

Visual Analysis of Blended Learning Research in Recent Five Years

LiHui Yao¹, Xiaoguang Wang*

E-mail:2809753785@qq.com, Corresponding author: 505061025@qq.com

¹school of Applied Psychology, Jiangxi University of Traditional Chinese Medicine, Jiangxi, China,

*school of Applied Psychology, Jiangxi University of Traditional Chinese Medicine, Jiangxi, China,

Abstract. The increasing integration of science and technology in education has led to a growing interest in blended learning, which combines both online and offline elements. To gain a comprehensive understanding of the current research status, hot topics, and trends in blended learning, this paper utilizes CiteSpace software to visually analyze core documents in the WOS database from 2019 to 2023. The analysis reveals that the field of blended learning has experienced an initial growth followed by a decline. The primary contributors to research in this field are China, the United States, and Britain. The research emphasis is on teaching design and application, medical education, and intelligent educational technology. There is a significant focus on teaching practice and empirical research and analysis.

Keywords: Visual Analysis, Blended Learning, CiteSpace

1 Introduction

The concept of blended learning originated in the 1990s with the aim of completely explaining learning through technological advances. As teaching systems and technologies have developed, and as teaching methods have evolved, there has been a growing emphasis on "learning along". University education, distance learning and e-learning have also recently played an important role in blended learning. Online learning is now available for informal training via the Internet. It has also increased the demand for personalised and advanced social tools[[1]]. After more than 30 years of development, there is a general consensus among researchers, teaching practitioners, governments and educational institutions that blended learning will become the 'new normal' for the future of education[[2]].

When the epidemic comes, in order to limit the spread of the virus, schools, universities and research institutes have to change their existing educational platforms to online learning. It is crucial to maintain social distance during this period, and the COVID-19 epidemic ended face-to-face education, which had a negative impact on educational activities[[3]]. Reviewing the scientific reports published during the new COVID-19 epidemic since 2019, it is clear that many international journals published a large number of scholarly articles on online, blended learning during the 2019 COVID-19 epidemic. Especially with the advent of the epidemic era, blended learning has seen another spurt in development and is extremely common in all fields of education. [[4]].

2 Research method

2.1 Research tool

CiteSpace is an internationally leading visualization application developed by Mr. Chen for diachronic and dynamic description of complex document collections, focusing on analysis of potential knowledge contained in scientific documents[[5]].

2.2 Data source

In this study, the WOS core collection database (including SCIE and SSCI) was used for bibliometric analysis, and the advanced retrieval function was adopted, with "blended learning" or "blended learning" or "flip learning" as the key words. The time span was from January 1, 2019 to May 1, 2023, and a total of 1967 related records were separated out. The limited language is English, and the Document Types are Articles or Review Article. By manually eliminating the irrelevant data, a total of 1905 documents were obtained.

3 Research Status of Blended Learning.

3.1 Number of documents

In this study, the amount of literature on blended learning in the WOS database from 2019 to 2023 is counted,as can be seen in Figure 1.

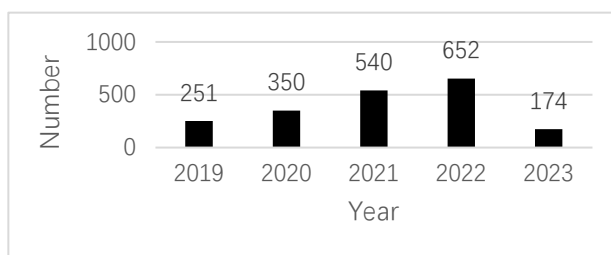


Fig 1. Time Distribution Diagram of Core Documents of Blended Learning

3.2 Distribution of research institutions

The visual analysis of research institutions in blended learning research yielded the top ten research institutions or colleges in terms of the number of statistical articles published, as shown in Figure 2.

