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A Scientometric Analysis of Extension Education in Web of Science Databases (2014-2023)

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In the field of extension education, scientometric analysis has been conducted in Web of Science Databases over a period of ten years, and the objective of this study is to explore the significance of this analysis. Researchers in the field of extension education may find the information that this study gives on the trends in research and what is currently taking place in the field of extension education to be beneficial because it provides information about the patterns that appear in research. The topic of this study is to emphasize the literature that has been contributed by various nations on a worldwide scale, the literature that has been contributed by affiliations, the top ten most referenced literature in the field of extension education, and the keywords that have been used frequently by the writers. In order to accomplish the goals of this study, a total of 32399 articles were gathered from the databases. Extending education was the keyword used for filtering the document, and only articles were selected for inclusion in the collection which were taken from the years 2014-2023. The software known as biblioshiny is utilized to carry out the data analysis for this paper.

Keywords: Biblioshiny, Extension education, Literature, Publication, Scientometric

Introduction

Extension is a form of education that aims to alter the attitudes and behaviors of the individuals with whom the work is conducted. It is a form of learning that extends beyond the confines of traditional schooling, enabling individuals of all ages to acquire new skills and techniques that they can apply and follow with the assistance of the government to enhance their life skills. Extension education was starter in in India in '50s introduced as undergraduate teaching programme in agriculture[1]. The process of teaching farmers the technologies of scientific agriculture so they can apply the knowledge for better agriculture and a better economy is known as extension and extension education. Its main objective is to assist people identify needs and challenges, develop leadership and aid problem-solving. spread economic and practical studies clearly, assist individuals in arranging and utilizing outside resources and capture and share management feedback[2]. In order to achieve sustainable agriculture, genuine participation is taking place and that interactive participation is effective. This involves getting people to work together to analyze problems, create action plans, form or strengthen local institutions, and involve farmers in advisory programs and extension services. Decentralizing activities and making it easier for local groups and NGOs to apply are the most effective approaches for extension in the future[3].

As the definition given by J.P. Leagans extension education is an applied science that combines content from research, accumulated field experiences, and relevant principles from behavioral science. This body of philosophy, principles, content, and methods is focused on the challenges of out-of-school education for adults and youth, and is synthesized with the assistance of useful technology.

Scientometrics is the examination of the quantitative components of scientific communication,

research and development practices, science and technology (S&T) policies, as well as research and development practices and relational information are all included in the archival records of scientific communications. These elements enable the reconstruction of patterns and the identification of latent characteristics in both authors and document collections. By employing scientometric methodologies, it is possible to establish a correlation between the institutional characteristics of research groups and the advancements in scientific disciplines and specialties[4]. The selection of a limited number of indicators that characterize the most significant aspects of the publications is necessary in order to acquire reasonable results that can be used in science policy-making[5].

Since 1996, there have been an estimated 64 million scholarly publications published. China is the nation that contributes the most academic papers, with the United States coming in second and India in third[6]. One of the biggest multidisciplinary databases available today is Web of Science, which has ten indexes with information gathered from thousands of academic journals, conferences, books and book series. It fully covers more than 12,000 highly regarded impact journals globally[7].

