 2012; Skinner, 2015). However, a social network analysis (SNA) approach picks up this lack. Therefore, the theoretical framework of this study was based on a social network analysis perspective (Scott & Carrington, 2011). This study was

143

designed to describe and examine the knowledge structure of the field of early childhood education and to contribute to the future direction of the field. It has been argued that social network analysis provides information on the relationships between the research trends or research concepts (Bemainan,oryaninejad,shahbazi,2106). Marin and Wellman (2011) stated that SNA enables the relationships between elements in a network to emerge, and thus, it provides a more holistic picture of a particular field such as early childhood education. Hence, social network analysis shows how relationships around an individual, group, organization or concept affect beliefs and behaviors. In addition, through SNA, a more global picture of the relationships among studies can emerge.

4. METHOD

The bibliometric method was applied in the current study to obtain a comprehensive overview of studies related to early childhood education in the past 17 years. For the purpose of this study, VOSviewer version 1.6.4 was used to construct and visualize bibliometric mapping from titles, keywords and abstracts of articles. This study reviewed articles published from 2000 until 2016. To achieve a real figure of published documents, we excluded 2017 items. The topic search could simultaneously trace the related information in the keywords, titles, and abstracts.

We measured the frequency of the citations from our sample. Subsequently, we measured the annual average number of citations by designing a citation index for each study. The next step was ranking the studies according to this citation index. This procedure would enable us to determine the first 500 journal articles which had the highest citation index. This sub-sample was used for the core analyses. In the case of more general analyses, however, the whole sample of 6,730 articles was analyzed.

Level 2

The search was conducted on 25 March 2017, in the WOS Core Collection database comprising "SCI-EXPANDED", "SSCI", "A & HCI", "CPCI-S", "CPCI-SSH", and "ESCI" (Thomas Reuters, USA) for the period 2000-2016. The search string that was used in the Topic field was "Early Childhood Education". As mentioned above, the general search criteria were followed in searching for the above mentioned phrase. In addition, the Education Resources Information Center (ERIC) thesaurus (www.eric.ed.gov) was used to find similar phrases or terms related to ECE. The following related terms were retrieved from the ERIC thesaurus: young children,

elementary education, kindergarten, nursery schools, Montessori schools, Montessori method, Reggio Emilia approach, child development centers, child care centers, early intervention, developmentally appropriate practices. The Journal Citation Reports (Thomas Reuters) was used to obtain the JCR Impact Factors and ranks.

The WOS built-in functions, including "Refine" and "Analyze", were employed to perform the bibliometric analysis (frequency and distribution of types of documents, institutions, countries, and prolific authors). The trends analysis involved exporting the entire information on the records and cited references, which included the full information on author names, keywords, abstracts, editors, references, and so on, in tab-delimited (Windows) format from the WOS database. Then, in order to analyze the data, we converted the format to CSV file with Microsoft Excel 2016 and used the Microsoft Excel 2016 to generate text and statistical functions.

The VOSviewer program was used for analyzing the WOS full record with references CSV file and generating landscapes and networks. The terms which were excluded from the analysis were city and country names as well as common terms, such as "study", "background", "baseline", "participant", and "significance". The VOSviewer default parameters were used; however, the terms which were analyzed were those which occurred over 50 times and author keywords which occurred over 20 times. We generated the cluster and timeline landscapes, alongside author keywords, co-authorship networks, institution, and country.

5. RESULTS

In our analysis of the dataset, 6,730 information sources were identified. These records were published from 2000 to 2016 within nine (9) document types. Table 1 shows the frequency along with the percentage of each type of document.

Table 1. Document types in ECE research

| Document types	Number of total articles	%
Article	5862	87.10
Proceedings paper	482	7.16
Review	274	4.07
Editorial material	114	1.69

Book review	60	0.89
Meeting Abstract	25	0.37
Book Chapter	18	0.26
Letter	5	0.07
Correction	5	0.07

As Table 1 illustrates, of the 6,730 samples, 5862 (87.10%) were journal articles. It means that the dominant document type published in the area of ECE is the journal article. Conference proceedings were the second most frequent document type (n = 482; 7.16%), followed by reviews (n = 274; 4.07%), editorial material (n = 114; 1.69%), book reviews (n = 60; 0.89%). The published information sources with the lowest frequency were letters and corrections (n = 5; 0.07% each).

