



Scitometric Analysis on Energy Literacy Based on CiteSpace Between 1993–2022

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Abstract. In recent years, with the emergence of a series of problems such as energy shortage and resource depletion, people pay more attention to energy security. Energy literacy is the knowledge and skill about the energy using. Energy literacy largely affects energy consumption and sustainable development. Combining the research hotspots of energy literacy literature is helpful for researchers to understand the development trends. This paper is used CiteSpace to do a scitometric analysis of 646 articles on energy literacy from Science Citation Index and Social Sciences Citation Index during 1993 and 2022. The cooperation relationship of authors, institutions, countries, and keyword are analysed in this study. Results shows that Arizona State University is the top co-institution. USA is the top co-country. Energy education and energy behaviour are the main research issue about energy literacy.

Keywords: Sociometric analysis · Energy literacy · CiteSpace

1 Introduction

Energy literacy is defined as the knowledge about energy, and the attitude about energy consume [1]. Since the industrial revolution in the mid-nineteenth century, the utilization of fossil energy such as coal, oil and natural gas has greatly improved production efficiency. At the same time, the CO₂ produced by its combustion has also brought serious climate change problems such as “global warming”. In the US, the petroleum consumption is 35%, the natural gas consumption is 34%, and the renewable energy consumption is 12% [2]. The primary energy consumption by energy source is shown in the Fig. 1. With the development of our social economy, the contradiction between energy supply and demand is inevitable.

The energy structure is facing many problems, and the traditional mode of economic growth has come to an end. It is important to understand that transformation and upgrading of energy use is a process. Improving energy literacy can help public people pay positive attitudes and behavior toward energy-related issues [3]. We need to gradually cultivate energy literacy at multiple levels such as residents and enterprises, make the renewable energy consumption deeply rooted in the hearts of the people, and finally

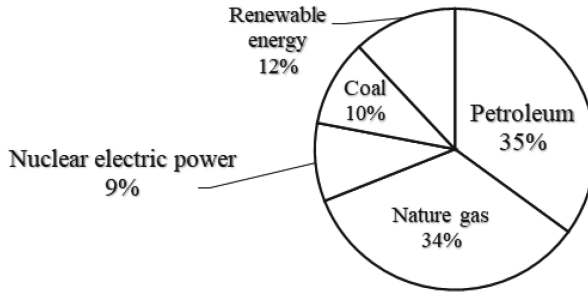


Fig. 1. The U.S. primary energy consumption by energy source in 2020.

promote the sustainable development of the whole world. Some scholars have focused on energy literacy research. Combing the research hotspots and trends of energy literacy research is helpful for researchers to understand the development trends of energy literacy research. In this study, we try to collect the prior studies and collection and describe current status about energy literacy.

2 Method

CiteSpace is a scitometric software developed by Chen Chaomei [4]. As a visualization tool, CiteSpace is widely used to analyses the literature, and provided a systematic and objective description about the research issue [5]. The collaboration analysis focuses on identifying search community. In this study, we analysis the cooperation relationship of authors, institutions, countries. The keywords co-occurrence is an effective way to realize the research trends. Keyword co-occurrence analysis is used to find out the research trends of energy literacy.

The searching database of this study is based on Science Citation Index and Social Sciences Citation Index in the Web of Science core collection. The searching keyword is “energy literacy”. The last searching time is Jan 5th, 2023 to avoid bias caused by daily database updates [6].

The time slicing was set as 2013 JAN to 2022 DEC. The slice year was set as one. The selection criteria were set as the Top 50. The pruning method was pathfinder and pruning sliced networks. The node type was chosen according to the analysis plan, including co-author, co-institution, co-country (region), and keyword.

3 Results

After searching and screening analysis, there are 646 articles related to energy literacy.

3.1 Results of Co-author Analysis

Co-author analysis can identify leader authors of the domain and their cooperation intensity and mutual citation relationship [7]. In this study, we find 482 nodes and 423

Table 1. The result of co-author analysis.

No.	Frequency	Author
1	6	Dehaene, Stanislas
2	5	Cohen, Laurent
3	4	Blasch, Julia
4	4	Anderson, Charles W
5	3	Akers, R M
6	3	Boogen, Nina
7	3	Dias, Marta Ferreira
8	3	Madaleno, Mara
9	3	Martins, Ana

links. The result of co-author analysis is shown in the Table 1. The threshold was set as 4.

From Table 1, we can realize that Dehaene, Stanislas is the top 1 co-author. His research is focus on the cognitive psychology. Cohen, Laurent mainly focus on the literacy and behavior. And Blasch, Julia indicate that energy literacy is related to people’s financial literacy.

