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Research Article:

In-Service Teacher Training: A Bibliometric Analysis

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ABSTRACT

The present study was devoted to acquiring complex information regarding in-service teacher training (INSETT) and evaluating the most relevant topics in the future through a bibliometric analysis. Data mining was performed using the "in-service teacher training" keyword as input to the Scopus database, as it is considered a complete and ideal data source. The VOSviewer software was employed as an analysis tool to visualise networks of authors, countries, journals, and keywords. A total of 541 analysed documents have been published from 1954 to 2022. The number of in-service training publications fluctuates due to the author's productivity. The peak was in 2021, with a total of 33 articles. The most productive countries that publish INSETT documents were the United States and some European countries, while Indonesia is in the big 40. Guglielmo Trentin and Kleopatra Nikopoulou were the authors who produced the most documents and many citations. The INSETT topic has greatly been published by the Procedia Social and Behavior Science supported by Routledge publisher. The Journal of Teaching and Teacher Education has referenced topics with a great link strength with INSETT. The most frequent themes include teacher training, personnel training, "e-learning," continuing professional development, information and communication technologies, and open distance learning.

Keywords: Teacher training, In-service teacher, Continuing professional development, Personnel training, E-learning, Open Distance Learning

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INTRODUCTION

Teachers are the leading element of the success of education (Miroj et al., 2020). They play a major role in an optimal learning process supported by work professionalism (Kurniati et al., 2020; Fitria & Puspita, 2021). One of the expectations of community members is for teachers to produce highly competitive students in embracing the era of Industry 4.0 and Society 5.0 (Lase, 2019; Style et al., 2022). Teachers must maximise their roles in instilling fundamental character development values among the students, preparing them to start living in a society and a more competitive working life (Malik, 2018). Accordingly, the government constitutes a teacher education policy in which prospective teachers should not only hold a Bachelor's Degree, but also participate in in-service teacher education, such as the Professional Teacher Education Programme (henceforth, PPG), in order to become civil servant candidates. Teachers graduating from PPG are known as pre-service teachers.

Following pre-service education, teachers are deemed necessary to participate in in-service teacher training (INSETT) as a requirement to become professional teachers. Studies have shown that the implementation of INSETT in most developing countries is often ineffective, in which many teachers have not had the opportunity to participate in INSETT (Schatz-Oppenheimer, 2017). In contrast, some teachers have participated in such activities more than five times (Luschei & Chudgar, 2016; Arwildayanto et al., 2023). The disparity in the distribution of INSETT, uneven between regions, causes quality of teacher reflection, autonomous learning, supervisory practice, peer-learning, peer-observation have not met ideal expectations (Ghimire, 2015). Unlike the implementation of INSETT in developing countries, developed countries have indicated great implications of INSETT in the development of professional teachers in (Gable et al., 2012).

INSETT is in line with the demands for building on knowledge, professionalism, and the dynamics of teacher work (Connell, 2020). INSETT requires quality, equitable policies, management and collaborative work to create professional teachers (Stang & Lyons, 2008; Hrusa et al., 2020). INSETT has been managed by government agencies and professional private institutions. During the COVID-19 pandemic and the new normal era, INSETT tends to be carried out by means of open and distance learning (ODL), supported by information and communication technologies (ICT) with the principles of continuing professional development (CPD) (Erdas Kartal et al., 2018; Keskin et al., 2022).

Various articles reviewing gaps in implementation, impact, ICT support and benefits of INSETT as a strategic step to improve teacher competence and professionalism have motivated authors to study these topics. This paper attempts to examine current trends of INSETT management, state-of-the-art, publication sources, articles, journals, authors, countries, institutions, research areas, and the frequently cited themes, and keywords.

A search for information about INSETT through the Scopus database was performed as a strategic need. The present work expects to provide valuable knowledge and information concerning in-service teacher training and recommendations for researchers with the same concern and interest. The writing systematics begins with an introduction, followed by a literature review. The methodology is applied to collect documents in the Scopus database and produce a bibliometric network. Result and discussion include publication productivity analysis, co-authorship analysis, analysis of co-occurrence, citation and co-citation analysis. Finally, conclusion, limitation and recommendation for future perspectives.

LITERATURE REVIEW

INSETT is in-service education or training participated by serving teachers (Hwang et al., 2017). In-service teacher training aims to improve teachers' skills and abilities in the field of study (Ma et al., 2018). INSETT is required in today's development of science and technology; a teacher should always follow the dynamics and current progress (Chalmers et al., 2017). Three terms frequently used in the context of INSETT, namely education, training, and upgrading, share the same goals. Education, training, and upgrading intend to enhance teachers' knowledge, skill, expertise, ability, and capacity in their jobs (Pérez Cañado, 2016). INSETT is crucial, considering the limited teaching experiences of pre-service teachers. Their experiences have not yet been of good quality in performing duties and taking responsibilities as professional teachers (Meschede et al., 2017). INSETT is undertaken to prepare teachers to upgrade their teaching methods. Teachers with unimproved knowledge and skills will lead to unchanging teaching methods. If they do not take the opportunity to involve in INSETT, they will not be able to compete globally and adapt to the development of society, country, and information technology (Meirovitz et al., 2022).

For such reasons, in-service teacher education for the teaching profession refers to upgrading academic and professional abilities to bear specific duties in accordance with science development, particularly in education, to improve skills and understanding, to reform teachers for the present and future, and continuously develop their knowledge, skills, attitude and work productivity (Ayvaz-Tuncel & Çobanoğlu, 2018; Aldosemani, 2019; Osamwonyi, 2016). An in-service education programme is planned comprehensively and able to be implemented formally by the government through oral or written workshops to create professional teachers. The programme can also be organised informally by stakeholders, individually or in groups (Lam, 2018).

The education and training system for teachers' capacity improvement can comply with education and training revitalisation, and teachers' capacity improvement is focused explicitly on bettering teachers' performance (Huang & Shimizu, 2016). Improvement of education quality and not solely with programme teaching certification, but too with control over education and training and capacity improvement is essential to optimise the implementation process systemic and periodic evaluation system, determine the effectiveness and impact of in-service education on education quality (Radinger, 2014)

In-service education activities are generally grouped into three approaches; first, the directive approach is when a teacher participates in the programme directly. If she/he has shortcomings, a stimulus should be given for the teacher to react to it immediately. The application of this approach in in-service teacher training is in the form of practice, such as being able to explain, present, direct, give examples, set benchmarks and strengthen. The directive approach enables teachers to enhance their capacities and competencies that indicate their involvement in the successful implementation of the education and training programme, i.e., policies made by the government (Öztürk, 2019).

