

Professional Education and Technology Usage for Establishing Methodological Competence among Future Professors: Bibliometric Analysis

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Abstract—There has been emerging interest in the effectiveness of technology usage in professional education for establishing various competences among future educators. However, the field still lacks in holistic overviews of the role of technology for establishing various competences among future educators. The present bibliometric study was employed to identify and synthesize the results from studies exploring domains of professional education, technology and establishing competence. An author analyzed the papers published in highly ranked and cited journals which were indexed and ranked in the Web of Science Core Collection and Scopus, in the period of 2000 to 2020. The results demonstrated high interest in studied domains within various subjects and fields of study, demonstrating the interest in the opportunities which provide the technology for professional education and developing methodological competences.

Keywords—professor, technology, methodological competence, didactic system, traditional and innovative teaching methods

1 Introduction

Recent studies on learning with technologies indicated significant differences between learning from and learning with computers [1]. Technology increases learners' academic success [2], enhances improvement of already learned skills and competencies [3], and influences motivation and academic engagement [4]. Although, many studies on technology used in professional education have been conducted in various disciplines, there still remain unanswered questions. Majority of studies explored the use of technology in a teaching-learning process, the benefits and dangers of its use, and attitudes towards using technology in an educational process [5], [6]. Therefore, more studies are required to examine the use of technology in professional education for the establishment of methodological competence. Consequently, this paper aims to gather, analyze and synthesize available studies in the mentioned field to establish a holistic approach to the understanding of interrelations between professional education, technology and establishing competences.

2 Literature review

Nowadays, technology became extremely popular in the educational system, since it provides novel opportunities for knowledge-generation, sharing information and developing skills. Technology is viewed as both, educational means and an engaging atmosphere. This requires effective strategies and methods helping teachers and students cope with professional, social and psychological changes in the modern world. Technology makes available and assessable new styles of learning and stimulates deeper understanding and thinking. It also enhances different mind-sets and beliefs among educators, and teaches them how to incorporate the technology with their course effectively. Applying technology in an educational settings allows students to experience team work and support while utilizing various learning resources and tools in studying, doing activities or solving problems [1]. According to a study by [2] technology increases learners' academic success and makes multiple roles and tasks more achievable.

Study by Judson [4] stated that technology is used as an alternative to the traditional teaching style or strategy. Among common drives computer personal level of technology use, level of self-efficacy, access to professional development, and positive teacher attitudes towards technology have been indicated as significant. However, the effectiveness of using technology in professional education should be supported by appropriate educational models [5].

Some studies have explored the process of incorporating technology into the teaching-learning process and analyzing the key factors contributing to an effective outcome [7]. Technology usage makes the learning environment more active involving students into meaningful tasks and transferring their responsibility for academic achievements. Problem-based learning projects, browsing the Internet, the preparation of presentations, using various apps and software became an effective tool used to establish a final course product [7]. Another study argues that technology usage allows teachers to increase critical thinking, computer skills, and practical decision-making abilities [8]. It also enhances the improvement of already learned skills and competencies, including peer in effective usage of technology in educational processes [3].

Recent studies indicated the relationships between academic engagement, motivation and establishing of sophisticated activities (e.g. multimedia products, or data analysis). It has been stated that technology use might increase empowerment and feeling of pride among students [3]. Similarly, a study by Means [2] and Shapely, Maloney, and Caranikas-Walker [9] has argued that involving students into a technology-based education results in academic achievement in all subject areas.

Recent studies on integration of technology in educational process indicated that there are key factors influencing the effectiveness of this process. According to Hew, six following factors have to be considered: institutional structures, lack of resources, lack of specific skills and knowledge, teacher beliefs and attitudes toward technology, subject nature, and types of assessment. Nevertheless, the same study indicated that technology integration demands more time to prepare materials, search for websites, download videos etc. [10].

Among the factors contributing to teachers use of technology, aptitude, knowledge skillfulness and acceptance have been mentioned. For instance, it has been argued that

younger learners are more open for technology and internet usage in an educational process [11]. On the other hand, it was discovered that university faculties need to improve their skills and competences related to technology usage [12] that will allow them to apply new technology tools in their teaching practice. They also need to improve their methodological competences to be able to mix technologies with curricular and course nature [12].