Further analysis was applied by using bibliometric mapping in order to find out where journal papers were published by ECE researchers. As Figure 1 shows, European Early Childhood Education Research Journal (EECERJ) (n = 168; 2.49%), Early Childhood Research Quarterly (ECRQ) (n = 155; 2.98%), Australasian Journal of Early Childhood (AJEC) (n = 132; 1.96%), and Early Education and Development, (n = 105; 1.56%) were the top journals where most of the ECE researchers published their articles.
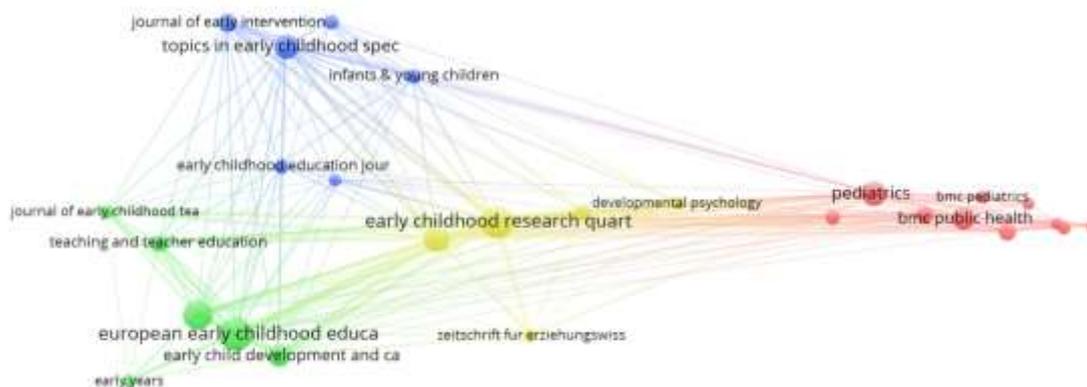
Figure 1. Destribution of documents of the ECE research (n>20)

The second trend that is reported is the time trend of the publications related to ECE research in our sample. Based on the results (Table 2), the number of publications increased sharply in 2015, which shows the growing interest of educational researchers in ECE research in recent years, but there was also a remarkable surge in 2008.

Table 2. Frequency of ECE publications per year

Year	Number of Publications	Number of Citations	Cites per publication
2000	115	29	0.25
2001	99	157	1.59
2002	107	374	3.50
2003	117	571	4.88
2004	163	935	5.74
2005	147	1383	9.41
2006	187	1852	9.90
2007	241	2536	10.52
2008	324	3407	9.40
2009	369	4498	12.19
2010	438	5536	12.63
2011	476	6749	14.18
2012	566	7703	13.61
2013	629	9122	14.50
2014	669	10639	15.90
2015	1006	12759	12.68
2016	1077	15066	13.99

In Table 3, we list the top ECE authors the frequency and percentages of their publications in the WOS dataset from 2000 to 2016. There were 43 authors with more than 10 papers. Among them, Dearly, I. J. was the most successful, with 27 (0.40%) published articles. In the second place was Reynolds, A. J., with 24 (0.36%) published articles, followed by Sumsion, J., with 20 (0.35%) articles. Regarding the frequency of published articles, the difference between the first and eighth most prolific authors is 10 publications. The difference is three articles between the first and second most prolific authors, while it is only one published article between the third and fourth authors.

Table 3. Number of articles published by prolific authors

Now	Authors	Number of publication	Percentage
1	Deary, I. J	**27**	**0.40**
2	Reynolds, A. J	**24**	**0.36**
3	Sumsion, J	**23**	**0.34**
4	Edwards, S	**22**	**0.33**
5	Brooks-Gunn, J	**19**	**0.28**
6	Fleer, M	**19**	**0.28**
7	Justice, L. M	**18**	**0.27**
8	Tayler, C	**17**	**0.25**
9	Vandenbroeck, M	**15**	**0.22**
10	Batty, G. D Leung G. M Schooling C. M	**14**	**0.23**

6. BIBLIOMETRIC MAPPING

The VOSviewer program was used to analyze the keywords which occurred in the publication titles and abstracts. The results of this analysis are presented in Figure 2. Based on the mapping approach, in the scientific overview four (4) clusters emerged automatically. Each cluster was labeled with an appropriate research theme based on the most frequently occurring keywords:

• Child Development, family and community research (green color): This cluster comprises terms such as "year", "mother", "control", "risk", "risk factor", "physical activity", "exposure", "infant", "gender", "adulthood", "birth", and "father".

• Professional development, policy and teacher training studies (red color): This cluster includes terms such as "language", "kindergarten", "knowledge", "teacher", "program", "practice", "approach", policy", "issue", "service", "care", "experience", "strategy", and "support".

• Health, safety, administration and management related studies (blue color) are represented by author keywords such as "autism", "treatment", "patient", "asthma", "cancer", and "management".