Review of Literature

Gupta[8] study examines India's research activities in medicine from 1999 to 2008, focusing on the total number of publications, their growth rate, the quality of papers, and India's global ranking. It also evaluates the research performance of various types of Indian medical institutions, including colleges, hospitals, research institutes, universities, and research foundations. Additionally, it analyzes the characteristics of published literature in both Indian and foreign journals using Scopus Databases. India is ranked 12th in terms of productivity in medicine research. It has published 65,745 papers, accounting for 1.59% of global publications. The growth rate for papers published between 1999-2003 and 2004-2008 is 76.68%. Research of a high standard in India is severely lacking and needs careful planning, commitment, and support in terms of resources. Additionally, it is imperative to enhance the current medical education system in order to cultivate a culture of research. Mooghali[9] aims to provide a comprehensive overview of the development of Scientometrics by analyzing the literature published between 1980 and 2009. The study utilizes bibliographic records from the Social Science Citation Index, Science Citation Index, and Arts & Humanities Citation Index. An examination of the timeline revealed that the scientific output in the subject of Scientometrics experienced a gradual rise from 1980 to 2009. The vast majority of documents were written in the English language, and the worldwide journal of Scientometrics was the most productive journal in the area. Additionally, it has been stated that 67.87% of the literature was produced in the field of Library and Information Science. Aswathy and Gopikuttan[10] examines the publication patterns of academic members from three universities in Kerala, namely the University of Kerala, Mahatma Gandhi University, and the University of Calicut. The study clearly indicates that multi-authorship is widespread among university lecturers. The ranking of institutions takes into account both the quantity and quality of their publications. The publishing output of faculty members, particularly in science departments, plays a significant role in this regard. institutions can raise their visibility, status, and credibility within the academic world by conducting exceptional research. This, in turn, improves the institutions' reputation and increases their chances of attracting top-tier students and staff. Heilig and Vob[11] Utilizing a comprehensive bibliographic database, this study use scientometric methods to empirically analyze the development and current status of research on cloud computing, providing a broader perspective on the subject. The findings of this study indicate that computer science research, particularly disseminated through conference proceedings, overwhelmingly dominates both historical and contemporary research. The findings of the scientometric study have significant value in terms of discussing and establishing future research goals in the field of cloud computing. Furthermore, the partially automated procedure of evaluating a substantial number of papers enables the convenient acquisition of a comprehensive overview of a specific study field. The findings of the scientometric study have significant value in terms of discussing and establishing future research goals in the field of cloud computing. Furthermore, the partially automated procedure of evaluating a substantial number of papers enables the convenient acquisition of a comprehensive overview of a specific study field. Kumar and Kaliyaperumal[12] conducted a study on the growth and development of mobile

technology research by analyzing the publication output in the Web of Science database. From 2000 to 2013, a grand total of 10,638 publications were released in the discipline. The study has noted a steady increase in the number of publications in the discipline, with recent years showing a significant rise compared to previous periods. A multitude of academics and scientists are actively engaged in conducting study in the field of mobile technology, fostering the expectation of a substantial increase in literature on the issue from countries worldwide. Regarding India, it has made a somewhat less contribution in terms of the number of publications. Belfoire[13] examined scientific articles and patents related to the Internet of Things (IoT) in healthcare from 2015 to 2020. The findings indicate that this topic is relatively new, with significant scientific and patent production occurring only in the past six years. Prior to this, the growth of scientific production on IoT in healthcare was slow, despite the technology being in existence for fifteen years. The year 2014 saw the highest number of publications, with a total of 62. Consequently, research on the Internet of Things (IoT) in the healthcare industry is a rather nascent subject.

Objectives of the Study

1. To identify country-wise contribution of the literature in the databases
2. To explore global wise most trending research area
3. To know global wise affiliation contribution
4. To find out most cited documents in the database globally
5. To study Frequency of Author Keywords Use
6. To identify the core source through used of Bradfords Law
7. To analyze publisher wise contribution in the database

Methodology

The quantitative approach of studying the existing literature in the field of science is referred to as a scientometric study. Data is gathered for the purpose of this study from the Web of Science database, which is widely recognized as one of the most prominent databases. There are a total number of 32,399 information that have been gathered from the years 2014-2023, which spans a period of ten years. The keyword "extension education" is utilized in the process of picking the data, and for the purpose of the study, only research article is chosen. The entirety of the chosen literature is extracted in the form of a plain text file, which is then uploaded into the applications that are used for metric study. An analysis of the data that was collected was performed with the help of biblioshiny tools, and the results were displayed in the form of a table and a graph. Since, after conducting an analysis of the various literature that is available in the field of extension education, it was discovered that no other study has been conducted to study the metric study on the available literature in the database. This is because the study has the potential to be a helpful instrument for many researchers to make use of in order to learn about the trending research area and the gap in the literature for the purpose of conducting additional research. The purpose of this study is to investigate the literature contributions made by each country in the databases, to determine the most frequently conducted research area, to discover the affiliation-wise contributions made in the databases of the Web of Science, to determine the most cited document for the available literature in the database, and to analysis the most frequently used keywords in the literature. The results section contains a list of the top 10 documents for each objective.

