Visualization Analysis of Media Literacy From 2010-2019 Based on CiteSpace

Wei He, Xiaohong Liu, Li Zhao

School of Education Science, Nanjing Normal University, China
1324122949@qq.com, 2093242714@qq.com, li.zhao@njnu.edu.cn

Abstract

In order to explore the similarities and differences in media literacy research between Chinese and international publications in the last decade, this study used *CiteSpace* to arrive at a comparative analysis of 957 articles from China National Knowledge Infrastructure (CNKI) and 1,779 articles from Web of Science (WOS). High impact research scholars and institutions, hotspots, trends, and frontiers of media literacy research were visualized and analyzed. The findings showed that: (1) the number of international publications was three times that of Chinese; (2) Chinese and international publications presented different cooperative maps of authors and institutions; (3) the main research subjects in China were teenagers and college students, while the research from international publications focused on children; (4) the hotspots in China focused on were media literacy education and online media; while the international focus was hotspots like films, fiction and other media content and the media industry; (5) in both China and other countries, media literacy could be summarized into four categories; and (6) both in Chinese and international publications, new media and self-media (independent, individually-operated accounts producing content and posting it on social media platforms) were the frontier fields.

Keywords: Media literacy, CiteSpace, Visualization analysis, Knowledge mapping

1   Introduction

Media literacy is defined as "*the ability to access, analyze, evaluate and create messages across a variety of context*" [1]. This definition was provided by 1992 National Leadership Conference on Media Literacy in the   US, and is widely accepted. Compared to international publications, Chinese publications, which started studying media literacy in the 1990s, is still at the stage of continuous exploration. On the one hand, many scholars in China have identified the development frontiers and trends of foreign media literacy related fields outside China. For example, Geng et al. [2] combed the research status and development trends of media literacy courses outside China; Zhao et al. [3] studied the history, problems, and development trends of media literacy education in the United States; and Geng et al. [4] reviewed the evolution of European Union media literacy policy in the digital environment. On the other hand, some scholars studied the development frontiers and trends of media literacy related fields inside China. For example, Wu et al. [5] analyzed and summarized the results of college students' media literacy research conducted from 2004 to 2010, and Zhao [3] analyzed the research hotspots and trends of media literacy from 2012 to 2013. Additionally, with the development of new media and the arrival of self-media, how to promote the development of Chinese media literacy has become an urgent problem [6]. A comparative study of media literacy indicates that the international literature can provide some useful inspiration for further development of media literacy in China. However, these studies only compared one or a few specific countries, and the overall trends in the international development of media literacy have not been studied. Furthermore, the similarities and differences in the research on media literacy between Chinese and international publications have not been studied. Thus, this study focused on comparing the similarities and differences in high impact research scholars and institutions, hotspots, trends, and frontiers related to media literacy between China and international.

In 1967, McLuhan, a Canadian scholar, proposed the concept of media ecology [7]. From the perspective of developmental ecology [8], media literacy does not focus on traditional psychological processes such as perception, motivation, thinking, and learning; rather, the focus is on the content of the material. Media literacy is concerned with perceptions, desires, thoughts about, or acquisition of knowledge, as well as how media material changes as a function of exposure to and interaction with it. The media ecological environment of different social systems is determined by the economic, political, social, cultural, and other social systems. That is, the media ecology of China is

different from that of other countries, which may, therefore, affect media literacy differently. In line with this, this study compared Chinese and international media literacy research from 2010 to 2019 and explored the following questions: (1) What are the similarities and differences in the authors and institutions of Chinese and international publications in the media literacy research field, and do the authors and institutions form research groups? (2) What are the similarities and differences in the research hotspots and trends between Chinese and international publications in media literacy research? and (3) What are the similarities and differences in the research frontiers of Chinese and international publications in the media literacy research?

2 Methods and Data

China National Knowledge Infrastructure (CNKI) is the largest continuously updated database in China with the most complete collection of academic papers written in Chinese. Thus, the relevant papers written in Chinese were taken from CNKI database. Web of Science (WOS) was used to source English articles, as WOS is the premier research database of comprehensive academic information resources covering the social sciences, hard sciences, arts, and humanities from around the world. CiteSpace (version 5.2) was used to analyze the research trends of media literacy in CNKI and WOS from 2010 to 2019. By analyzing the authors, institutions, and keywords, we aimed to visually show the development trends and research contexts of media literacy between Chinese and international publications, over the past decade.