Second, the collegial approach enables teachers to participate in education and training by acquiring concrete and abstract experiences and reflective observation (Kayapinar, 2016). It is expected that teachers discuss with each other to discover new ideas and adopt

teaching methods to be employed. Teachers with a reflective-observation teaching style fit the collegial approach as they have a high level of reflective observation, are responsive, and enjoy working with others (Arseven, 2018).

Third, the independence approach enables teachers to finish projects or solve critical or substantial problems individually (Morris, 2020). In-service teacher education activities can be implemented formally by the government through workshops. It can also be held informally by stakeholders individually or in groups (Hagermoser Sanetti et al., 2013) some implementers need support to maintain high levels of treatment integrity. Performance feedback has a large body of research supporting it as a strategy for improving teachers' implementation of classroom interventions. However, in most prior studies, performance feedback has been delivered by a researcher, not by a school staff member, which limits generalisability of results to applied settings. In this study, school personnel (i.e., internal consultants. In-service education/training comprises the following activities: course, application, lecture, seminar, curriculum learning, community survey, demonstration, field trip and school visit (Osamwonyi, 2016; Nutta et al., 2020).

All in all, in-service education is defined as all activities received by teachers, including education, training, development, and improvement of the capacity of the aspects of knowledge, skill, experience and competence strengthening in carrying out duties. A bibliometric analysis is important in INSETT topics to explore comprehensive information regarding aspects that have not drawn the attention of researchers, policymakers and teachers. Such an analysis also offers future directions about various unexplored keywords that are significant to be researched comprehensively such as continuing professional development (CPD) through open and distance learning (ODL). INSETT implementation in South Africa, Nigeria, Botswana, Kenya, Namibia, Tanzania, Turkey, India and all developed countries have transformed to a digital system through ODL by CPD (Asgar & Satyanarayana, 2021; Zaman et al., 2021; Modise, 2022). Theory about INSETT needs thorough deepening, for example the part of the incident with INSETT in the form of teacher training (Yumru, 2015) and various other keywords that are becoming trends for future INSETT research are reviewed in the discussion.

METHODOLOGY

Bibliometrics is an analysis method to identify scientific trends and systematise the use of literature, the quality of information and the product of a study published by different disciplines (Wawak et al., 2020; Kreso et al., 2021). This bibliometric mapping analysis is supported by several global platforms, including Scopus, Open Refine, Tableau Public 2022 and VOSviewer (Sindhu & Bharti, 2020). Bibliometric mapping stages consist of five activities, as displayed in Figure 1.

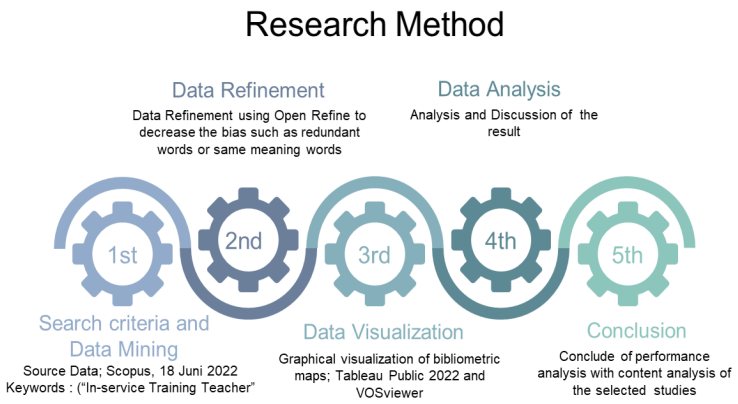

Figure 1. Bibliometric mapping process (Source: Arwildayanto, 2020)

The search criteria and data mining stage in this research were from the Scopus database on 18 June 2020, as this platform is considered the most comprehensive research database or big data (Parlina et al., 2020). The bibliometric analysis inputs keywords TITLE-ABS-KEY "in-service teacher training". The selection of these keywords is based on the frequency of the words appearing in articles, while analysing the strength of each relationship, and the tendency of interesting keywords to be researched in the future because of the low level of saturation.

Data refinement was retrieved from the database that had been collected and filtered through the Open Refine Software. This is to minimise biases or words with the same meaning in the author keyword and indexed keyword that are considered different by the database in articles, research reports, conference executive summaries, and reviews. The number of published documents being analysed was determined by quoting the phrase "in-service teacher training." The obtained data were collected and exported as a tab-delimited file that contains "Full notes and cited references." The data of this research were used for publication productivity analysis, co-authorship analysis, citation analysis, keyword analysis and co-occurrence analysis in the author or indexed keyword.

Research data display the visualisation of similarities supported by VOSviewer Version 1.6.17. Clusters generated by the VOSviewer are automatically in the form of network, overlay, and density in color on the map (Leydesdorff & Rafols, 2012; Boyack et al., 2018). The prominent feature of the Vosviewer platform is that it has a text-mining function to identify the combination of phrases relevant to INSETT. An integrated approach was employed to select keywords on co-occurrence analysis. This approach is limited to examining bibliometric data in the context of co-authorship (unit of analysis; author; organisations; countries), co-occurrence (unit of analysis; all keywords; author keywords; indexed keywords), citation (unit of analysis; documents; sources; authors; organisations; countries), and co-citation by exploring information from cited references, cited sources and cited authors (Tupan & Rachmawati, 2017; Mulyana & Maha, 2021).

Data analysis was performed on the output displayed in an interlocking circle to determine the relationship between the bibliometric data. The distance between two or more circles indicates the strength of the relationship between the terms represented by each. Different colours represent different term groups. Also, circle size correlates with the frequency of term appearance. The number of clusters in each network map may change depending on the number of links built. In some cases, terms are not displayed with labels to avoid overlap. It should be highlighted that repetitive or irrelevant terms for this study were manually excluded. Considering the relationship between keywords in each INSETT cluster, the relevant issues are elaborated in detail.

