Progress and Trends of Digital Literacy Education Research in China
CiteSpace-Based Visual Analysis

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Abstract. In order to reveal the current situation and trend of digital literacy education research in China, this paper uses China Knowledge Network as the core database to sort out, count and analyze domestic digital literacy education research papers in terms of overall publication volume, research power, keyword clustering and emergent dimensions. The research results show that: ① the number of literature increases, the concentration of research groups needs to be strengthened, ② the research themes are diversified, the research fields need to be deepened, ③ the service targets are marginalized, and emphasis is placed on the improvement of literacy for all .

Keywords: digital literacy · CiteSpace · digital technology · information literacy

1 Introduction

"The outline of the 14th Five-Year Plan clearly proposes to strengthen the education and training of digital skills for all people, and to improve the digital literacy of citizens as soon as possible. However, the research results of the Academy of Social Sciences show that the overall digital literacy level of Chinese residents is low; among them, there is a risk of farmers falling behind in digital literacy; the digital literacy of middle-aged and elderly groups cannot keep up with the average level; the awareness and ability of residents to use personal computers, cell phones and other smart devices to engage in creative and productive activities are insufficient. This paper summarizes and analyzes the literature on digital literacy education on China Knowledge Network in the past ten years, sorts out the research contents and research themes, and predicts and analyzes the research hotspots and trends, in order to provide useful reference for the research on the cultivation and enhancement of digital literacy .

2   Research Methodology

2.1   Research Tools

This study adopts CiteSpace 5.6 R2, an information visualization software running in Java environment, which is developed and used mainly based on co-citation analysis theory and pathfinding network algorithm [1], the bibliometric approach is used to systematically analyze data in a given field and to quickly derive a chronological map of research themes and their evolution in that field.

2.2   Data Sources

In order to ensure the reliability and objectivity of the study, the study used the advanced search of "topic" with the search criteria: (topic% = 'digital literacy' or title% = 'digital literacy') AND (Between ('2013','2023')) to search a total of 1285 relevant core journals, and the top 612 journal papers were obtained by manually removing conference announcements, conference reviews, interviews, republished literature and literature unrelated to the topic, and sorting them by citation.

3   Study Results

3.1   Analysis of the Overall Volume of Articles Issued

As shown in Fig. 1, the volume of digital literacy research literature published in the past decade shows an upward trend, among which in October 2021, the central government triggered the Action Outline for Enhancing Digital Literacy and Skills for All (hereinafter referred to as the Action Outline), which made arrangements and arrangements for enhancing digital literacy and skills for all people, and the volume of articles published for digital literacy began to grow rapidly in 2021 and began to enter a hot period of research, and predicted that The number of research articles on digital literacy is expected to reach 478 in 2023. This shows that national strategic planning is the core force driving educational research, while the development of new technologies such as artificial intelligence and big data in recent years has given a strong impetus to domestic research on digital literacy education for all age groups.

3.2   Research Power Analysis

As for the research institutions, the research power of digital literacy education is mainly concentrated in domestic universities and library research centers, among which the first one in terms of the number of publications is the School of Information Management of Sun Yat-sen University and the second one is the School of Information Management of Wuhan University (see Table 1). It is the information schools of major universities that put "digital literacy" in an important position for research. Scholars in universities generally believe that cultivating digital literacy can effectively promote the cultivation of students' core literacy and adapt to the survival of the digital era.
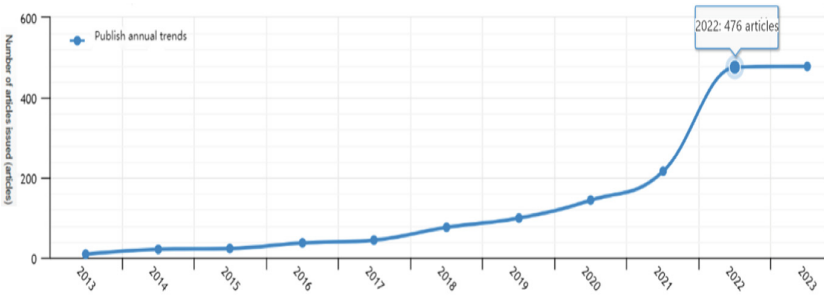
Fig. 1. Overall posting volume analysis