Data Analysis Country-wise Contribution of the Literature in the Databases

Due to the large number of academic publications that are published in a variety of fields on an annual basis, this study will assist us in gaining an understanding of the country-wise contribution in the field of extension education, and the results indicate that the top 10 countries have made the most contributions. Table 1 and Fig. 1 below presents the contribution of the literature that is available in the Web of Science database, broken down by country. Out of the total number of 32,399 available literature,

Table 1 — Country-wise contribution of literature in the databases

Sl. No	Country	Numbers
1.	People's Republic of China	9406
2.	USA	6978
3.	Japan	6079
4.	Germany	2615
5.	Italy	1982
6.	England	1794
7.	South Korea	1638
8.	Brazil	1523
9.	Spain	1375
10.	France	1338

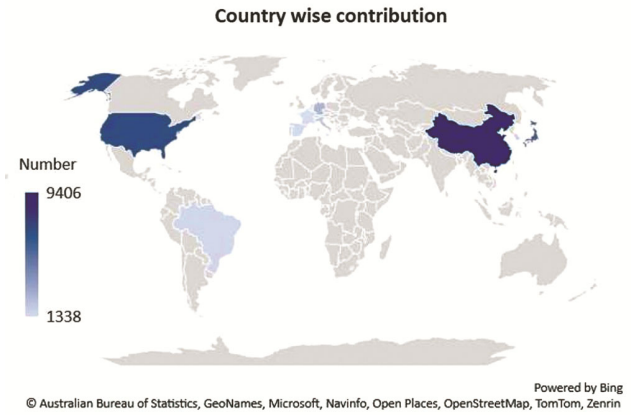

Fig 1 — Country-wise contribution of literature in the databases

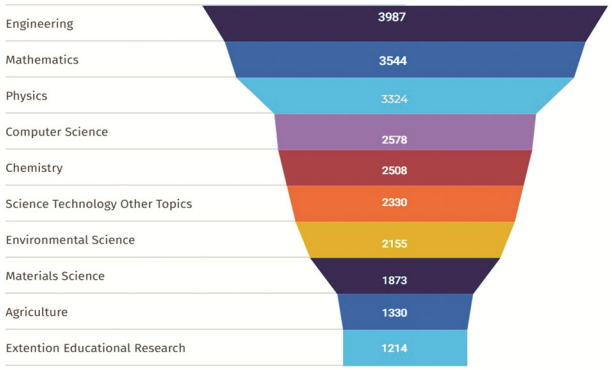

Fig 2 — Global wise most trending research area

Table 2 — Global wise most trending research area

Sl. No	Research Area	Numbers
1.	Engineering	3987
2.	Mathematics	3544
3.	Physics	3324
4.	Computer Science	2578
5.	Chemistry	2500
6.	Science Technology Other Topics	2330
7.	Environmental Science Ecology	2155
8.	Materials Science	1873
9.	Agriculture	1330
10.	Education Educational Research	1214

Table 3 — Top 10th global wise affiliation contribution

Sl. No	Affiliation	Numbers
1.	University of Tokyo	1098
2.	Chinese Academy of Science	955
3.	University of California System	847
4.	Centre National De LA Recherche Scientific CNRS	846
5.	Kyoto University	778
6.	Helmholtz Association	683
7.	Russian Academy of Sciences	582
8.	Nagoya University	553
9.	University System of OHIO	552
10.	State University System of Florida	519

the People's Republic of China is responsible for 9406, which is equivalent to 29.03% of the total. The United States of America is the second largest country that contributed to the database, with a total of 6978, which is equivalent to 21.53%. Japan came in third with a total of 6079, which is equivalent to 6.11%. Germany came in third with a total of 2615, which is equivalent to 6.11%. Italy is 1982, which is equivalent to 6.11%. England contributed 1794 literature, which is equivalent to 5.53%. South Korea contributed 1638 papers, which is equivalent to 5.05%. Brazil contributed 1523 papers, which were equivalent to 4.70%. Spain contributed 1375 papers, which is equivalent to 4.24%, and France ranked tenth with 1338 papers, which is equivalent to 4.12% .