The output of this analysis was continued by drawing conclusions of performance analysis with content analysis of selected studies as the principal trend in the domain of INSETT. In addition, it generates recommendations which provide information and trend on current topics and issues, as well as INSETT continuation.

RESULTS

Publication Productivity Analysis

INSETT topic-related scientific publications in various languages that can be accessed on the Scopus database can be classified according to the document types and sources. The types of documents include journal articles, conference papers, book chapters, reviews, conference reviews, and others (Sweileh et al., 2017; Aidi Ahmi, 2019; Sigogneau, 2000). The results of data mining from 1954 to 2022 have obtained 541 documents. The productivity of the document publication each year is illustrated in Figure 2.

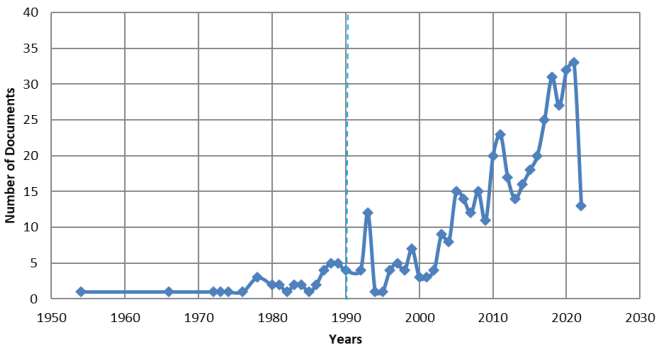

Figure 2. In-service teacher training topic-related publication productivity

Figure 2 shows that fluctuating graph of publication productivity with INSETT topic. Due to many factors, including the author's productivity, the number of authors each year varied. This was evident from the significant increase in the publication in 1993 (eight documents), in 2005 (seven documents), and in 2010 (nine documents); each was seen from the previous year. A decrease also took place in three different years, i.e., 1994 (11 documents), 2012 (six documents), and 2017 (five documents), seen from the previous

years. However, the trend of the increase occurred for eight consecutive years (2013–2020). On the whole, the peak of publication was in 2021, with 33 documents produced. The year 2022 has not shown an increase since the data analysis was carried out in the middle of the year; the remaining six months may increase the number of publications. Obtaining the productivity data per active year of publication in the INSETT topic follows the formula: total publication divided by the number of active years of publication, i.e., eight documents generated each year.

There were 541 documents in various languages based on the source of the documents analysed. After filtering English documents, 460 documents related to INSETT were obtained. All those documents were distributed in the form of 335 journal articles (72.83%), 61 conference papers (13.26%), 39 book chapters (8.48%), 21 article reviews (4.56%), three books (0.65%), and one conference review (0.22%), presented in Figure 3.

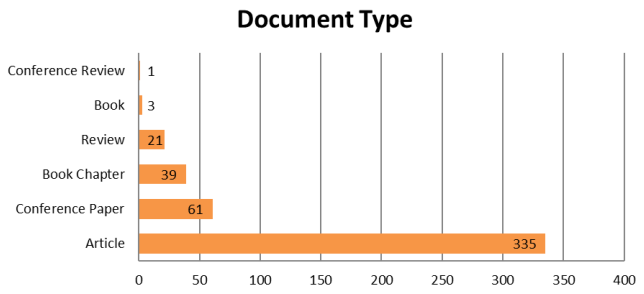

Figure 3. Distribution of document types publishing the INSETT topic

Figure 3 indicates that articles are the most-published documents, with an average of ten documents each year. The documents displayed in the figure had been filtered to make it easier to classify them into similar types. For instance, conference papers are classified as papers presented at a conference, and have possibly been published as journal articles (Ahmi & Mohd Nasir, 2019). An article discussing the INSETT topic was first published in 1954 entitled Critical Examination of Sex Education in the Elementary School in the journal of Research Quarterly of the American Association for Health, Physical Education and Recreation. The article concludes the importance of INSETT for sex education in elementary school integrated into the school programme (Lee Eggert, 1954). Moreover, an article entitled "Effects of the Seattle Social Development Project on Sexual Behavior, Pregnancy, Birth, and Sexually Transmitted Disease Outcomes by Age 21 Years" has become the most cited document (172 times). The article was published in Archives of Pediatrics and Adolescent Medicine, concluding the same matter of how essential INSETT is in the parenting class, the improvement of teachers' social competences for children's academic achievement, and the prevention of high-risk sexual practices in school (Lonczak et al., 2002). As many as 335 articles about INSETT have been published. There are 17 journals, with nine articles as the most published documents and four as the least published, as displayed in Figure 4.