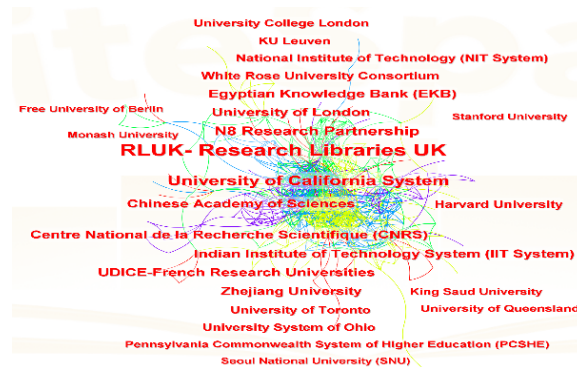


Fig. 2. Collaboration map of blended learning research institutions

3.3 Keywords Co-occurrence Map Analysis

The key word is the highly condensed and embodied theme of literature research, which is the key symbol of the hot spot in this research field[[6]]. The keywords were visually analyzed in CiteSpace software, and the keyword co-occurrence map (N=340, E=1884, density =0.0327) was obtained, as shown in Figure 3. If the nodes of key words are larger, it indicates that keywords are more frequent in a particular research area.



Fig. 3. Keyword co-occurrence map for blended learning

3.4 Keywords cluster map analysis

CiteSpace provides module value and average contour value to judge the effect of map drawing according to the network structure and the clarity of clustering[[7]]. The module value $Q = 0.445 > 0.3$; the average contour value $S = 0.7754 > 0.7$. As can be seen from the keyword clustering map, the research hotspots of blended learning are mainly divided into six clustering groups with different colors, as shown in Figure 4. Such as, the red cluster is a cluster formed by deep learning, artificial intelligence, model, Internet of Things and other related words around mechanical learning[[8]]. Purple cluster isacluster formed by related words such as clinical technology, nursing and communication means around nursing[[9]].

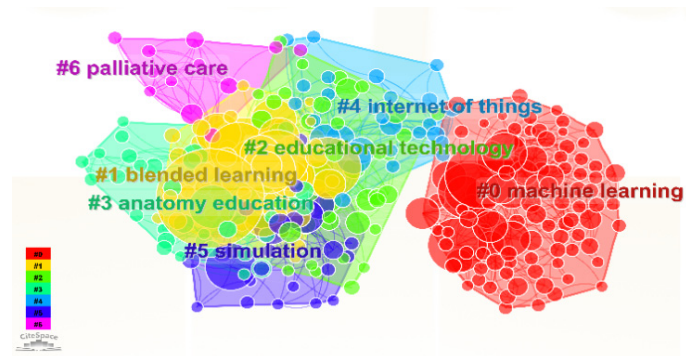


Fig. 4. Keyword clustering map for blended learning

3.5 Analysis of emergent words

Through the analysis of emergent words, we can find the focus of scholars' attention in different time periods and reasonably predict the development trend of this field[[10]]. In this study, the Burstness function of CiteSpace is used to analyze the related literature of blended learning from 2019 to 2023, and the emergent words of Top10 are selected, as shown in Figure 5.

Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2019 - 2023
outcm	2019	3.27	2019	2020	
nurses	2019	2.62	2019	2020	
communication	2019	2.62	2019	2020	
competences	2019	2.24	2019	2020	
collaborative learning	2019	1.87	2019	2020	
energy	2019	1.87	2019	2020	
program	2020	2.6	2020	2021	
implementation	2020	2.39	2020	2021	
artificial neural networks	2020	1.73	2020	2021	
environments	2020	1.52	2020	2021	

Fig. 5. Top 18 highlighted words of blended learning

4 Conclusion

In this paper, the CiteSpace software is used to visually analyze the core literature of blended learning from 2019 to 2023, The specific performance is as follows:

From 2019 to 2023, the research on hybrid science showed a trend of first growth and then decline, which can be roughly divided into two stages: 2019-2022 was a period of rapid growth, and there was a downward trend in 2023. Most of the core forces of blended learning research come from China, the United States, Britain and India. Collaboration and exchanges between research institutions and scholars in these countries need to be strengthened.

The research focus of blended learning is mainly concentrated in three aspects: the research of teaching design and application, the research of medical education and the research of educational technology intelligence, emphasizing teaching practice and empirical research and analysis.

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