3.2 Results of Co-institution and Co-country (Region) Analysis

Institution analysis is based on the co-occurrence analysis [8]. In this study, we find 402 nodes and 481 links. The results are shown in the Fig. 2.

From Fig. 2, we can realize that Arizona State University is the top 1 co-institution. Followed by University of Monash University.

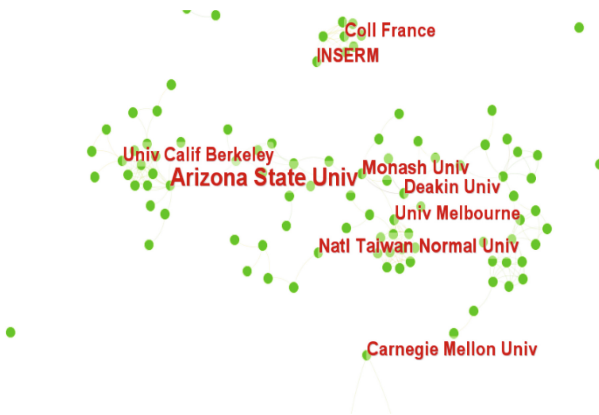


Fig. 2. The result of co-institution analysis.



Fig. 3. The result of co-country(region) analysis.

Country (region) analysis is also based on the co-occurrence analysis [9]. We find 79 nodes and 460 links. The results are shown in the Fig. 3.

In the Fig. 3, the results show that USA is the top co-country. The second co-country is China. And the third co-country is England.

3.3 Results of Keywords Analysis

Keywords are the core of a study. Keywords analysis is helpful to explore the research hotspots in this field [10]. In this study, keywords analysis is also based on the co-occurrence analysis. We find 501 nodes and 2318 links. The results are shown in the Fig. 4. In the Fig. 4, education, behavior, and knowledge are the top 3 keywords.

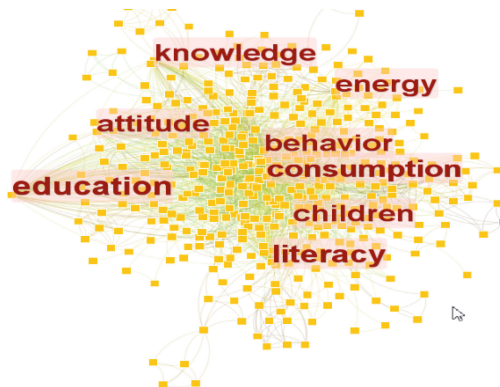


Fig. 4. The result of keywords analysis.

4 Discussion

This scitometric analysis of energy literacy based on the publication between 1993 to 2022. Over the previous 20 years, a lot of research focus on energy literacy. The research has made great progress and formed a certain number of research teams and research institutions. The study mainly including three parts as follows: co-author analysis, co-institution and co-country (region) analysis and co-occurrence keywords analysis.

After search literature from the Science Citation Index and Social Sciences Citation Index database, 646 relevant papers are screened out. Scholars have pay more attention to the energy literacy. From the result of the author analysis, Dehaene, Stanislas's group is the top co-author than others. The results indicate that these authors are the influential scholar focus on energy literacy issues. However, the results also show that there is few cooperation between research author groups.

For co-institution analysis, the Arizona State University in USA is the top co-institution. This study suggests that future researchers should strengthen cooperation and cooperation with researchers all over the world, so as to achieve research in line with international standards and reach a higher level. Multi-disciplinary and multi-center cooperative research is necessary as well.

Keywords co-occurrence analysis is important to reflect the research topic and hotspots trends of the research issues. The results of keyword analysis in this study show that, energy education and energy behavior are the hot issues. Energy literacy includes affective and behavioral aspects [11]. Behavioral aspects including energy-saving behaviors or citizens' energy decisions [12]. Education and literacy are the hot topic in recent years. Scholars have developed an energy literacy scale based on students in UK university and indicates the importance of energy knowledge [13].

Like other research, this scitometric study also has limitations. For example, this study only obtains literatures from Science Citation Index and Social Sciences Citation Index in the Web of Science core collection. More database such as ProQuest will be searched in the future. Moreover, the data of this Citespace analysis is objective, but the description of results may contain research's' subjective views. A deeply systematic review analysis is necessary in the future.

5 Conclusion

Energy literacy is an important literacy of people. Improving energy literacy is helpful to achieve a win-win situation of environment and benefits and realize sustainable development. In this study, we use the visual scitometrics analysis software Citespace based on the literatures published from 1993 to 2022. A total of 646 publications were included. This study aims to provide an insight and a better understanding about energy literacy for both researchers and practitioners. Researchers may find out the potential collaborators and cooperative institutions according to the research results. In summary,

Energy consumption, and energy behavior are the main research issue about energy literacy. Research frontiers will focus on the importance on education.

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