Global Wise Most Trending Research Area

There are a number of trending research topics in the field of extension education. These shows indicate which area the author primarily concentrates on and conducts a study that will assist us in finding the most trending research area on a worldwide scale. The results of this study highlight the top ten most trending research areas. Based on the data presented in Table 2 and Fig. 2, it can be observed that the field of engineering is the most frequently researched area, with a total of 3987, which accounts for 12.30% of the total. The second most common research area is mathematics, with 3544, which accounts for 10.93%. The third most common research area discovered is physics, with 3342, which accounts for 10.31%. Computer science is found to be the fourth most trending research area, with 2578, which accounts for 7.95%. Chemistry is found to be the fifth most trending research area, with 2500, which is 7.71%. Other topics include science technology, materials science, and ecology, with 2155, which accounts for 6.65%, materials science, with 1873, which accounts for 5.78%, agriculture, with 1330, which accounts for 4.10%, and education research, with 1214, which accounts for 3.74%.

Global Wise Affiliation Contribution

By gaining an understanding of the global ranking of affiliation-wise contributions, we are able to determine which university or institution has made the most significant contributions to the field of extension education. According to this study, the top 10th institution in rank is based on the contributions they have made. The result given in Table 3 and Fig. 3

shows the global wise affiliation contribution in the databases it shows that University of Tokyo rank the highest with 1098 papers contributed which is 3.38%, in the second rank comes Chinese Academy of Science with 955 papers contribution which is 2.94%, the third affiliation contributed paper in the database is University of California System with 847 which is 2.61%, Centre National De LA Recherche Scientific CNRS follows with 846 papers contribution that is 2.61%, Kyoto University stood in fifth place with 778 numbers of papers which is 2.40%, and nwxt come Helmholtz Association with a total number of 683 paper contribution which is 2.10%, Russian Academy of Sciences with 582 papers contribution that is 1.79%, Nagoya University with 553 papers which is 1.70 The University System of Ohio contributed 552 papers, which is equivalent to 1.70% of the total, and the State University System of Florida came in tenth place with 519 papers submitted in total, which is equivalent to 1.60% of the combined total.

Most Cited Documents in the Database Globally

With the help of identifying the document that has received the most citations, we are able to determine

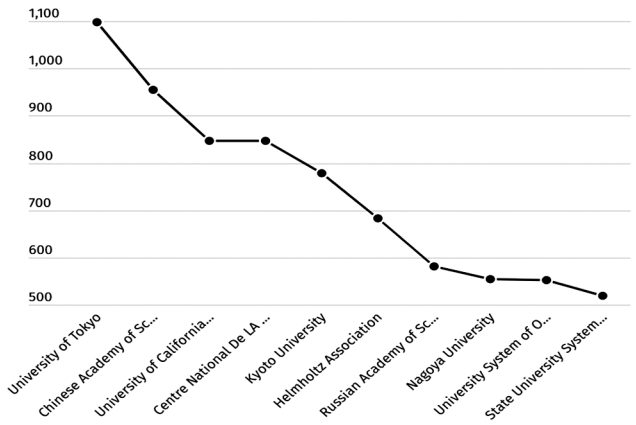

Fig 3 — Top 10th global wise affiliation contribution

which documents are the most cited. This allows us to determine whether or not the paper has been viewed and referenced by other people. Additionally, we can assert that a document that has received a greater number of citations has an impact on researchers, who find the document and work to be useful for their research. The results indicate that Hoffman Tc, 2014, BMJ-BRIT MED J received the highest citation, with a total number of 5103, and the findings are presented in Table 4, which displays the top 10 most referenced documents worldwide in the databases. On the other hand, Bateman A., 2015, NUCLEIC ACIDS RES received the second highest number of citations, with a total of 3422. The publication that received the third most citations is Hoffman MD, 2014, Journal of March Learning and