Workshops and trainings for teachers increase the effectiveness of technology use in professional education, since it increases skills of using technology as a part of their lesson plan [13]. Consequently, there is a positive association between technology integration in the classroom and teacher's computer self-efficacy [13]; as well as between teachers' positive beliefs regarding technology and efficiency of its use in educational processes [14]. The teacher's self-image and perceived role, influences the establishment of the way they will use technology [15]. In addition, modelling might be used to encourage teachers to introduce and maintain the technology usage (e.g. multimedia) in professional education [16], [17], [18]. Additionally, Bullock [17] discovered that easy access to technology, clear expectations, technical support, and positive experiences will enhance teachers' need and desire to use technology on a regular basis. It has been stated that if teachers accept the use of technology at their workplace, they will use it for both teaching and communication [19]. Furthermore, teachers who were aware of being skillful enough to use technology successfully were recognized as high technology users and efficient in integrating technology into the educational process [20], [21]. Study by Adamy and Heinecke [22] indicated that integration of technology into education has to be equipped with institutional support to increase its efficiency.

Another factor contributing to teachers' use of multimedia is an attitude toward educational technology. However, technology cannot replace effective teaching [23], but it should be the content (human community) instead of the tool [16]. Studies on teaching or learning styles indicated the impact of intrinsic and extrinsic factors on technology usage in professional education [24], [25]. As a result, the educational goals have to be reconsidered and re-organized at various educational levels [26].

3 Methodology

3.1 Purpose of the study and research questions

The main objective of this study is to explore scientific publication patterns in research domains of "professional education" concerning "technology usage for establishing methodological competences". The paper also aims to reveal the contribution of scientific knowledge by highlighting the gaps and direct the potential development areas for further studies. Based on the research scope and objectives, research questions are formed below;

RQ1 What are the descriptive characteristics of publication results?

RQ2 What are the publication trends in terms of the most productive authors, institutions and countries?

RQ3 In which journal sources were the papers published most frequently and which publisher?

3.2 Bibliometric study

The bibliometric study enables researchers to explore patterns, trends, associations, and scientific developments in searched domains and interrelated fields over published data. It requires a structured bibliometric database to analyze the appropriate data to answer research questions [27], [28], [29], [30]. Bibliometric is also defined as the use of statistical methods to analyze the bibliometric publications of data in a wide spectrum like peer-reviewed journal articles, books, conference proceedings, periodicals, reviews, reports, and related reports.

3.3 Data collection and extraction

A bibliometric study requires a structured database to analyze the publication data. The main two bibliometric databases available for these reasons are ISI WoS and Scopus. ISI WoS contents highest ranked and impacted (prestigious) sources, whereas Scopus also ranks the same sources besides more sources that cover included conferences, symposiums, congress proceedings compared to WoS. The data collection strategy is used as a similar bibliometric study conducted in various research fields [27], [28], [29], [30].

Search query

Scholarly Works (1997) = professional education, technology, methodological competence, professors.

Filters: Year Published = (2000 - 2020)

Publication Type = (journal article) Publisher = (Informa UK Limited, Elsevier BV, SAGE Publications, Emerald, Springer Science and Business Media LLC, Wiley, National Institute for Health Research, Clute Institute, BioMed Central, Wiley-Blackwell) Cited By Scholarly Works Above mentioned search criteria was conducted, and data retrieved as plain .txt, excel .csv, and .bib file formats for further analysis. The Lens Analysis software used for descriptive and bibliometric data analysis.

4 Results

4.1 Publication profile and descriptive publication results

The search results show that a total of 1997 studies have been published during the period of 2000-2020 years. The highest period among the published data set indicated the research conducted during 2015. The majority of papers were published within Psychology, Sociology, Medicine, Pedagogy and Public relations. The top five authors are Andrew Booth, Adam Lindgren, Anna Cantrell, Bahaudin Mujtaba, Duncan Chambers and Chris Salisbury, who published 27 papers altogether. The leading institution in publishing papers is Karolinska Institutes (52 papers out of total 1997) and the leading country is the United Kingdom (more than 750 papers out of total 1997 papers). The top three publishers are Elsevier, Informa UK Limited and Sage. Among journals the leader is the Journal of Applied Business Research.