• Early childhood general and experimental studies (yellow color) are represented by author keywords such as "control group", "care", and "ECE".
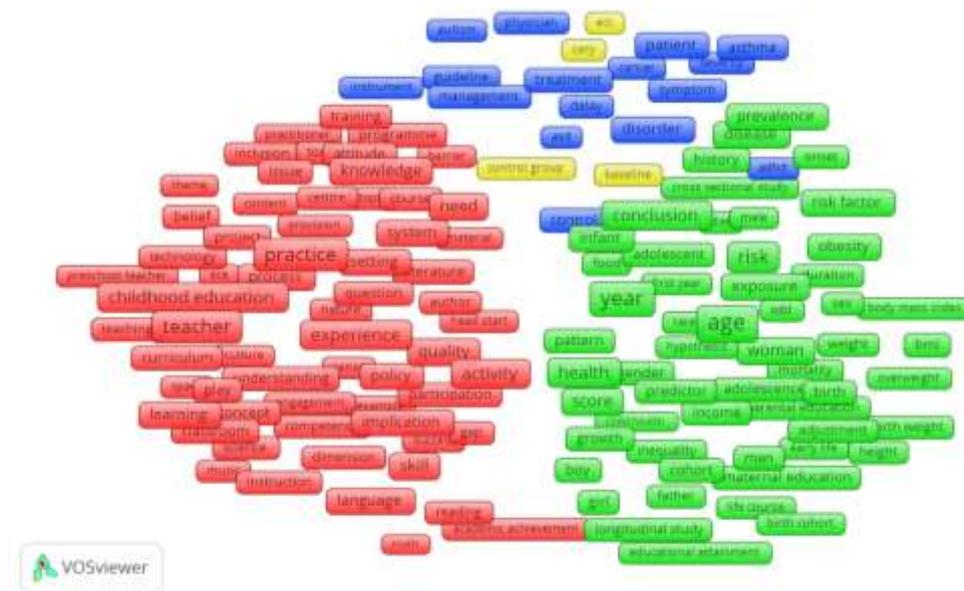
Figure 2 The scientific overview of ECE research from 2000 to 2016

149

In addition, author keywords were used to analyze the text. Since they represent key concepts of the publication, author keywords are very important (Vošner et al., 2016). ECE researchers used 10,877 different keywords. In this study, using VOSviewer we highlighted more frequently used keywords with larger circles while we used smaller circles to indicate less frequently used keywords (Fig. 3). Some of the most frequent author keywords include "preschool", "obesity", "epidemiology", "early intervention", "teacher education", "child development" and "gender", followed by "special education", "family", "play", and "autism". The software identified keywords as occurring within three (3) different color-coded clusters, which represent the themes below:

• Professional development, child development, curriculum and learning environment related research (red color) indicated by keywords such as "preschool", "child development", "teacher education", "early intervention", "parenting", "assessment", "curriculum", and "learning";

• Health, safety, nutrition and physical research (green color) characterized by author keywords such as "obesity", "overweight", "physical activity", "nutrition", "epidemiology", "pregnancy", "infant", and "prevention";

• Community and family related studies (blue color) represented by author keywords such as "gender", "socioeconomic status", "family", "cognition", and "life course".
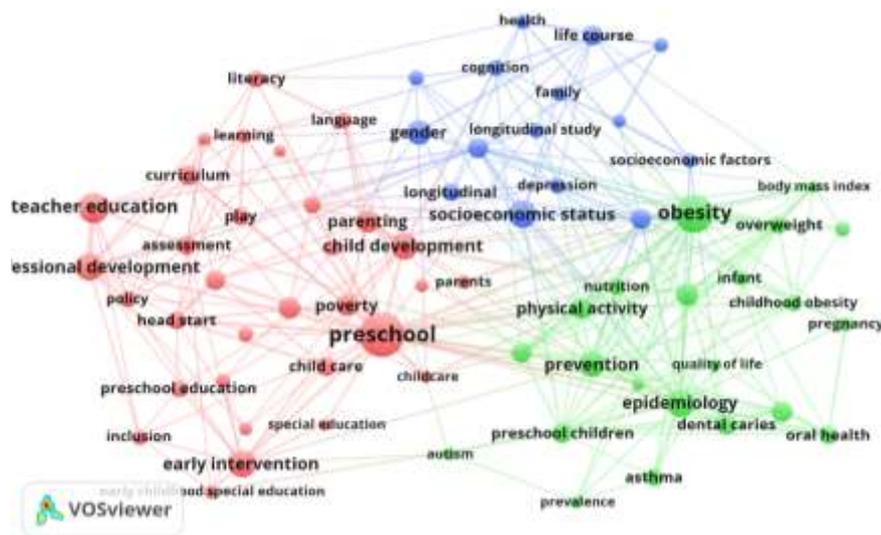