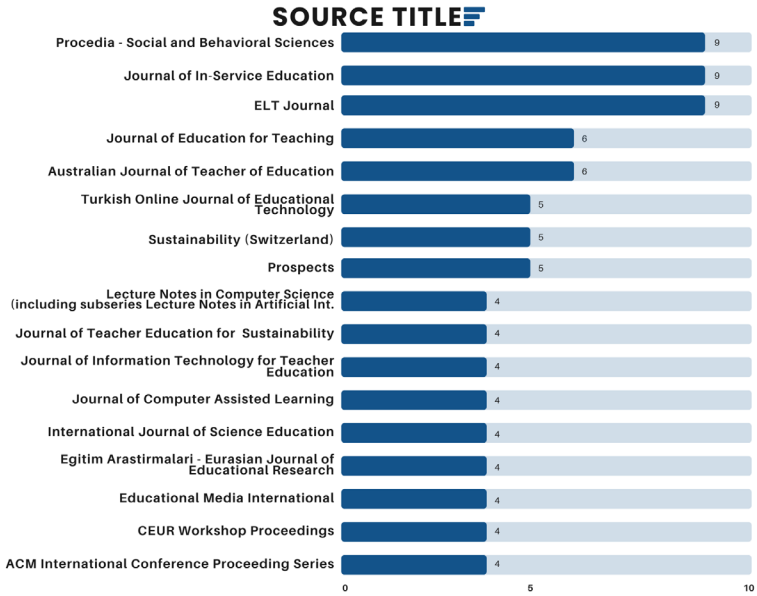

Figure 4. Journals with the most published articles with INSETT-related topic

Figure 4 shows that the number of documents published by each journal varies, depending on the research productivity that is usually defined by the number of publications (Abramo & D'Angelo, 2014; Carpenter et al., 2014). Out of three journals with the most significant contribution to the publication of INSETT topics, one journal is Scopus-indexed, named English Language Teaching (ELT) Journal, published by Oxford University Press, United Kingdom, in 2021, with SJR 1.3 Q1. Meanwhile, the other two journals, namely Procedia–Social Behavior Science, published by Elsevier BV, United Kingdom, with conferences and proceedings as types of publications, as well as Journal of In-service Education, published by Taylor & Francis, are currently not indexed in the Scopus database or Scimago Journal and Country Rank (SJR). Journals indexed in the Scopus depend on the quality of management and journal citation analysis metrics which are predictors of journal statistical quality by the Social Sciences Citation Index (SSCI) as an interdisciplinary citation indexer. The SCCI is part of Thomson Reuters, initially developed by the Institute for Scientific Information (ISI) from Science Citation Index (Kulczycki et al., 2021). The productivity of INSETT-related topic publications is also supported by the world's best publishers that produce Scopus-indexed documents in several scientific products, journals, conference papers, books, and article reviews. Here are the ten contributing publishers presented in Figure 5.

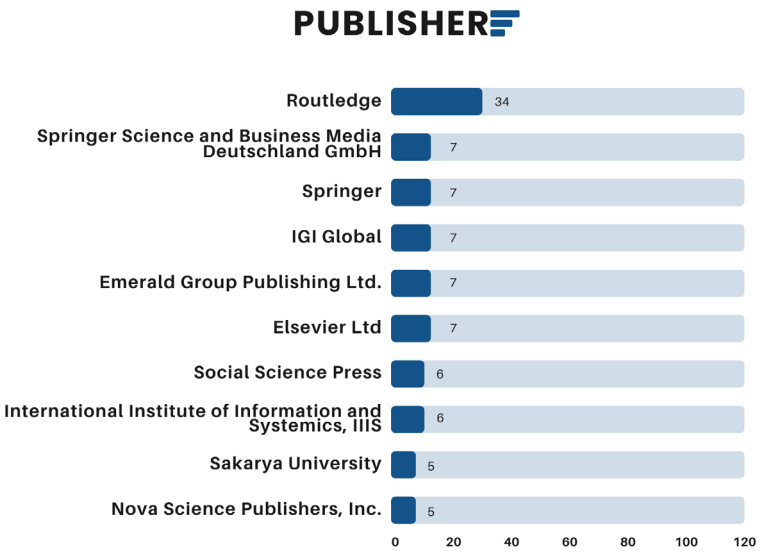

Figure 5. World's best publishers contributing to the publication of in-service teacher training topic

Figure 5 displays that Routledge publisher, founded in 1836 by George Routledge, is an international publisher based in London, United Kingdom, that has made a great contribution in providing references, including academic books and scientific journals related to the INSETT. The support of the Routledge publisher in producing INSETT-related topic documents is dominated by its most famous business unit, Taylor and Francis Book Limited. It has contributed significantly to advancing the publication of scientific papers in reputable and Scopus-indexed journals (Steele, 2013).

INSETT topics becoming discussed globally are also on account of the contribution of several developed countries, dominated by those in the United States and Europe. From the countries where the authors and publishers come from, there are 40 countries considered to significantly contribute to the publication of INSETT topics, as in Figure 6.

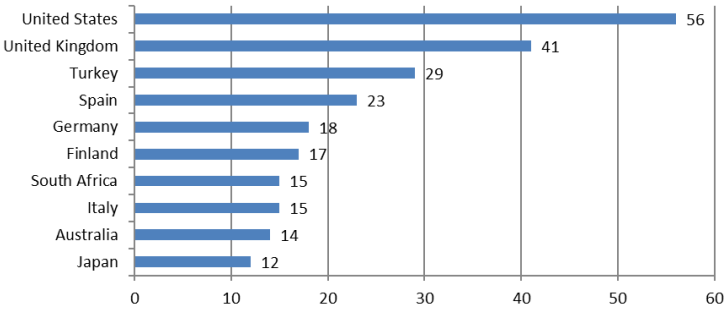

Figure 6. Countries contributing to the publication of INSETT topics

Figure 6 illustrates that the United States (56 countries), as a developed country, has excellent attention and contribution to the INSETT issues. This is evident by the number of studies and publications produced, publishers, and authors from the United States that dominate. Consequently, this country's number of INSETT-related topic publications outperforms other developed countries, for example, Indonesia which only published 3 articles in Scopus indexed journal with INSETT topics. This makes Indonesia included in the list of 40 countries contributing to the INSETT publications.

Co-Authorship Analysis

During the co-authorship analysis, it was found that Lee Eggert (1954) was the first among 987 authors who published an article discussing the INSETT. He contributed considerably to the publication until today, taken over by Guglielmo Trentin, who has produced five documents with 125 citations. Chunmei Yan also wrote the same number of documents. Still, the number of citations is far less than that of the author Kleopatra Nikopoulou, with 100 citations. Out of all contributing authors, 10 produced the most documents with various citations, as shown in Figure 7.

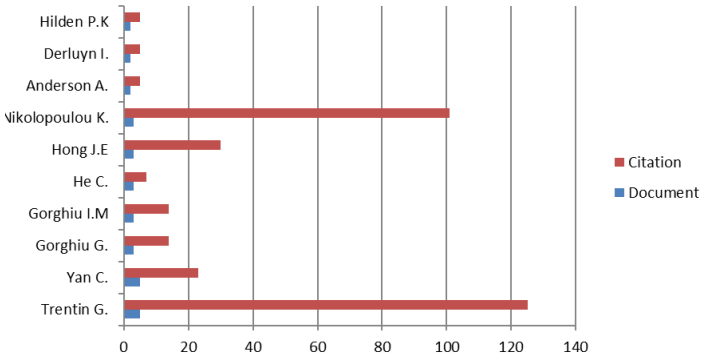

Figure 7. Data of document and citation of INSETT topic publication

Co-authorship analysis explains authors' relationship, domination, and collaboration in writing an article for Scientific Journal (Rudianto, 2019; Sidiq, 2020). Co-authorship network is a form to uncover the direction of the collaboration and identify the researcher and institution that lead the research (Sampaio et al., 2016). It helps overcome and make a substantial contribution to scientific development (Morel et al., 2009). The present study performed a collaboration analysis of 987 authors putting their thoughts and perspectives on INSETT. As many as 62 authors (6.28%) had two or more documents (f = 62, *N* = 987) included in the co-authorship analysis. The analysis showed 36 different clusters; some collaborated, and others did not. The collaboration of authors had been formed in 36 clusters; each cluster had various quantities, as described in Table 1.