Table 1. Highly productive research institutions in digital literacy education

Institution Name	Number of Articles
School of Information Management, Sun Yat-sen University	12
School of Information Management, Wuhan University	8
University of International Business and Economics	5
Guangdong Zhongshan Library	4
Huazhong Normal University	4
New Media Consortium (NMC)	3

3.3   Research Hotspots

3.3.1   Keyword Co-occurrence Analysis

A keyword is a distillation of the content of an article, and when a keyword appears twice or more, it is called keyword co-occurrence. In this study, we analyzed the keyword co-occurrence in the last ten years, set the single time partition as 1 year, set the threshold as "Top50", i.e., we selected the top 50 keywords in each time partition, and set the Threshold as 16 (i.e., we displayed the keywords with the number of occurrences greater than and equal to 16). The final keyword co-occurrence map of digital literacy education with 394 network nodes, 814 links, and a network density of 0.0105 is shown in Fig. 2.

The size of the network nodes in the figure represents the frequency of the keywords, and the thickness of the connecting lines represents the co-occurrence of the keywords and the closeness of the association. The overlap of keywords such as "digital literacy", "digital transformation", "digital village" and "digital economy" is high, which indicates that digital transformation, digital village and digital economy are the keywords of research in this field. This indicates that digital transformation, digital countryside and digital economy are the hot research directions in this field.
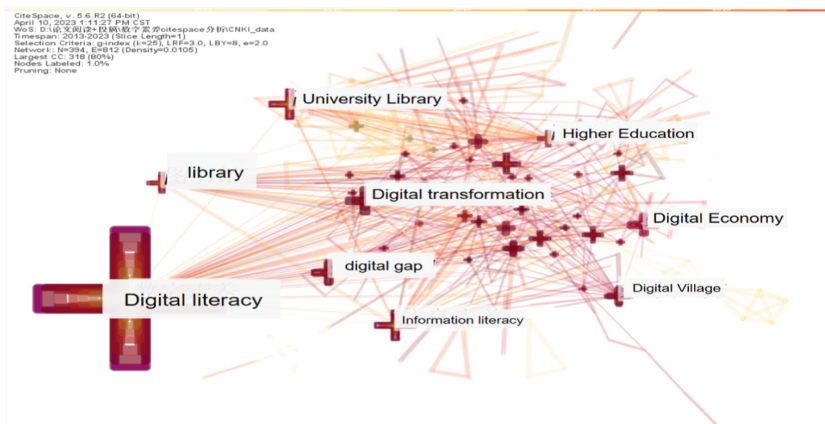
Fig. 2. Digital literacy keyword co-occurrence analysis

3.3.2   Keyword Time Zone Analysis

The time zone map is a temporal dimension of the evolution of documentary knowledge, which can reflect the turnover and interactions of documents comprehensively and clearly. As shown in Fig. 4, the research hotspots on digital literacy have been changing during 2013–2023, and "digital transformation," "digital village," "digital society," and "digital literacy" are the hotspots in recent years. "enhancement strategies" are the hotspots of research in recent years [2]. From the digital transformation dimension, scholars propose the organic integration of digital literacy education with the teaching of various disciplines [3, 4]; Scholars analyze the framework and construction model of students' digital skills development through empirical research studies to promote the improvement of the development effect [5]. Longitudinally, Yu Ying proposes to develop youth digital literacy from the IT curriculum [6]; Library services for minors are being upgraded for the ages [7]; People's Daily proposed "Don't forget the elderly in digital literacy", Zeng Yueliang analyzed the current situation of ICT learning for the elderly and proposed a framework for ICT learning for the elderly, focusing on improving literacy for all [8]. From the regional dimension, the learning space shifts from the academy to the countryside, and by analyzing the policy, Jin Mengxin proposes that building a digital village helps promote digital transformation [9], it also means that future research is no longer limited to the promotion of students' digital literacy, providing more options for scholars to embark on digital promotion possibilities (Fig. 3).