Figure 3. Author keywords co-occurrences network

The results of co-authorship collaboration among ECE researchers is presented in Figure 4. As the figure shows, collaboration was identified between the top 30 countries. As indicated by the size of the circle, the most active authors in co-authorship collaboration are from the U.S. These authors have strong collaborations with Chinese, English, and Australian researchers as indicated by the strength (thickness) of the lines. As the figure shows, UK researchers are the second most active authors. They have strong collaboration with Canadian researchers. The whole co-authorship collaboration among the researchers from the top 30 countries is shown in the figure below.
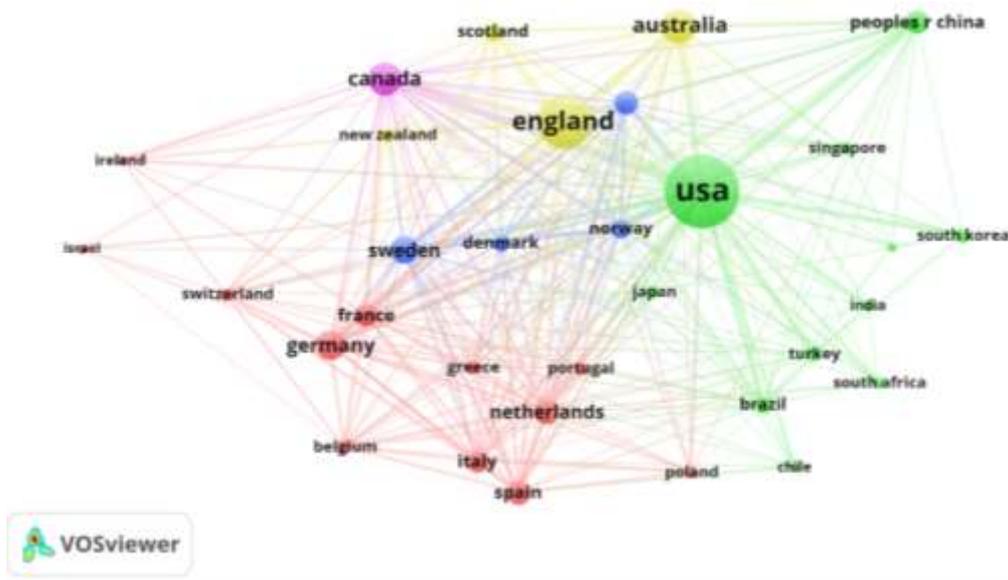
Figure 4. Co-authorship collaboration among the researchers from the top 30 countries

The next trend we describe is the most productive institutions in ECE research. From a total of 6,730 institutions, the University of North Carolina (n=180, 2.67%), Columbia University (n=136, 2.02%) and Harvard University (n=131, 1.94%) were the most productive universities. Institutional co–authorship was reported among 434 institutions. Co-authorship collaboration among top institutions is presented in Figure 5.
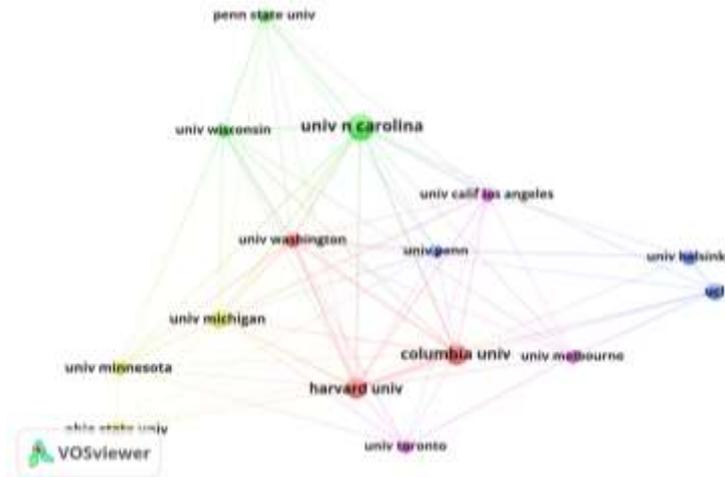
Figure 5. Co-authorship collaboration among 15 most collaboration intensive institutions

In order to present a wide-ranging overview of ECE literature, we conducted a chronological analysis of the terms that occurred in titles and abstracts of the sources from WOS. Figure 6 depicts the results of the analysis, which was based on the average publication date of the sources where the terms related to ECE research appeared. As the figure illustrates, literature production in the area of ECE progressed in six different categories. It is worth noting that the focus of publications produced in 2009 and earlier was primarily on health care education in early childhood. Between 2009 and 2010, research in the field of ECE focused on safety education, gender differences, parenting studies and physical education. By contrast in 2010-2011, the emphasis turned to child development studies. Then, in the period 2011-2012, the focus of ECE literature shifted to learning environment and curriculum studies, subsequently in 2012 and 2013 to policy studies. More recently, ever since 2013, the main focus of the ECE literature has been devoted to professional development studies.

Figure 6. The evolution of research terms in ECE literature for the period 2009-2016

Figure 7 schematically presents six periods. The evolution is relatively logical from a chronological perspective; the research in the field of ECE starts with specific topics of early childhood such as health and safety. Nevertheless, later the focus of studies shifts more to studies related to child development, teaching, and learning. The most recent publications are devoted to research on policy and professional development studies.