Table 1. Clusters and number of authors collaborating in INSETT topic

Cluster	Author	Total number of authors	Description
1	Six people	6	40 links were formed in total, with a total link strength of 82
2–5	Each with three people	12	
5–18	Each with two people	26	
19–36	Each with one person	18	
Total		62	

Table 1 shows that the author collaboration forms the largest cluster with six authors and a degree of strength of a maximum of 10. The smallest cluster (no collaboration) only consists of one author. The overall collaboration map of the author, cluster, and degree of link strength can be seen in Figure 8.

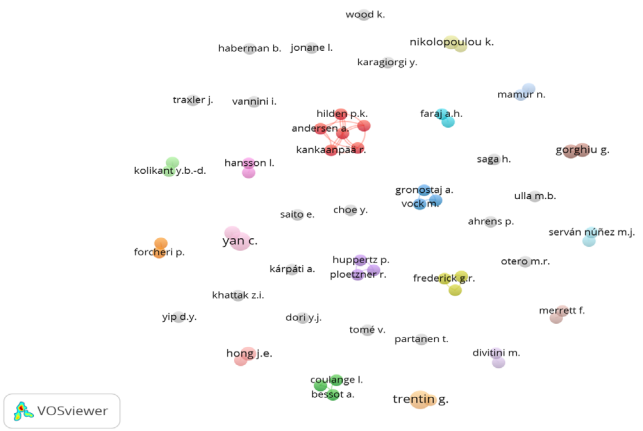

Figure 8. Map of collaboration, cluster and degree of link strength of INSETT topic author

Co-occurrence Analysis

Analysis of co-occurrence in this study calculates paired data in the data collection unit in the form of INSETT topics based on keywords in the title, abstract and list of keywords from the publication in the Scopus database to reveal the general topic or INSETT topic, in particular, by educational institutions. The more frequently a pairing between two keywords occurs, the closer the relationship. The performed co-occurrence reveals the structure and development of INSETT-related issues by researchers to study an overview of an activity, policy, and knowledge (Chen et al., 2016). Co-occurrence analysis using the VOSviewer related to INSETT topics found a total of 1,565 keywords. There were only 88 keywords that met the threshold criteria of four times appearances. From the frequently appeared 88 keywords, 10 of which have frequent occurrence and total link strength, as shown in Table 2.

Table 2. Verify selected all keywords of "INSETT"

No	Keywords	Cluster	Occurrence	Link	Total link strength	Average publication year
1	Teacher training	2	93	82	356	2012.98
2	Personnel training	2	63	56	320	2011.30
3	Teaching	2	55	69	294	2010.05
4	In-service teacher training	3	75	73	196	2014.02
5	Education	4	31	52	151	2009.16
6	Human	1	18	43	150	2009.06
7	Curricula	2	22	38	130	2011.23
8	Article	1	14	41	126	2008.79
9	E-learning	2	18	36	101	2012.17
10	Professional development	3	29	48	90	2016.10

The keyword occurrence frequency determines the mapping analysis of each keyword node in the top 10 as displayed in Table 2. Those not related to INSETT keyword are not included (Liu & Chen, 2012).

Figure 9 illustrates the line connecting two keywords from two articles from different journals. The thickness of the connecting line indicates a strong co-occurrence between the keyword pairs related to INSETT (Gmür, 2003). The proximity of the two nodes and the thickness of the line connecting them indicates the strength of co-occurrence between keyword pairs (Sedighi, 2016). The color of the largest nodes represents keyword clusters with words that appear together and can be interpreted as heavily researched topics.

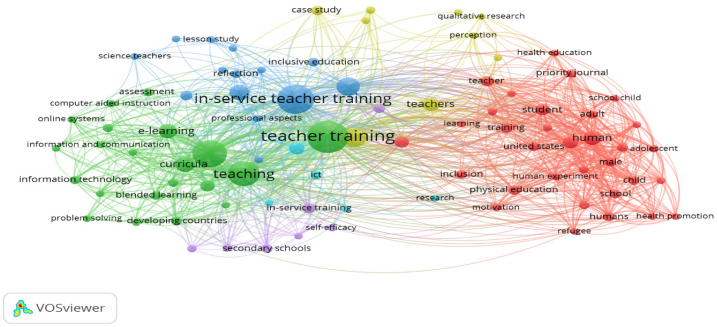

Figure 9. Mapping of knowledge domains for co-occurrence related to INSETT

This co-occurrence analysis raises various captivating keywords that coincide with the INSETT topics later in the future, forming six clusters to be studied in depth. The clusters can also serve as valuable information for researchers in selecting topics in the field of INSETT. The first cluster focuses on the general terms of INSETT, e.g., keywords of adolescent, adult, attitude, controlled study, curriculum, health education, human experiment, learning, motivation, organisation and management, physical education, teacher and training. Next, the second cluster informs the appearance of keywords in the supporting aspects of INSETT, namely assessment, blended learning, computer-aided instruction, distance education, e-learning, educational technology, information and communication technology, knowledge acquisition, learning system, online course, personnel training, problem-solving and teacher training. The third cluster focuses on the keywords related to teacher training activities, such as pre-service teacher training, INSETT, inclusive education, lesson study, professional aspects, professional development, reflection, science teachers, teacher change, teacher professional development, teacher beliefs and teaching practices. The fourth cluster relates to INSETT techniques as depicted in the appearance of keywords: case study, education for sustainable development, and workplace learning. The fifth cluster focuses on INSETT materials, including education computing, science education, self-efficacy and teaching programming. The last cluster relates to continuing professional development (CPD) of teachers with issues: classroom management and pedagogical content knowledge.