2.1 Data Collection

The literature in CNKI and WOS was searched on January 10, 2020. The timespan of both databases was set to 2010-2019 and the search mode was set to advanced search with the following formula: "TS = ('media literacy')." On the CNKI website, the source category was limited to the database of Chinese Social Sciences Citation Index (CSSCI). A total of 992 records including authors, titles, keywords, abstracts, and cited references were obtained. After manually excluding less representative record types, such as news, biographies, advertisements, notices, and press releases, the dataset was reduced to 957 original research articles and review articles. On the WOS website, the type of data was set to the core collection of the WOS and the language was set to English. A total of 1,869 records including authors, titles, keywords, abstracts, and cited references were found. After manually excluding less representative record types, the dataset was reduced to 1,779 original research articles and review articles. In the end, 957 articles from the CNKI database and 1,779 articles from the WOS database were collected for analysis.

2.2 Analysis Tool

In this study, CiteSpace was used to analyze the data. CiteSpace is a computer program that aids information visualization analysis, which developed by Dr. Chen, from Drexel University [9], and can scientifically analyze the potential knowledge contained in the academic research. For example, CiteSpace can analyze academic papers in specific fields and explore the developing trends of related disciplines by drawing a series of visualized atlases using the co-citation analysis theory. In CiteSpace, Timeline views show the publication and peak times of articles and terms, while Cluster views provide diagrams of nodes and links, where the nodes represent such details as author, institution, country, term, keyword, cited reference, cited journal, etc. [10-11]. The size of the node corresponds to the citation frequency. In addition, links represent co-citations and co-occurrences, where the thickness of the lines shows the strength of the co-citation or co-occurrence. By studying the size and color of the nodes and links in the network, researchers can analyze the trends, patterns, and critical changes that they represent.

2.3 Data Processing

To ensure the accuracy of the results, the literature was screened again to ensure there was no duplication of papers before the text data collected from WOS and CNKI were preprocessed using Citespace built-in data converter. The data were imported into CiteSpace for systematic analysis. In CiteSpace, the document time was limited to the period from 2010 to 2019; the time slice was set to 1 year; the document sources selected were "Title," "Abstract," "Author Keywords (DE)" and "Keywords Plus (ID)"; threshold was set to "Top N% = 50"; visual selection was selected as "Cluster View-Static" and "Show Merged Network." The knowledge map showed three aspects of the articles: authors, institutions and keywords.

3 Results

3.1 Analysis on the Number of Publication Output

As shown in Figure 1. The number of media literacy articles in CNKI kept at a steady trend in the last decade. From 2010 to 2012, the number of publications was stable, declined briefly in 2013, and then rebounded from 2014 to 2015. In 2016, the number of publications rose and reached a peak with 106 papers. However, the number of publications decreased significantly in 2017, and reached the lowest level in 2019. The number of annual publications on media literacy in WOS between 2010 and 2019 was shown in different time stages. The publications from 2010 to 2014 were in a stationary phase. In comparison, 2015

was a period of rapid growth. In 2016, the number of publications reached a peak with 292, which was more than twice of CNKI at that time. The publications from 2015 to 2019 were again in a stagnant phase, but the number of publications had doubled from 2010 to 2014. The overall trend of published articles in CNKI declined gradually, but was steady. The overall trend of published articles in WOS increased sharply, especially in 2015. In 2019, the number of publications in WOS was three times that of CNKI.
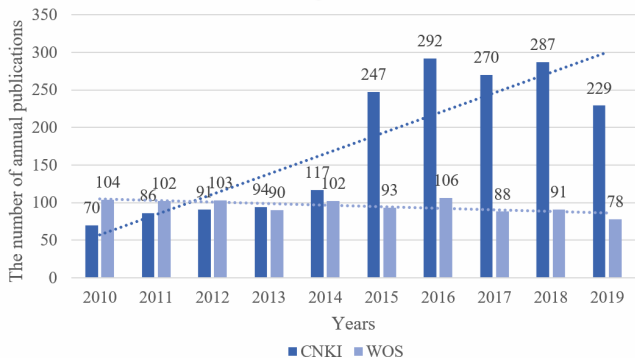

Figure 1. The number of annual publications on media literacy in CNKI and WOS (2010-2019)

3.2 Analysis of Authors

The top 10 authors contributing the most publications in CNKI and WOS from 2010 to 2019 are shown in Table 1. Of the authors in CNKI who had the most publications, Zhang, S. ranked the first (28 publications), followed by Chen, X. (13 publications), Zhang, Y. (5 publications) and Wang, F. (5 publications). Of the authors in WOS who had the most publications (Table 1), Strehovec, J. ranked the first (6 publications). Other authors generally published less. The authors who published the most publications in Chinese publications far outstripped the output of scholars from international publications.