4.2 Distribution of publication by years and fields of study Document title and meta-data

Records start with $n=2$ in 2000 and $n=1$ in 2001, then slightly increases from 2006 to 2009. From 2011 to 2015 rises sharply ($n=20$ to $n=65$), and decreases until 2020 ($n=12$ to $n=18$). The sharp decrease can be seen in 2020 ($n=8$). 2015 shows the highest interest in publications in the data set for the analyzed research period. The mean of the data for the highest period of 2011 to 2015 is $n=48$ yearly. The publication distribution also supports downward movement till 2020 in Figure 1. Starting from 2009 the papers published in *Procedia Social and Behavioral Sciences* increased sharply with the highest interest in publications in 2015 (from 5 to 40 respectively).

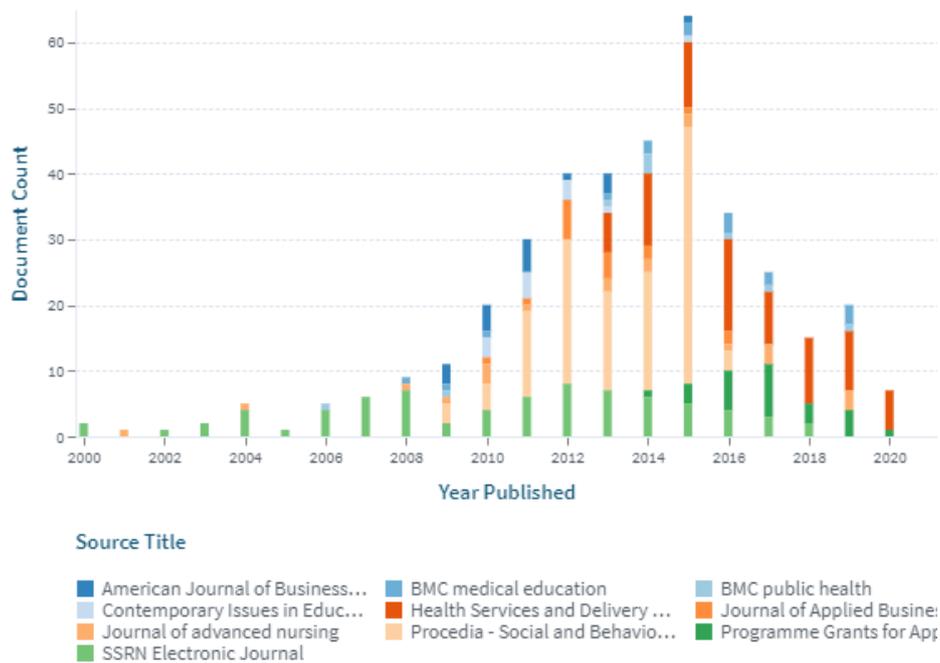


Fig. 1. The trend of publication count by source and year (2000-2020)

Figure 2 displays the top fields of study in this result set, based on the number of scholarly works. According to the results, the majority of papers were published within Psychology and Sociology ($n=480$, $n=450$ respectively), slightly less than 300 papers were published in Medicine, Pedagogy and Public relations, and slightly more than 200 papers published in Higher education and Business. Only 2 papers were published in Psychological resilience.