Citation and Co-Citation Analysis

Co-citation analysis is done when two publications are cited together in a reference publication (Surwase et al., 2011) to map knowledge domains and specialisation of research subjects, and reveal relevant literature cited from the published INSETT research (Garfield, 2004; Jarneving, 2007). This analysis relies on various analysis units, such as cited reference, cited source and cited author. Cited reference analysis used a minimum number of citations. From 14,928 cited references, 263 of which had met the threshold, forming 40 clusters with different link strengths. The number of references of each cluster is varied: cluster 1 (37 items), cluster 2 (35 items), cluster 3 (29 items), cluster 4 (21 items), cluster 5 (17 items), cluster 6 (15 items), cluster 7 (14 items),

cluster 8 (11 items), cluster 9 (10 items), cluster 10 (10 items), cluster 11 (nine items), clusters 12 and 13 (six items), cluster 14 (five items), clusters 15 and 16 (four items), clusters 17 and 18 (three items), clusters 19 and 20 (two items), and clusters 21 to 40 (one item). A comprehensive mapping of the co-citation towards the INSETT reference is shown in Figure 10.

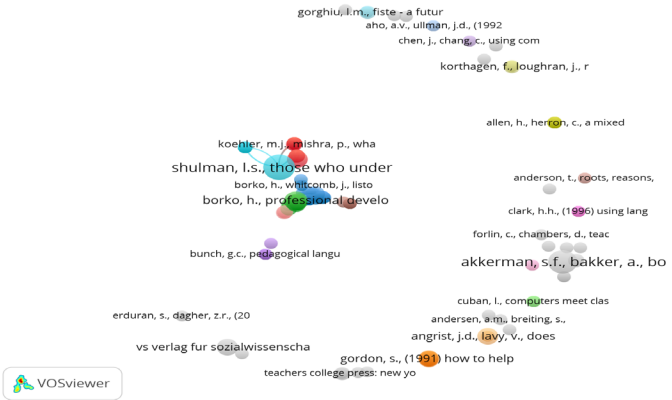

Figure 10. Comprehensive mapping of the co-citation towards the INSETT reference

Cited source analysis used a minimum of two citations from 9,060 available sources, and only 1,497 had met the threshold. The cited author also considered the minimum two citations towards 18,124 contributing authors. As many as 4,197 authors had met the threshold. These were all filtered, so that 10 sources and authors were found. They had citations with the highest total link strength to other sources and authors in the INSETT topics, as described in Table 3.

Table 3: Cited source and author analysis in INSETT topics

Source	Cluster	Citation	Link	Link strength	Author	Cluster	Citation	Link	Link strength
Teaching and Teacher Education	8	196	617	6,196	Darling-Hammond, I.	2	47	603	2,662
Review of Educational Research	18	88	28,422	2,172	Shulman, I. S.	1	41	401	1,840
Educational Leadership	17	85	333	2,460	Fullan, M.	2	40	301	1,192
Educational Research	7	84	140	2,365	Wheldall, K.	12	37	8	434
Journal of Research in Science Teaching	5	82	290	2,201	Dornyei, Z.	4	32	65	517

(Continued on next page)

Table 3. (*Continued*)

Source	Cluster	Citation	Link	Link strength	Author	Cluster	Citation	Link	Link strength
Journal of Teacher Education	8	72	484	2,681	Guskey, T. R.	3	29	349	1,916
Computer and Education	3	58	196	1,119	Borko, H.	1	29	378	1,373
Science Education	5	53	277	1,386	Day, C.	2	26	267	1,701

The cited source analysis in Table 3 shows each citation link strength and other sources that formed 18 clusters, as follows: cluster 1 (133 items), cluster 2 (106 items), cluster 3 (97 items), cluster 4 (76 items), cluster 5 (72 items), cluster 6 (70 items), cluster 7 (63 items), cluster 8 (62 items), cluster 9 (55 items), cluster 10 (53 items), cluster 11 (48 items), cluster 12 (36 items), cluster 13 (32 items), cluster 14 (31 items), cluster 15 (30 items), cluster 16 (19 items), cluster 17 (11 items), cluster 18 (6 items) as presented in Figure 11.

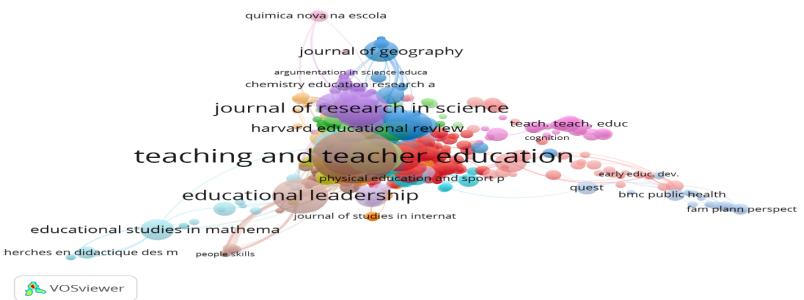

Figure 11. Mapping of cited source analysis in INSETT topics

Figure 11 illustrates the co-citation concerning the in-service teacher training topics. The publication source with the strongest link was Teaching and Teacher Education (88 citations), published by Elsevier LTD. One of the frequently cited articles entitled "Professional development on fostering students' academic language proficiency across the curriculum: A meta-analysis of its impact on teachers' cognition and teaching practices" by Eva Kalinowski et al. from Universität Potsdam, Germany. A meta-analysis study is able to combine the effects of ten studies on in-service teacher professional development interventions to support students' mastery of language skills. The aggregation of effects was examined on 650 teachers. The classroom teacher's practice (g' = 0.71, SE = 0.16) shows that professional training and development are beneficial for improving teacher's practice (Kalinowski et al., 2020).

The above-cited author analysis shows each citation link strength and other authors that formed 12 clusters, as follows: cluster 1 (238 authors), cluster 2 (209 authors), cluster 3 (203 authors) and cluster 4 (150 authors), cluster 5 (73 authors), cluster 6 (36 authors), cluster 7

(30 authors), cluster 8 (29 authors), cluster 9 (13 authors), cluster 10 (12 authors), cluster 11 (3 authors), cluster 12 (2 authors) as provided in Figure 12.