Table 1. Top 10 authors in CNKI and WOS (2010-2019)

	CNKI		WOS	
	Count	Authors	Count	Authors
1	28	Zhang, S.	6	Strehovec, J.
2	13	Chen, X.	2	Baetens. J.
3	5	Zhang, Y.	2	Bosch, M.D.
4	5	Wang, F.	2	Dunaway, D.K.
5	4	Dong, X.	2	Torrego-Gonzatez, A.
6	4	Wang, G.	2	Lecourt, S.
7	4	Li, S.	2	Bovcon, N.
8	4	Yang, J.	2	Garcia-Umana, A.
9	3	Wu, P.	2	Sanz, J.L.M.
10	3	Zhao, L.	2	Gauxachs, A.S.

The network authors of media literacy research are shown in Figure 2 and Figure 3. In these figures, the node is the author's name, the node size represents the number of published papers, the node rings represent the year, the label size represents the centrality, and the lines describe the cooperation between authors. According to the network structure and the clarity of the clustering, CiteSpace provides Modularity (Q value) and Silhouette (S value), which are the basis for evaluating the mapping effect. A Q value above 0.3 means that the community structure is significant. An S value above 0.5 is reasonable, and above 0.7 means that the clustering is convincing. There were 53 nodes and 18 connections in the author cooperation network in CNKI. The overall density of the network was 0.0131. The Q value was 0.85, which showed that the community structure was significant. In Figure 2, the media literacy research from CNKI formed two cohesive research groups dominated by Zhang, S. and Chen, X. at the core of each group. Other cohesive research groups were formed by the groups of Bai, J. and Xiao, R.; Yang, J. and Huang, J.; and Lu, T. and Zhang, Z. There were 536 nodes and 1,855 connections in the author cooperation network in WOS. The overall density of the network was 0.0129 and the Q value was 0.6174. In Figure 3, the media literacy research from WOS formed two cohesive research groups including the group of Bosch, Sanz and Gauxachs, and the group of Torrego-Gonzalez and Garcia-Umana. However, Chinese scholars did not form a cooperative map with scholars from any other countries.

Figure 2. The network of authors in CNKI

Figure 3. The network of authors in WOS

3.3 Analysis of Institutions

The top 10 institutions contributing the most publications in CNKI and WOS from 2010 to 2019 are shown in Table 2. In terms of institutions with the most publications in CNKI, the Communication University of China ranked first, followed by Nanjing Normal University, Northeast Normal University and the Communication University of Zhejiang. For the institutions with the most publications in WOS, University of Ljubljana ranked first, followed by Oxford University and the Russian Academy of Sciences. In China, universities mostly majoring in communications and teacher education paid higher attention to media literacy than other types of universities, while in other countries comprehensive universities and research institutes focused more on this area.

Table 2. Top 10 institutions in CNKI and WOS (2010-2019)

	CNKI		WOS	
	Count	Authors	Count	Authors
1	33	Communication Univ of China	11	Univ of Ljubljana
2	31	Nanjing Normal Univ	10	Oxford Univ
3	25	Northeast Normal Univ	9	Russian Acad Sci
4	18	Communication Univ of Zhejiang	6	Ghent Univ
5	11	Sichuan Univ	6	Univ British Columbia
6	7	Xuzhou Univ	6	Univ of London
7	6	Zhengzhou Univ	5	Univ of Sao Paulo
8	6	Nanjing Univ	5	Complutense Univ of Madrid
9	4	Chang'an Univ	5	Harvard Univ
10	4	Sourthwest Univ	5	Univ of Manchester