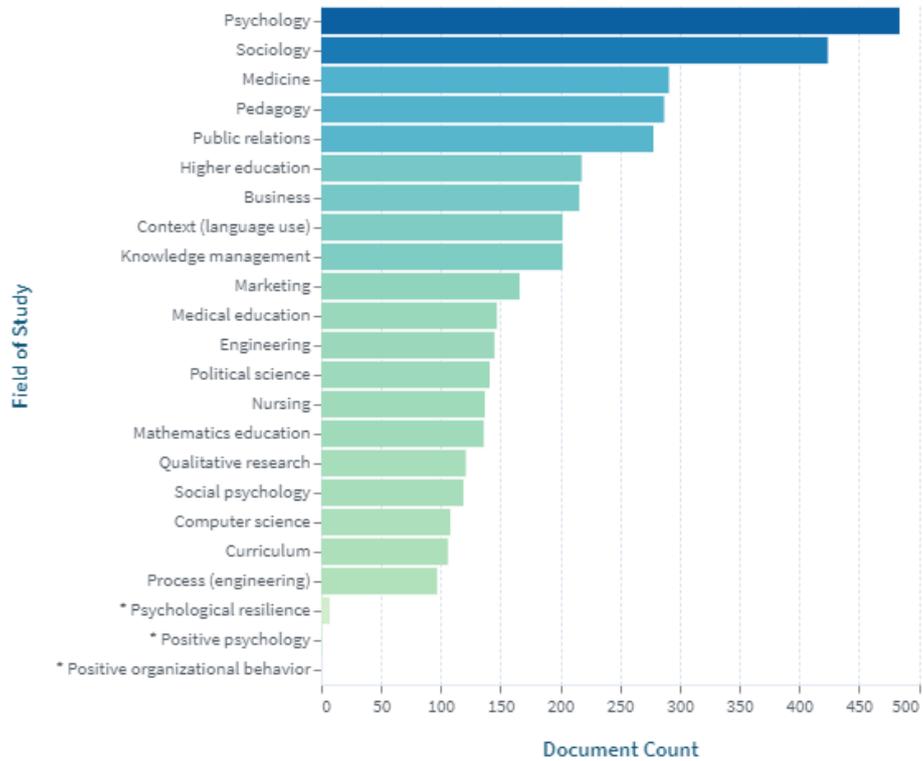


Fig. 2. The field of study

Figure 3 shows the top subjects of study in this result set, based on the number of scholarly works. According to the results, the majority of papers were published in education (n=450), followed by strategy and management subject (n=180) and Management of technology and innovation (n=125). Only 50 papers were published in computer science applications, library and information sciences and general medicine subjects.

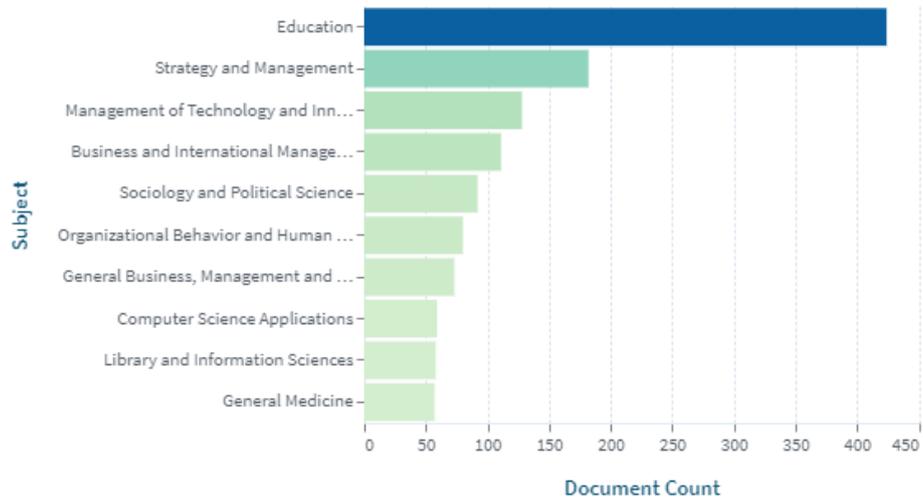


Fig. 3. The subject of study

4.3 Most productive authors, institutions and countries

Figure 4 indicates the author descriptive/statistical results by document count (the search was limited up to 20 names). Figure 4 shows most productive authors. The top five authors were Andrew Booth (7 papers), Adam Lindgren, Anna Cantrell, Bahaudin Mujtaba, Duncan Chambers and Chris Salisbury (5 papers each). Four of them published 4 papers each, eleven authors published 3 papers each.