Research, with 2336 citations, Astron Astrophys, which was ranked in fourth position with 1764 citations, was published by Aghamin N in the year 2020. It has been discovered that Aguet F, 2020, SCIENCE has received a total of 1701 citations, which places it in the fifth position. Riahi, K, 2017, GLOBAL ENVIRONMENT CHANGE has received 1597 citations, which is the next most cited publication. Zhou Y, 2017, REV MOD PHYS have a total number of citations of 884, which is followed by Schmutz J, 2014, NAT GENET, which has a total number of 834 people citing their work. Mascher M, 2017, NATURE have a total number of 955 citations, and Kowdley KV, 2014, NEW ENGLSIH J MED have a total number of 941, respectively.

Frequency of Author Keywords Use.

For the purpose of this study, the top ten keywords that were used the most frequently by the authors were chosen. The keywords that were used on the document assist us to learn about the themes that are currently trending and the primary subject of the research. The given Table 5 and Fig. 4 shows that

Table 4 — Most cited documents in the database globally

Sl. No	Most Cited Global Documents	Total Citation	TC Per Year	Normalized Tc
1.	HOFFMANN TC, 2014, BMJBRIT MED J	5103	463.91	169.01
2.	BATEMAN A, 2015, NUCLEIC ACIDS RES	3422	342.20	122.75
3.	HOFFMAN MD, 2014, J MARCH LEARN RES	2336	212.36	77.37
4.	AGHAMIN N, 2020, ASTRON ASTROPHYS	1764	352.80	115.59
5.	AGUET F, 2020, SCIENCE	1701	340.20	111.46
6.	RIAHI K, 2017, GLOBAL ENVIRON CHANG	1597	199.63	67.16
7.	MASCHER M, 2017, NATURE	955	119.38	40.16
8.	KOWDLEY KV, 2014, NEW ENGLISH J MED	941	85.55	31.17
9.	ZHOU Y, 2017, REV MOD PHYS	884	110.50	37.17
10.	SCHMUTZ J, 2014, NAT GENET	834	75.82	27.62

extention is the most frequently keyword used with 1855 times, the keyword model is found to be the second most frequent keyword used with 1383 time, which is followed by the keyword performance with 1008 used, the keyword impact is used 752 time, management keyword is used 747 times, the keyword behavior is used 706 times, which is followed by the keyword evolution used 605 times, the keyword systems is used 590 times, followed by keywords growth is used 574 times while the keyword strength is used 559 times.

Table 5 — Frequency of Author Keyword Use

Sl. No	Keywords	Frequency
1.	Extension	1855
2.	Model	1383
3.	Performance	1008
4.	Impact	752
5.	Management	747
6.	Behavior	706
7.	Evolution	605
8.	Systems	590
9.	Growth	574
10.	Strength	559

Fig 4 — Frequency of Author Keyword Use

Core Source Through used of Bradfords Law

Bradfords Law studies how the literature on a particular subject is scatters or distributed in the journals. Figure 5 shows that Plus One is the top journals found in the database, Physical Reviewed D is found to be the second journals found in the database and the third journals found in the databased is Scientific reports, Journals of High Energy PH is found to be the fourth journals while Sustainability Journals is found in the fifth place .