Figure 7. The six periods of ECE literature production

Highly cited publications were analyzed in order to provide a comprehensive overview of ECE research trends. The aim of this analysis was to detect the articles with higher impact and quality. For this purpose, the top 500 highly cited studies were analyzed via citation counts (as of 25 March 2017). By using total citations, we identified the 500 most frequently cited documents published from 2000 to 2016. These articles had citation counts of ranging from 1551 to 40. A publication with more citations is likely to have made a greater contribution to the field (Ozcinar, 2009). The articles with the highest

153

frequency of citations were analyzed based on their research design (developmental, descriptive, experimental), research methods (qualitative, quantitative), research settings and so on. In this section, we selected the top five publications for detailed analysis.

1. Barlow, S. (2007). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. *Pediatrics*, *120*(1), 164-192; **1551 citations.** This paper had the highest rank, with 1,551 citations and an impressive mean value (M= 141) of annual citations. In this article, Barlow reviewed the previous studies and recommended assessment, prevention, and treatment approaches. The central role of environmental and social change in reducing the obesity epidemic stands out in Barlow's recommendations. The study is a qualitative study and is categorized as developmental research. The article's subject category was *Pediatrics*.

2. Lee, S. J., Schover, L. R., Partridge, A. H., Patrizio, P., Wallace, W. H., Hagerty, K., … Oktay, K. (2006). American Society of Clinical Oncology recommendations on fertility preservation in cancer patients, *Journal of Clinical Oncology*, *241*(18), 2917-2931; **856 citations.** This article was the second highly cited paper with a high mean value ($M = 71.33$) of annual citations. The main objective of the study was guiding practicing oncologists on the commonly used fertility preservation methods and issues related to cancer patients under treatment. The article used an expert panel review to collect the data.

3. Fombonne, E. (2003). Epidemiological surveys of autism and other pervasive developmental disorders: An update. *Journal of Autism and Developmental Disorders, 33*(4), 365-382; **706 citations**. As compared with the previous two papers, with a lower annual citations mean score of $M = 47.07$, this article was ranked third among the 500 highly cited publications. The objective of the article was to provide a review of epidemiological studies of pervasive developmental disorders (PDD). The subject category of this article in WOS was Developmental Psychology. The paper reviewed characteristics of 32 surveys published between 1966 and 2001. The study was classified as a qualitative study.

Blair, C. (2002). School readiness - Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist*, *57*(2), 111-127; **584 citations.** With an annual citations mean score of $M =$

32.44, this article was ranked fourth. Its subject category was Multidisciplinary Psychology. The study examined several constructs including emotionality as well as developmental relations between cognition, emotion, and neural plasticity. The efficacy of preschool compensatory education was also examined in promoting school readiness. The study was quantitative research and review.

4. McEwen, B. S. (2000). Allostasis and allostatic load: Implications for neuropsychopharmacology. *Neuropsychopharmacology*, *22*(2). 108-124; **573 citations**. With an annual citations mean score of $M = 35.81$ this article was ranked fifth, and its focus was public health. The subject category of this article was Neurosciences. The study was categorized as quantitative research with a descriptive design.
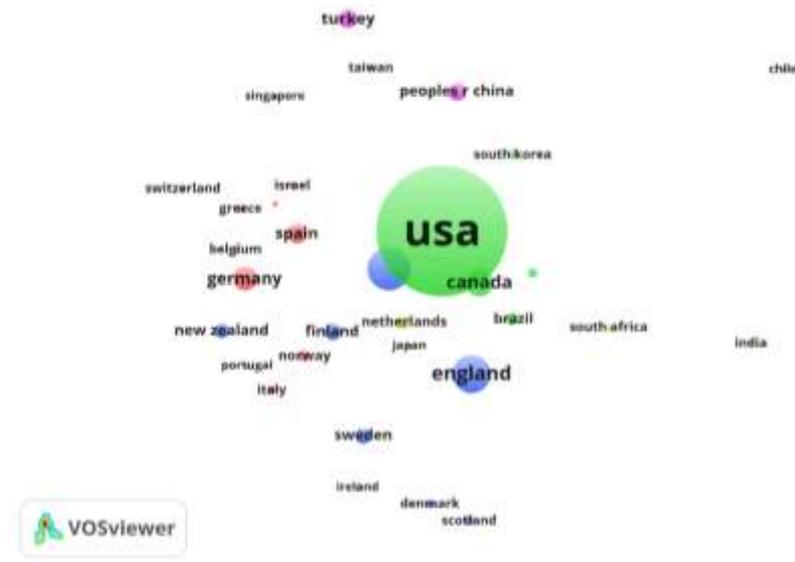
Figure 8. Top citation countries

All of the five most cited articles were published before 2010. None of the top citations had been produced by the most ECE prolific authors. Surprisingly, the first prolific author Deary was ranked in the 57th place. Further analysis on top cited papers showed that researchers in the US published high quality papers (Figure. 8), followed by those in the UK, Canada and Germany.