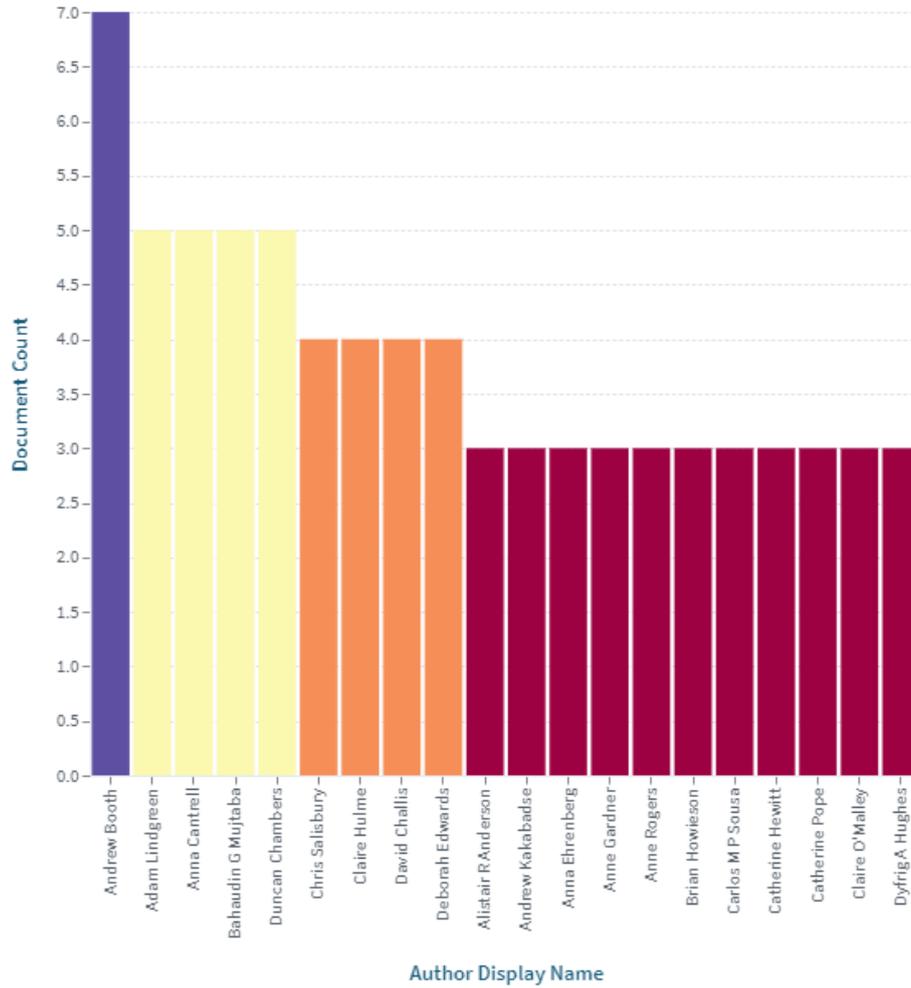


Fig. 4. The most productive authors

Figure 5 displays the contributed institutions from various countries around the world. Karolinska Institutet is leading institution with 52 papers (2.6% out of the total), and University of Wawrick with 42 papers. Queensland University of Technology and Cardiff University 38 and 36 papers, while all other universities with 30 papers and less.

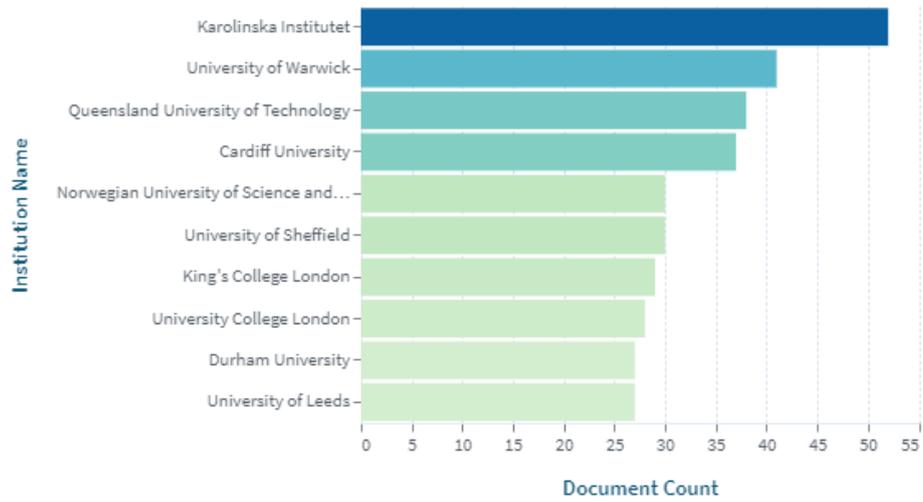


Fig. 5. The most productive university by publication count

Figure 6 displays the contributed institutions by field of study. Karolinska Institutet and King's College London are leading institutions in medicine (38 and 23 papers respectively). In Sociology the leading is Durham University with 10 papers, while in the Psychological field the leaders are Karolinska Institutet and Queensland University of Technology with 9 papers each. Queensland University of Technology is leading in pedagogy as well (15 papers). The top three institutions in Public relations are Open universities, Queensland University of Technology and University of Wawrick (7 papers each).