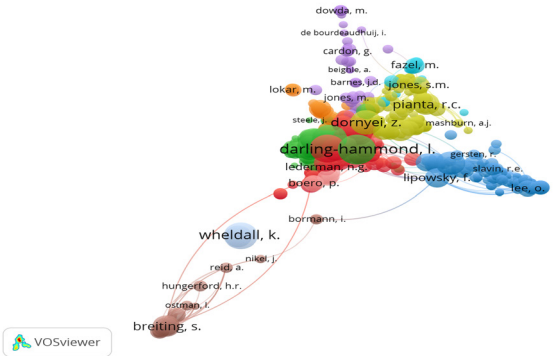

Figure 12. Mapping of cited author analysis in INSETT topics

Figure 12 demonstrates the fact that the author Linda Darling-Hammond, Professor of Education at Stanford University in cluster 2, had the strongest link among the authors of INSETT topics since being published on 25 May 2017, in the European Journal of Teacher Education, published by Routledge Taylor & Francis Group. Linda Darling-Hammond wrote an article entitled "Teacher education around the world: What can we learn from international practice?". It concludes the policies on the practice of education, training, and development of teachers in various countries: Australia (Victoria and New South Wales), the United States of America, Canada (Alberta and Ontario), Finland and Singapore agree on the need for financial support, preparation of well-connected theoretical and practical design, support for teacher's career development through induction programmes, quality leadership, and continuing professional development (CPD). Finland recommends integrating quality clinical training and works in setting quality learning practices. Meanwhile, Australia and Canada have created new models for student teaching, often called training schools or professional development schools, where professional teaching standards are important to focus on learning and evaluating critical thinking knowledge and higher-order skills. Synthesis of various issues, ideas and in-service teacher training programmes aligns with future research trends (Darling-Hammond, 2017).

Research topics that are trending now and, in the future, observed from the overlay visualisation map of the co-occurrence analysis of the INSETT topic keywords from the past few years and have been discussed in the public space include mixed learning, game-based learning, and collaborative learning. These findings suggest that the aforementioned topics have been of interest to researchers in recent years. Besides, there is a tendency for several INSETT topics to become trends in the future, as portrayed in Figure 13.

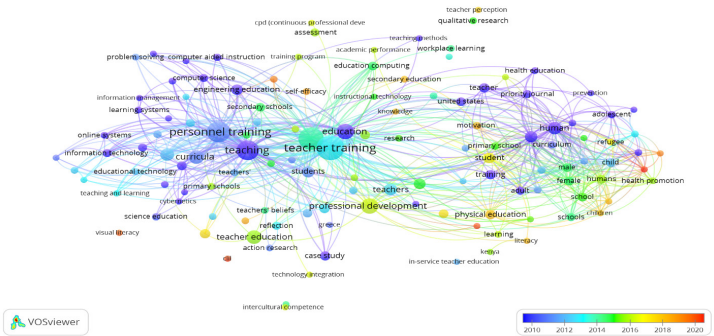

Figure 13. Trending research topics by year based on the overlay visualisation map of INSETT keyword co-occurrence analysis

Figure 13 depicts several INSETT topics based on the overlay visualisation map of co-occurrence analysis from 2012 to 2022, revealing some issues that researchers discuss, such as: First, components of teachers' work competence improvement by having workplace computing (2014) and instruction technology (2015) abilities. Second, objectives and benefits: professional development, continuing professional development (CPD), intercultural competence, academic performance (2016), physical education, and teacher professional development (2017). Third, materials and techniques: self-efficacy, lesson study (2018), teaching programming, visual literacy, content and language integrated learning (CLIL) (2019), and school health service (2021). All topics being studied can be observed from the current issues and the objective conditions of educational institutions.

DISCUSSION

The data analysis of the publication productivity of the INSETT topics based on the year of publication shows a fluctuating trend. The trend of the increasing productivity of INSETT publications has occurred in the last 10 years. This is determined by the number of studies and publications that increase (Aithal & Kumar, 2016). These research data also give opportunities for researchers to track patterns and visibilities of INSETT-related research topics (Aidi Ahmi, 2019). The publication pattern tends to be in journal documents in the form of articles, reaching 72.83%. A publisher that dominates the publication of scientific papers related to INSETT topics is Routledge, under the business unit of Taylor and Francis Book Limited. Geographically, the countries contributing to publications come from developed countries, i.e., the United States and Europe.

Regarding the visibility of INSETT topic publication, the first article published in 1954 was entitled "Critical examination of sex education in the elementary school" in the Journal of Research Quarterly of the American Association for Health, Physical Education and Recreation. The article has been published online in the same journal since 22 March 2013, which concludes the importance of providing in-service training about sex education for elementary students to teachers and school administrators.

Approximately 5% of young women experienced childhood sexual abuse (Pereira et al., 2020). On this ground, teachers need to participate in in-service training as a primary preventive effort by developing comprehensive strategies, and stopping violence before initial action or victimisation (Exner-Cortens et al., 2021).

The productivity of INSETT-related topic publications in Scopus from 1954 to 2022 shows that the productive author is Guglielmo Trentin, who produced five documents and 125 citations with a link strength of 4. In terms of citation link strength, documents produced by Linda Darling-Hammond reached higher achievement with 47 citations and a link strength of 2,662. His article entitled "Teacher education around the world: What can we learn from international practice?" published in 2017, was cited by other authors, such as Roca-Campos et al. (2021), in an article entitled "Educational impact evaluation of professional development of in-service teachers: The case of the dialogic pedagogical gatherings at Valencia "on Giants' Shoulders"" published in "Sustainability" (Roca-Campos et al., 2021). Linda Darling-Hammond's ideas for the future still have strong links and cover the discussion related to INSETT. Teacher training for students' improvement remains open as its publication relatively lacks in number until today. Linda Darling-Hammond also recommends the In-Service Teacher Professional Development Programme through dialogical principles related to pedagogical aspects contributing to improving educational outcomes, in accordance with sustainable development goals, and quality education for all (Darling-Hammond, 2017).

The better writing quality of Linda Darling-Hammond than that of Guglielmo Trentin is consistent with a study by (Kirchik et al., 2012) that the number of citations correlates with the number of readers. It is indirectly determined by the quality of the document's scientific contributions. Citation analysis is applied to find the most influential article in INSETT study and examine the relationship between analysis units (Liao et al., 2018). The frequency of document citations is not only seen from the scientific significance of the material published, but also from the number of articles published (Moed, 2005). Researchers cite a work to acknowledge or appreciate the contributions of others, as well as to acknowledge that the document is helpful for the study they are conducting (Islam & Afroze, 2020). The frequently cited documents and simultaneously re-cited by others are deemed to have a more substantial link effect and be more beneficial for other researchers. Total link strength becomes a benchmark of a publication's effect, the aggregate publication level, showing the scientific community built from the publication (Guo et al., 2019).