7. DISCUSSION

Explosion of knowledge in the last two decades has marked ECE and its impact on children development. Today, much of the literature emphasizes the value of ECE as a foundation for later life success. Prior studies that have noted the importance of early

childhood education indicated that the amount and nature of the ECE experience are some of the key factors for success in later academic performance. In this regard, widespread research has highlighted the evident benefits of participation in high-quality ECE program for all children in different areas, such as school readiness, academic performance, and social adjustment. In addition, according to OECD (2016), all countries should make sure that care, high quality early childhood development, and education are accessible to all children by 2030. As confirmed by the literature review, ECE is a fundamental infrastructure factor that shows sustainable education of a country in different areas, especially in developing countries. Therefore, evaluation and measurement of ECE research are essential for establishing a development road map for all countries.

An initial objective of the study was to explore themes and trends of ECE research by combining bibliometric analysis and bibliometric mapping. In this research, we investigated the trends of ECE research articles, more productive authors and institutions, the collaboration between scholars across countries, and the most productive themes of research alongside their evolution process. The novelty value of this study was that it combined bibliometric analysis and bibliometric mapping. WOS was used to capture and analyze the data, and to provide valuable information such as ECE research trends and the general overview of ECE research in a global context from 2000 to 2016. Having conducted a comprehensive search in the WOS database, and having refined the results, we found 6,730 publications that were produced by scholars in the area of ECE.

The current study found that the ECE researchers published nine (9) different document types in the 17 selected years (from 2000 to 2016). However, most of the researchers published their output in journal articles, followed by conferences presentations and reviews. Another important finding was that Early Childhood Research Quarterly (ECRQ) and the European Early Childhood Education Research Journal (EECERJ) were the top two journals in which ECE researchers published their research output. Interestingly, book chapters were only 0.26% of total publications during the 16 years.

Our study showed that research in ECE is steadily growing. This means the importance of ECE in promoting quality education is a continual concern for policymakers, educators and researchers. The trend in literature production has been positive; in other words, the

number of publications in the area of ECE has increased over the years. Many reasons can explain this increment, such as the exponential development of ICT as well as development in higher education and teaching-learning strategies. However, after 2011, there has been a slight reduction in the number of published articles.

Most of the highly cited articles had been published before 2010 as our findings in this study indicated. Compared with the other papers Barlow's (2007) article was interestingly ranked so highly, in spite of the shorter time it had to have remarkable impact on the research community and become cited. Barlow's (2007) article dealt with policy review and recommendations, which are current research issues; therefore, it seems logical to argue that the subject area of the article is likely to be the important factor that influences the citation trend. The United States made the largest contribution to the field by publishing highly cited and high quality papers.

Using bibliometric mapping on publication titles and abstracts, and then on author keywords, was what enabled the researchers to identify the most productive themes which were published in ECE studies. The themes identified from titles and abstracts were almost similar to author keywords because the abstracts, titles and author keywords derived themes more focused than general. In this regard, each theme is associated with education and curriculum-based research; health, safety, nutrition and physical education research; or community and family-related studies. The novelty of our study was using a combination of bibliometric mapping and bibliometric analysis, and a set of keywords with more variety and journals to include more articles and research areas undertaking ECE research studies. In addition, this study is the first of its kind in this field.

Interestingly, citation analysis of the ECE research production showed that the top cited paper was a review paper. In fact, in the education field, top papers and journals are generally review papers. For example, "Review of Educational Research" and "Educational Research Review," two top ranked journals in the JCR ranking system, mostly publish review papers. This finding confirms Koseoglu's (2016) claim that many fields have reached a level of maturity. In addition, this finding shows the significant role of review articles in educational research.

8. CONCLUSION

Analyzing a large sample of 6,730 records in conjunction with a subsample of 500 most frequently cited articles we were able to capture the increasing interest in ECE research

studies among researchers. Researchers have been conducting many studies in the area of ECE, especially on education and curriculum; health, safety, nutrition and physical education; and gender and family. These dynamic topics represent the foundation of the field and have highly progressive properties in the literature on ECE. In particular, curriculum studies investígate children's development in their conceptual understanding. The findings of these studies have provided invaluable pedagogical implications by showing how it is possible to develop suitable curricula that enable our children to explore scientific concepts (de Freitas & Palmer, 2016).

Despite its contributions, the current study had some limitations. First, the sample used in this study was gathered from a single database source, the WOS. Harzing (2011) noted that WOS provides a comprehensive citation search; however, Scopus, another main database, appears to have much broader journal coverage, and articles not listed in the WOS database are not represented in the study. Second, bibliometric mapping was performed on only information source, author keywords, abstracts and titles of publications. The results might have been different if the full publications had been analyzed. Third, in the citation analysis, we included only the 500 most frequently cited papers.

This study suggests a direction for ECE researchers by examining research trends in ECE publications released from 2000 to 2016 and derived from a high quality database. It is expected that this review of ECE research will outline a roadmap, will provide support for researchers in future directions of ECE research, and finally will initiate a foundation on which novel literature streams in the context of ECE research can be built.

REFERENCES

Alderson, P. (2011). Trends in research about health in early childhood: Economics and equity, from micro-studies to big business. *Journal of Early Childhood Research, 9*(2), 125-136.