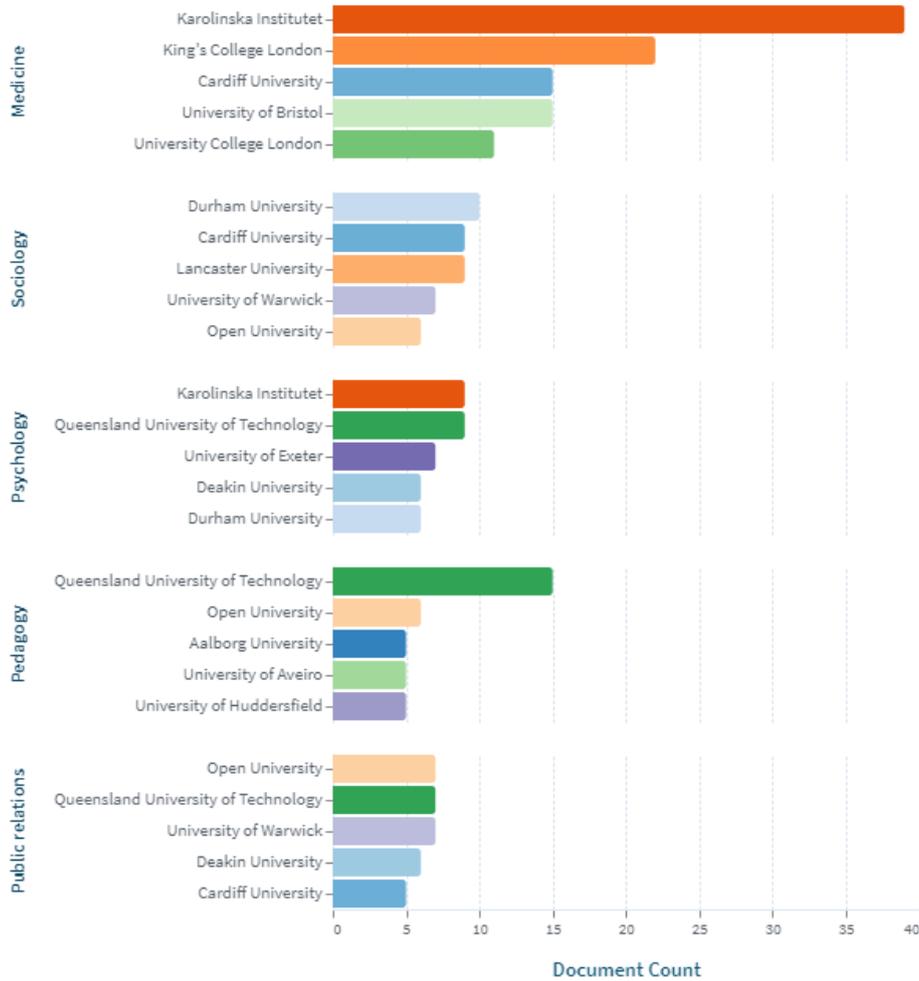


Fig. 6. The field of study and university

Figure 7 shows the most productive (top 20) countries that contributed to the research domain fields. The top three countries are the United Kingdom (more than 750 papers), USA (around 300 papers), and Australia (around 200 papers), followed by Sweden (more than 100 papers), Norway and Spain (around 100 papers each). Countries at the end of the top 20 are France, Switzerland, Belgium, New Zealand, South Africa and Romania (25 and less papers each).