In order to identify the core institutions of media literacy research, a network of institutions producing media literacy research was generated (shown in Figure 4 and Figure 5), in which the node size indicates the number of articles produced by each institution, and the links show the collaborations among institutions. There were 59 nodes and 11 connections in the institution cooperation network from CNKI. The overall density of the network was 0.0064 and the Q value was 0.93. In Figure 4, there were four core research institutions: Communication University of China, Nanjing Normal University, Northeast Normal University, and the Communication University of Zhejiang. There were 131 nodes and 19 connections in the author cooperation network from WOS. The overall density of the network was 0.0022 and the Q value was 0.9529. In Figure 5, there were five research institution groups: Yonsei University, Melbourne University, and Monash University; University of Sao Paulo and the Federal University of Santa Catarina; St. Petersburg State University and Northern Arctic Federal University; Utrecht University, Harvard University, and Duke University; and University Nacionel Sur and Consejo Nacl Invest Cient & Tecn, both Argentinian. However, for both Chinese and international publications, there were less cooperation between different media literacy institutions, and the research was relatively scattered. In addition, Chinese institutions did not form a cooperative map with institutions from any other countries.

Figure 4. The network of institutions from CNKI

Figure 5. The network of institutions from WOS

3.4 Analysis of Keywords

3.4.1 The Network of Keywords

The keywords with high centrality and frequency represent the hotspots of research in a certain period of time. As a measure of the power of nodes, centrality reflects the importance of a node in the network. The higher the frequency of keywords and the higher the centrality of points, the more important the nodes are in this field. In addition to the basic research keyword of "media literacy," the top 15 research keywords of media literacy from 2010 to 2019 are shown in Table 3. The top three keywords with the highest frequency in the field of media literacy research from CNKI also have the highest centrality. They were: "media literacy education" (109 times with a centrality of 0.18), "new media" (81 times with a centrality of 0.16) and "college students" (77 times with a centrality of 0.14). The top three keywords with the highest frequency in the field of media literacy research from WOS were "media" (94 times with a centrality of 0.63, which is the top), "digital media" (24 times with a centrality of 0.11), "fiction" (21 times with a centrality of 0.14) and "film" (21 times with a centrality of 0.31).

Table 3. Top 15 keywords from CNKI and WOS (2010-2019)

	CNKI			WOS		
	Count	Centrality	Keywords	Count	Centrality	Keywords
1	109	0.18	Media literacy education	94	0.63	Media
2	81	0.16	New media	24	0.11	Digital media
3	77	0.14	College student	21	0.14	Fiction
4	26	0.01	Self-media	21	0.31	Film
5	20	0.08	Media	20	0.03	Information literacy
6	19	0.03	Teenagers	13	0.13	Social media
7	19	0.03	Information literacy	12	0.04	Internet
8	19	0.05	Ideological and political education	12	0.02	Literacy Criticism
9	16	0.00	Media convergence	10	0.09	Culture
10	15	0.01	Micro-blog	10	0.12	Literacy journalism
11	14	0.01	Universities	9	0.01	Communication
12	13	0.03	Internet public opinion	9	0.12	Television
13	11	0.05	Media education	7	0.02	Education
14	10	0.06	The USA	6	0.03	New media
15	10	0.06	Social media	6	0.04	Childress literature

Table 3 shows that the main research subjects of media literacy were vulnerable groups. However, in Chinese publications the main research subjects were teenagers and college students, while in the international publications they were mainly children. Media literacy research in China mainly focused on media literacy education and online media, while the international research focused on films, fiction and other media content and the media industry. It could be seen that "media literacy education," "new media," "media," "information literacy," and "social media" were the common keywords in both the Chinese and international research, which revealed the research focus of media literacy all around the world.

3.4.2 Keyword Clusters

The keyword clustering results are shown in Figure 6 and Figure 7.