ALITAJER, S., SAJADZADEH, H., SAADATIVAGHAR, P., & SHAHBAZI, M. (2016). The Role of Physical Factors in the Sociopetalness of Informal Settlements: The Case of Hesar-e Emam and Dizaj Neighborhoods in Hamedan.

Amodei, M. L., Jalongo, M. R., Myers, J., Onchwari, J., & Gargiulo, R. M. (2013). Survey of publication outlets in early childhood education: Descriptive data, review processes, and advice to authors. *Early Childhood Education Journal, 41*(2), 115-123.

Ärlemalm-Hagsér, E., & Sandberg, A. (2011). Sustainable development in early childhood education: in-service students' comprehension of the concept. *Environmental Education Research, 17*(2), 187-200.

Barlow, S. (2007). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. *Pediatrics, 120*(1), 164-192.

BEMANIAN, MOHAMMAD REZA, and MEHRDAD SHAHBAZI. "FUNCTIONAL ROLE IN THE VITALITY OF URBAN OPEN SPACES (CASE STUDY: ERAM PARK HAMADAN)." (2017): 57-68..

Bemanian, Mohammadreza, Reza Oryaninejad, and Mehrdad Shahbazi. "Typology of spatial expansion new sprawl pattern (Case study: Urumia urban region)." *Journal of Turism Hospitality Research* 5.4 (2016): 65-80.

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American psychologist, 57*(2), 111-127.

Broadus, R. (1987). Toward a definition of "bibliometrics". *Scientometrics, 12*(5-6), 373-379.

Chuang, K.-Y., Chuang, Y.-C., Ho, M., & Ho, Y.-S. (2011). Bibliometric analysis of public health research in Africa: the overall trend and regional comparisons. *South African Journal of Science, 107*(5-6), 54-59.

Coronado, R. A., Wurtzel, W. A., Simon, C. B., Riddle, D. L., & George, S. Z. (2011). Content and bibliometric analysis of articles published in the Journal of Orthopaedic & Sports Physical Therapy. *journal of orthopaedic & sports physical therapy, 41*(12), 920-931.

de Freitas, E., & Palmer, A. (2016). How scientific concepts come to matter in early childhood curriculum: rethinking the concept of force. *Cultural Studies of Science Education, 11*(4), 1201-1222.

Education, E. C. (2008). *Strategic Review of Early Childhood Education Centres, Facilities, Services, Kōhanga Reo and Kōhungahunga*. Retrieved from The University of Auckland: https://cdn.auckland.ac.nz/assets/central/ece-literature-review-benchmarking-study-171108.pdf

Einarsdóttir, J. (2007). Research with children: Methodological and ethical challenges. *European early childhood education research journal, 15*(2), 197-211.

Fombonne, E. (2003). Epidemiological surveys of autism and other pervasive developmental disorders: an update. *Journal of autism and developmental disorders, 33*(4), 365-382.

Fu, H.-Z., & Ho, Y.-S. (2015). A bibliometric analysis of the Journal of Membrane Science (1976-2010). *The Electronic Library, 33*(4), 698-713.

Glanzel, W. (2003). Bibliometric as a research field: A course on theory and application of bibliometric indicators, . *Course Handouts.* Retrieved from http://nsdl.niscair.res.in/jspui/bitstream/123456789/968/1/Bib_Module_KUL.pdf

Góngora Orjuela, A. (2010). The Importance of Bibliometric Studies. The Orinoquia Case. *ORINOQUIA, 14*(2), 121-122.

GPE. (2016). *Early Childhood Care and Education: Strategic Plan 2016–2020*. Retrieved from Washington D.C: http://www.globalpartnership.org/focus-areas/early-childhood-care-and-education

Harzing, A. W. (2011). *The publish or perish book*. Melbourne: Tarma Software Research.

Hawkins, D. T. (2001). Bibliometrics of electronic journals in information science. *Information Research, 7*(1), 7-1.

Kamerman, S. B. (2005). Early childhood education and care in advanced industrialized countries: Current policy and program trends. *Phi Delta Kappan, 87*(3), 193-195.

Kim, A. C. H. (2012). *Knowledge structure in sport management: Bibliometric and social network analyses.* (PhD), The Ohio State University, ProQuest Dissertations & Theses Global. (3529825)

Lee, S. J., Schover, L. R., Partridge, A. H., Patrizio, P., Wallace, W. H., Hagerty, K., . . . Oktay, K. (2006). American Society of Clinical Oncology recommendations on fertility preservation in cancer patients. *Journal of clinical oncology, 24*(18), 2917-2931.

Mahan, A., Bazvandi, F., Shahbazi, M., & Bazvand, K. N. (2014). Evaluation of Compatibility of Architectural Styles in Change of Use in Historical Buildings Case Study: The Study of Change of Use in Tabriz Leather Factory to Islamic Art University.