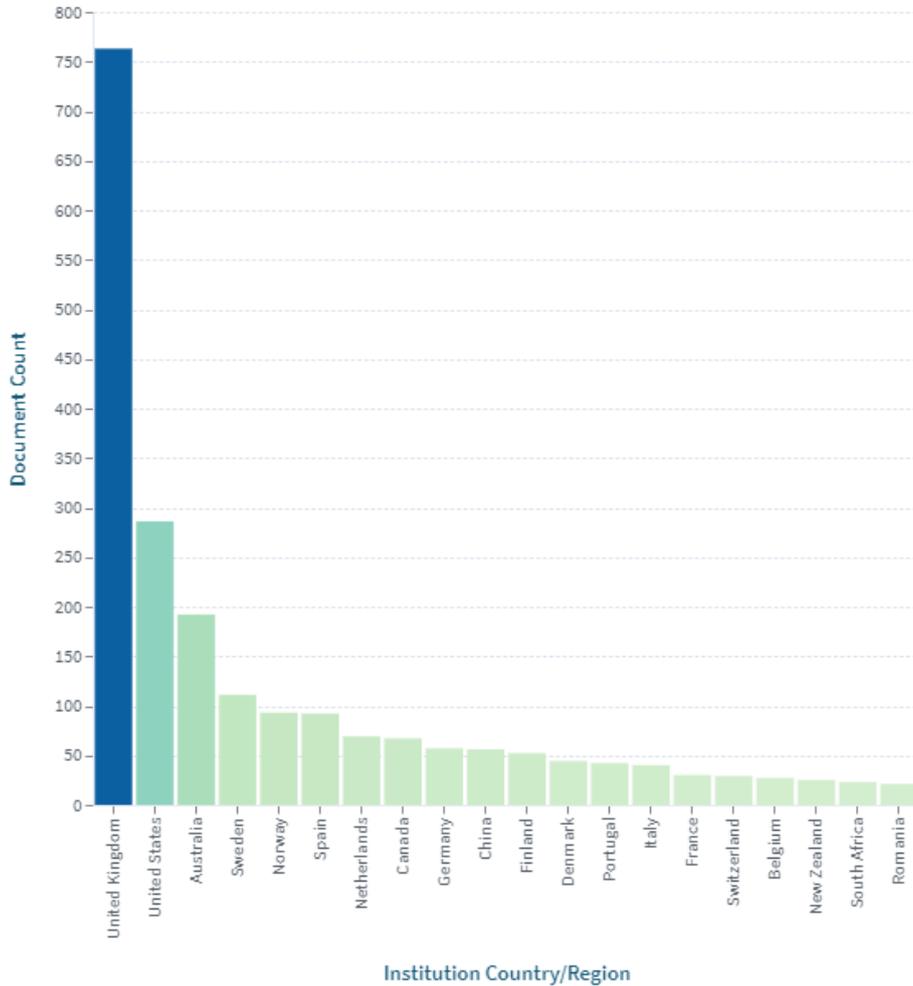


Fig. 7. The countries/regions of the institutions most actively engaged in the result set by their scholarly works

Figure 8 shows the top publishers by the number of scholarly works in this result set. The top three publishers are Elsevier (450 papers), Informa UK Limited (more than 400 papers), and Sage (around 250 papers), followed by Wiley, Emerald, Springer Nature, National Institute for Health Research, Clue Institute and Biomed Central. Although there is not a large amount of articles published in other publishers, it still seems that they published similar amounts of papers.