3.3.3   Keyword Emergent Word Analysis

The distribution of emergent words reflects the citation frequency intensity of keywords related to the research field and the starting and ending years of stronger citation frequency. By analyzing the key turning points and new concepts appearing in certain years, it can, to a certain extent, reflect the research development trend, research hot issues and some frontier issues related to research in the research field. As shown in Fig. 4, digital
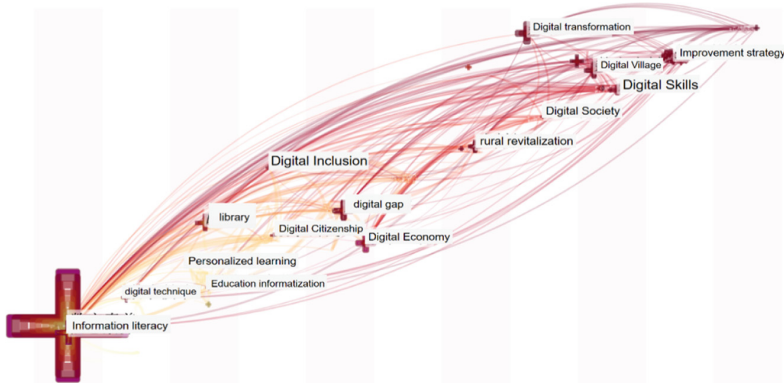
Fig. 3. Keyword time zone analysis

Fig. 4. Keyword emergent word analysis

literacy exploded in education from 2013–2016, and in recent years, artificial intelligence big data technology swept the world, and domestic policies were introduced to promote digital literacy for all people, and since 2020, research on full-dimensional digital literacy began to explode, especially in the digital economy and digital villages.

4 Research Conclusions and Implications

4.1 The Number of Literatures has Increased, and the Concentration of Research Groups Needs to be Strengthened

In terms of distribution years, Xiao Junhong formally introduced the term digital literacy in China in 2006 [10], Research on digital literacy began to increase substantially, opening the door to digital literacy research in China. From the analysis of the literature on the Knowledge Network, it seems that from 2006–2013, it was the initial stage of the

explosion of digital literacy, mainly focused on the education industry; from 2013–2020, the amount of literature began to grow slowly, revolving around curriculum integration and digital inclusion; from 2020 to the present, digital transformation became a national development strategy and related research began to soar.

4.2 Research Themes are Diversified and Research Areas Need to be Deepened

The diversification of research areas is seen through keyword co-occurrence. Research targeting digital literacy is beginning to break through the school gates and is beginning to focus on the digital countryside, the digital economy and the digital society. This is related to the current trend of current events, where digital skills are necessary for individuals to integrate into society in the digital age. However, the current pluralistic research is more theoretical and less on field studies.

4.3 Marginalization of Service Recipients and Emphasis on Literacy Enhancement for All

As we can see from the emergent words, in recent years, research on digital literacy has begun to focus on young people and older people, and research on older people has been increasing year by year, which is closely related to the national proposal of "don't forget older people in the digital age". This is related to the national proposal of "don't forget the elderly in the digital age". This is of great significance to promote the digital transformation of the whole population by giving attention to the marginalized groups.

5   Conclusion

At present, the intelligent technology represented by ChatGPT based on the big model of language has emerged, digital twin, digital person and digital immortality have become the next hot topics, and the enhancement of digital literacy for all people is on the horizon. This paper adopts modern analysis tool CiteSpace to analyze digital literacy related research in China Knowledge Network, and presents the research hotspots and foreword through visualization, expecting the findings of this paper to bring new directions for the subsequent research on digital literacy.

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