Publisher Wise Contribution in the Database

Identification of publisher wise contribution in the database helps us to know which publisher contribute most in the database. In the Table 6 and Fig. 6 data it shows that Elsevier contribute the most with 7670 (23.68%) numbers of publication which is followed by Springer Nature with 4561(14.07%), and thirdly followed by Wiley with 2233 (6.89%), Mdpi with 1796 (5.46%) literature contributed, Taylor & Francis with 1748 (5.39%) literature, IEEE with 957 (2.95%) , a total number of 721(3.22%) is contributed by American Chemical Society, Oxford University Press with 708 (2.18%), 668 (2.06%) number of literature is

Table 6 — Publisher wise contribution in the database

Sl. No	Publisher	Numbers
1.	Elsevier	7670
2.	Springer Nature	4561
3.	Wiley	2233
4.	Mdpi	1796
5.	Taylor & Francis	1748
6.	IEEE	957
7.	American Chemical Society	721
8.	Oxford University Press	708
9.	American Physical Society	668
10.	Sage	631

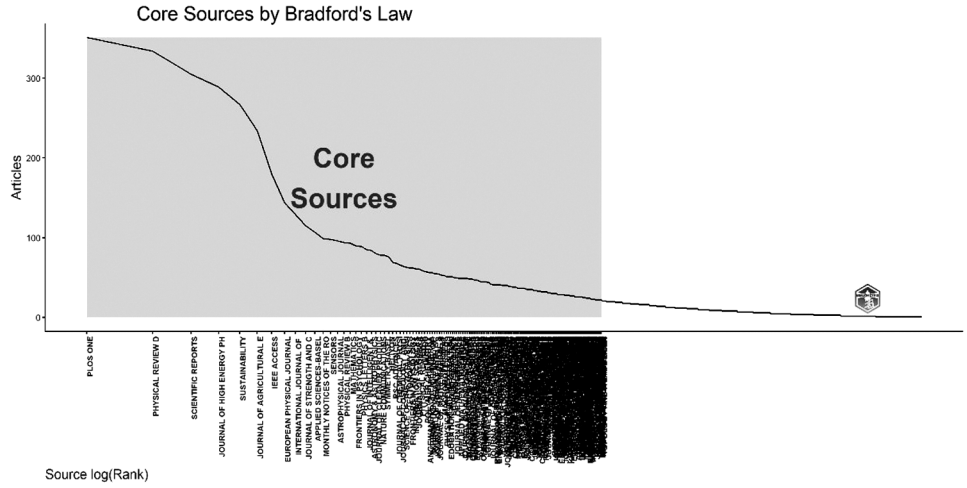

Fig 5 — Core Source Through used of Bradfords Law

Fig 6 — Core source through used of bradfords law

published by American Physical Society and which is followed by Sage with 631(1.94%).

Discussion

In the 1960s, Vassily V. Naimov coined the term "scientometric," which is used to study an object's productivity, growth, structure, and linkages[14]. Thus, it is possible to link advances at the level of scientific fields and specializations with institutional features at the level of groups of researchers by using scientometric methodologies. It is crucial to do scientometric analysis in order to map research trends, assess research impact, pinpoint relevant individuals and networks, gauge research productivity, forecast upcoming trends, inform policy and decision-making, and ensure quality control[15]. This study demonstrates that, with the United States and Japan coming in second and third, respectively, the People's Republic of China is the nation with the greatest contribution to the database. Engineering is the field with the most trending research, then followed by mathematics and physics. When the contribution of affiliations worldwide is analyzed, it is discovered that the University of Tokyo contributes the most publications globally. The Chinese Academy of Science follows, and the University of California System follows after. HOFFMANN TC, 2014, BMJ-BRIT MED J, BATEMAN A, 2015, NUCLEIC ACIDS RES, and HOFFMAN MD, 2014, J MARCH LEARN RES are the three most cited papers in the database that was found. Word extension ranks first in terms of keyword usage frequency, followed by model and performance.

Conclusion

In the field of Extension Education, scientometric studies contribute to a more in-depth understanding of the research landscape, improve opportunities for collaboration, support evidence-based decision-making in policy and practice, and facilitate the advancement of knowledge within the discipline in order to effectively address the needs of society. In addition, this paper conducts a study over a period of ten years and analyzes the literature that is available in Web of Science Databases. It serves as a foundational resource for guiding future research directions, fostering collaborations, and informing evidence-based practices and policies in order to effectively address the needs of society.

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