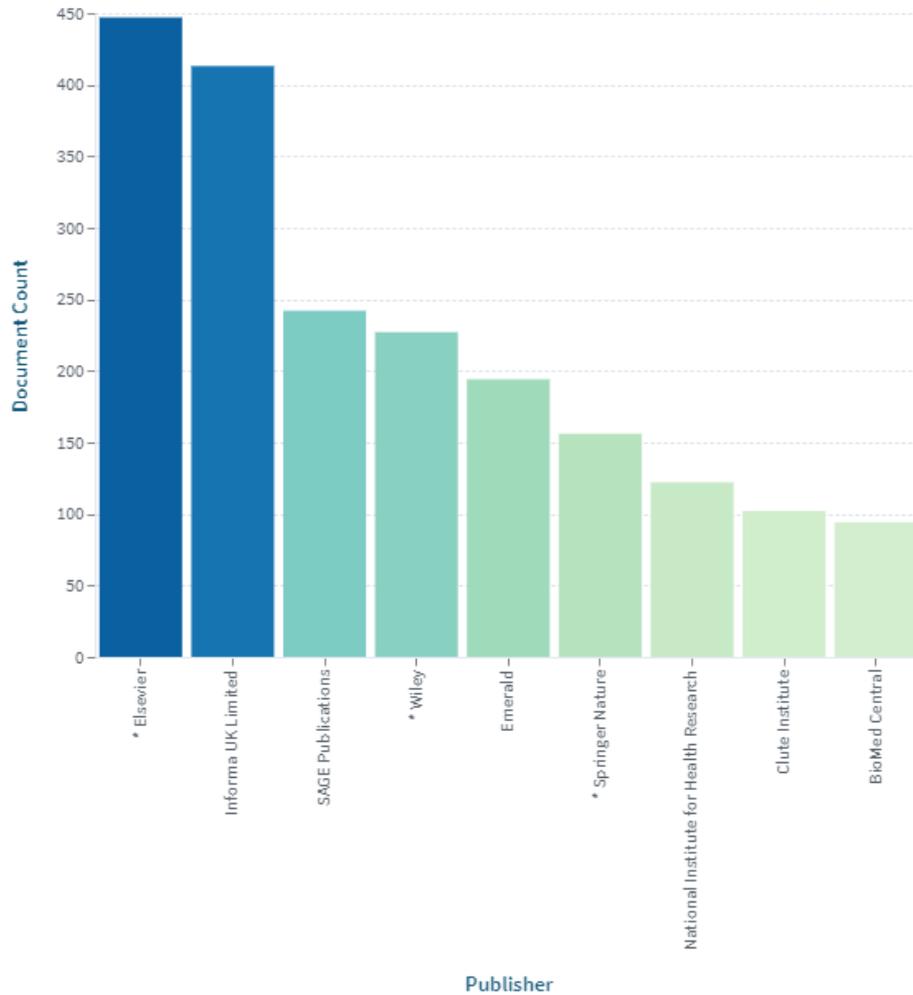


Fig. 8. The Top publication Sources (titles) categorized by publisher

5 Discussion and conclusion

Technology has a significant impact on the educational system, however just inserting a technological tool to a traditional teaching paradigm does not result in more effective outcomes. The technology utilized in professional education allows engaged students into various activities, deepens their understanding level and transfers to them the responsibility for their learning. Technology supports teachers in preparing their teaching materials, provides the variety of resources and tools.

The objective of this work is to present a bibliometric analysis of all the scientific articles published by the journals which were indexed and ranked in the Web of Science Core Collection and Scopus, during the period of 2000 to 2020. The structure of this

study allowed me to explore and identify the main research domains of “professional education and technology” in relation with establishing a methodological competence. Therefore, research questions have been formed to understand and find out the outputs in publication patterns according to the database results.

According to the obtained results, in total 1997 studies have been published during the period of 2000-2020 years, that shows high interest in the analyzed subject. The bibliometric research outcome would clearly state that the number of articles published in the research topic has been increased during the period from 2010 to 2015 and sharply decreased from 2016 to 2020. Psychology, Sociology, Medicine, Pedagogy and Public relations are considered as the most interested in exploring technology usage in professional education fields. United Kingdom is a leading country in discovering the effects of technology usage on an educational system. (37.5% out of 1997 papers). The Elsevier, Informa UK Limited and Sage are the top three publishers supporting the domain of technology usage in professional education.

Concerning the limitations of this study, our bibliometric search strategy was broad so that the further analysis might be focused on the cross-sectional association between various variables including technology, professional education, competences and personality. With regard to the limitations of this study, the bibliometric search strategy was broad, however, further analysis will follow in a more deep complex manner such as content analysis, co-word, citation, co-citation, and network analysis. In addition, the educators’ attitudes, beliefs and values have to be explored and more detailed, since they can be considered as a significant factor influencing readiness and success in technology usage in professional education. The last point to be explored is the interrelation between educators’ attitude and their efficiency in facilitating students’ competences with the help of the usage of technology. Our study indicates the importance of conducting more studies exploring the practical effectiveness of using technology for improving individual competence and performance. In this study, it has been taken an essential step in examining the scientific publication patterns for the technology usage for establishing methodological competence among from 2000 through 2020. Presented results attempted to analyze and synthesize available studies in the mentioned field to establish a holistic understanding of interrelations between professional education, technology and establishing competences.

Analysis of trends and patterns of existing publication in this domain will allow educators, researchers and practitioners to be aware of the most actual existing need in gaining and applying data in practice. The results obtained in our study also emphasize the need for more studies on the efficiency of using technology as a content not only tool of improving individual competences. This article is relevant for researchers, academics, and practitioners in different disciplines as well as who works and contributes to the field of information studies, management-business, psychology and interdisciplinary studies.

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