Marin, A., & Wellman, B. (2011). Social network analysis: An introduction. In J. Scott & P. Carrington, J (Eds.), *The SAGE handbook of social network analysis* (Vol. 11). Thousand Oaks, CA: SAGE Publication.

McEwen, B. S. (2000). Allostasis and allostatic load: implications for neuropsychopharmacology. *Neuropsychopharmacology, 22*(2), 108-124.

Medicine, N. R. C. a. I. o. (2000). From neurons to neighbourhoods: The science of early childhood development: Washington DC: National Academy Press.

Mitchell, L., Wylie, C., & Carr, M. (2008). *Outcomes of early childhood education: Literature review*: Ministry of Education New Zealand.

Moon, S.-H., Cheong, D., Park, C.-O., & Cho, J. (2012). Study of Research Trends in Science Education Field for Early Childhood. In T.-h. Kim, C. Ramos, J. Abawajy, B.-H. Kang, D. Slezak, & H. Adeli (Eds.), *Computer Applications for Modeling, Simulation, and Automobile* (Vol. 1, pp. 308-316). Korea: Springer.

OECD. (2016). *Education at a Glance 2016: OECD Indicators*. Retrieved from Paris: http://dx.doi.org/10.187/eag-2016-en

Ozcinar, Z. (2009). The topic of instructional design in research journals: A citation analysis for the years 1980-2008. *Australasian Journal of Educational Technology, 25*(4), 559-580.

Perlman, M., Falenchuk, O., Fletcher, B., McMullen, E., Beyene, J., & Shah, P. S. (2016). A Systematic Review and Meta-Analysis of a Measure of Staff/Child Interaction

Quality (the Classroom Assessment Scoring System) in Early Childhood Education and Care Settings and Child Outcomes. *PloS one, 11*(12), 1-33.

Perlman, M., Fletcher, B., Falenchuk, O., Brunsek, A., McMullen, E., & Shah, P. S. (2017). Child-Staff Ratios in Early Childhood Education and Care Settings and Child Outcomes: A Systematic Review and Meta-Analysis. *PloS one, 12*(1), 1-24.

Punch, S. (2002). Research with children: the same or different from research with adults? *Childhood, 9*(3), 321-341.

Rahimi, R., Koseoglu, M. A., Okumus, F., & Liu, J. (2016). Bibliometric studies in tourism. *Annals of Tourism Research, 61*(2016), 180-198.

Ritzhaupt, A. D., Stewart, M., Smith, P., & Barron, A. E. (2010). An investigation of distance education in North American research literature using co-word analysis. *The International Review of Research in Open and Distributed Learning, 11*(1), 37-60.

Scott, J., & Carrington, P. J. (Eds.). (2011). *The SAGE handbook of social network analysis* (1 ed.): SAGE publications.

Sen Gupta, I. (1988). Bibliometric research Vol.!. Growth of biomedical literature: Calcutta: SBA Publications.

Shahbazi, Mehrdad, Mohammad Reza Bemanian, and Hamid Reza Saremi. "Analysis of Effective Key Factors in Adaptability of a Building in the Future with an Emphasis on Flexibility in Historical Buildings (Case Study: Bu-Ali of Hamadan)." *Space Ontology International Journal* 6.1 (2017): 69-78.

Shakiba, M., Zavvari, A., Aleebrahim, N., & Singh, M. J. (2016). Evaluating the academic trend of RFID technology based on SCI and SSCI publications from 2001 to 2014. *Scientometrics, 109*(1), 591-614.

Sheridan, S. M., Edwards, C. P., Marvin, C. A., & Knoche, L. L. (2009). Professional development in early childhood programs: Process issues and research needs. *Early education and development, 20*(3), 377-401.

Umayahara, M., Lanceta, A. C., & Krausz, T. (2016). *Southeast Asian guidelines for early childhood teacher development and management* (9292235435). Retrieved from Bangkok, Thailand: http://unesdoc.unesco.org/images/0024/002443/244370e.pdf

UNESCO. (2013). *Indigenous early childhood care and education (ECCE) curriculum framework for Africa: a focus on context and contents*. Retrieved from Addis Ababa: http://unesdoc.unesco.org/images/0022/002292/229201e.pdf

van Eck, N. J. (2011). *Methodological advances in bibliometric mapping of science.* (PhD), Erasmus Research Institute of Management (ERIM).

van Eck, N. J., & Waltman, L. (2013). *VOSviewer manual*. Leiden: Univeristeit Leiden.

van Eck, N. J., Waltman, L., Noyons, E. C., & Buter, R. K. (2010). Automatic term identification for bibliometric mapping. *Scientometrics, 82*(3), 581-596.

Vošner, H. B., Kokol, P., Bobek, S., Železnik, D., & Završnik, J. (2016). A bibliometric retrospective of the Journal Computers in Human Behavior (1991–2015). *Computers in Human Behavior, 65*(1), 46-58.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 429-472.