The contribution of countries in INSETT publications, specifically the United States, Europe and other developed countries, has shown high publications. The dominance of INSETT publications from developed countries joined the Organisation for Economic Co-operation and Development (OECD) with 38 countries worldwide. The success of countries in this organisation in INSETT publication is defined by their responsiveness to fulfilling new social, economic, and digital needs. Schools are assigned to be at the forefront of changes. In response to these changes, systems across OECD countries increasingly focus on capacity building for schools and their teachers (Weatherby & Burns, 2020). Developing countries generally contribute a little to INSETT publications, for example, Indonesia is in the group of 40 countries with most INSETT publications, in which it has published three Scopus-indexed articles. This reality requires reinforcement and encouragement to boost

INSETT publications. The enthusiasm of researchers in developing countries, including Indonesia, to carry out studies related to INSETT needs to be encouraged. Increasing INSETT publications in developing countries will certainly encourage equal distribution of the publications between developed and developing countries. Indonesia could take advantage of this equal distribution as it would help spread out INSETT services to 3.3 million teachers throughout the country (Kusnandar, 2022). Some efforts need to be taken to support the implementation of in-service teacher training in developing countries, such as carrying it out through ODL and CPD. Besides, learning from the good experience of developed countries which have long used ICT infrastructure, developed countries could also use ICT to support the success of INSETT.

Co-occurrence analysis of INSETT topics based on keywords in the title and abstract that shows several topics by educational institutions has still become the main interest and concern in these last three years, including the sub-topics of "teacher training", "e-learning" supported by "ICT mastery". Such issues are relevant to the COVID-19 pandemic that has taught and caused teachers to adapt and adjust to online learning. This situation also encourages them to master ICT in internet-based learning, which remains a basic need for teachers in the 21st century.

Hence, it is essential to undertake training to acquire skills in developing applications responsive to their special needs (Lubua & Maharaj, 2012). Training in ICT skills for teachers should be provided to pre-and in-service teachers as ICT continues to develop dynamically (Agyei & Voogt, 2011). The improvement of the capacity and professionalism of teachers in ICT also coincides with the workplace computing sub-topic found by the present study. During this pandemic, teachers must continue to teach to avoid the lost generation. They can finish their work using an existing platform and participate in training in their workplace (Gijbels et al., 2017). These have become supporting components that form a professional teacher community (peer-learning community/PLC (Phusavat et al., 2017). Another issue related to INSETT that draws the policymakers' attention is the continuing professional development (CPD) programme for professional teachers through offline and online training or blended learning (Srinivasacharlu, 2019). Another term is similar in meaning to open and distance education (ODE) to constantly develop oneself to meet educators' standards (Bozkurt, 2019; Qayyum & Zawacki-Richter, 2019).

The continuation of this INSETT study is an intriguing issue that needs to be explored by future researchers. According to the overlay visualisation map of INSETT keywords co-occurrence analysis in the last three years, in-service teacher training still strengthens the sub-topic of enhancing teachers' competencies and skills in accessing and using internet-based learning technologies. However, the digital divide relatively occurs between teachers in rural and urban areas. The need for in-service teacher training related to self-efficacy and lesson study drew the researchers' attention in 2018. Forms and models of learning interaction, including teaching programming, visual literacy, content and language-integrated learning (CLIL), rose in 2019. The latest issue related to school health services was trending in 2021 to date, along with the COVID-19 pandemic in over 215 countries (Ningrum et al., 2020). These issues are part of public needs, thus encouraging authors and publishers to pay attention to analysing them. During and after the pandemic, the dynamics of students' interaction, sexual violence issues, and excessive use of gadgets are crucial for

teachers to understand to meet the demands of competitive, fun, and wholesome learning. Teachers should be provided with knowledge and assistance for students experiencing post-traumatic stress disorder (PTSD) with two recommended INSETT interventions. These i nterventions i nclude t argeted s tudent c ognitive-behavioural c are-based t eaching recovery techniques (TRT) and preventive intervention focusing on peer integration and enhancement resources (PIER) (Kankaanpää et al., 2022).

CONCLUSION, LIMITATION AND RECOMMENDATION FOR FUTURE PERSPECTIVES

Conclusion

This study provides an overview of the INSETT themes that have been researched since 1954 until 2022, totalling 541 titles. Another trend shows the increasing and continuing publication of INSETT themes which are also increasingly in demand. The total of published articles is 335 documents, the peak of which was 33 articles in 2021. Developed countries dominate publications of INSETT themes, including the United States being the country with the highest number of publications reaching 56 articles equivalent to 16.72%. Conversely, developing countries still have a low contribution, including Indonesia which has published 3 articles equivalent to 0.9%. This has made Indonesia become part of the group of 40 countries that have contributed to INSETT publications. Journals that have significantly published INSETT themes on Scopus including Procedia Social and Behavioral Science with nine documents and Journal of In-service Education with eight citations. Routledge became a publisher that significantly contributed to INSETT with 34 documents. Meanwhile, "Teaching and Teacher Education" journal has references with the greatest link strength, which is 6,196 and 196 citations.

Limitation

The researchers attempted to conduct a comprehensive, objective, and in-depth bibliometric analysis, yet this study is subject to some limitations. First, it only used the Scopus database instead of combining it with another source, such as the Web of Sciences, to find broader conclusions. Second, the bibliometric Analysis only provides a macroscopic view of research trends and publication topics regarding INSETT. Despite this, further researchers and observers can acquire useful information from this work to discover new research interests or gaps about INSETT.

Recommendation for Future Perspectives

The latest research trends of INSETT topics based on overlay visualisation of VOSviewer analysis show many interesting issues to be investigated. These issues include " teacher training", "personnel training", "e-learning", and "professional development", through "open and distance education" for "continuing professional development" for all teachers to have self-efficacy. The activities comprise lesson study, forms, and models of learning interaction in the form of teaching programming, visual literacy, content and language-integrated learning (CLIL), to actualise school health services. All these keywords still serve as future trends to be studied and published since they are not yet saturated and have become the needs of many parties.

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