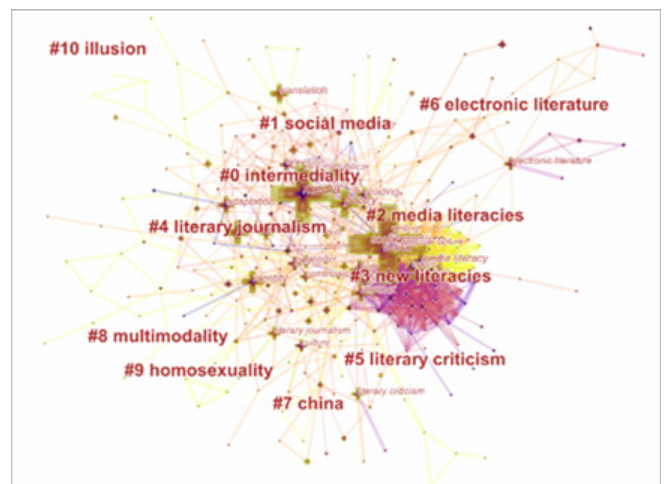**Figure 6.** The network of keywords from CNKI

Figure 7. The network of keywords from WOS

The Q values were 0.50 and 0.55, and the S values were 0.9366 and 0.5181 respectively, which showed that the result of clustering was of reference value. The keyword clustering results from CNKI had a total of 18 items. The smaller the sequence number, the greater the keywords that are included in the clustering results, and the larger the category is. It could be seen that "media literacy education," "new media" and "internet media literacy" were the top three among 18 categories. The keyword clustering results from WOS had a total of 11 items, the top three of which were "intermediate," "social media" and "media literacies." The main research topics and hotspots in the field of media literacy could be roughly summarized into four categories: theoretical research, practical research, learning environment and resources and media technology. The theoretical research included "media literacy," "visual culture," "new literacy," "literacy criticism," "internet literacy," "internet media literacy" and "media literacy education." The practical research included "status," "college student" and "China." The learning environment and resources included "literacy journalism," "intermediate," "new media," "program,"

"public opinion," "curriculum of media literacy" and "TV program." The media technology included "media information," "technology of new media," "media convergence," "social media," "electronic literature" and "multimodality."

3.4.3 Timeline of Keywords

The timeline of keywords map (shown as in Figure 8 and Figure 9) shows the development of hotspots related to media literacy research in Chinese and international publications in the last decade.
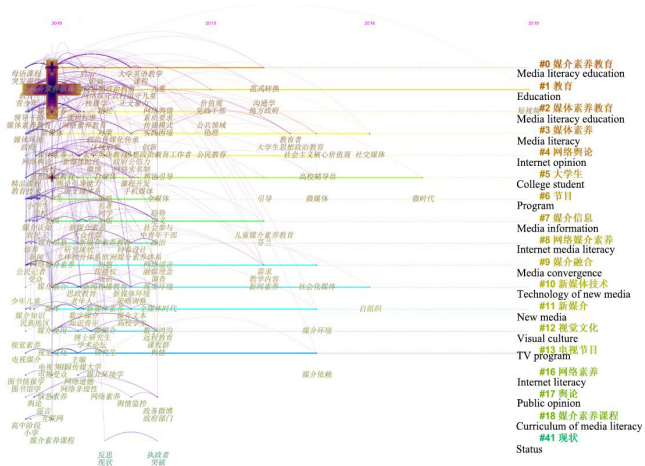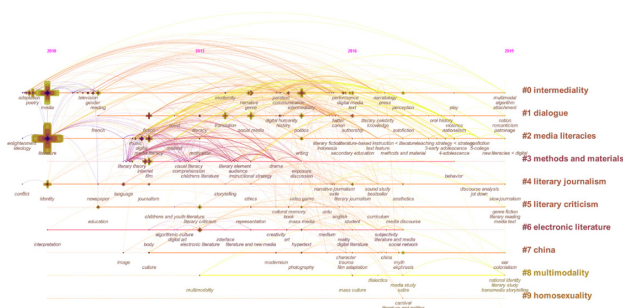

Figure 8. Timeline of keywords in CNKI (2010-2019)

Figure 9. Timeline of keywords in WOS (2010-2019)

From 2010 to 2019, the research on media literacy in China experienced stable development, and obviously, media literacy education was the most important research hotspot in the field of media literacy. In 2010, most of the research topics related to media literacy were concentrated on a single topic, with media literacy education and related content as the main focus of research. From 2010 to 2012, the scope of media literacy research gradually expanded, and the content of the research also increased. From 2012, with the growing popularity of new media technology, the study of policy and government, micro-media and micro-era, new media and self-media, mobile phones and Internet, etc., broadened the perspective of media literacy. In 2010, media and literacy were the main hotspots. From 2012 to 2015, the hotspots of media literacy were

methods and materials. From 2015 to 2017, the scope of media literacy gradually expanded. A great deal of research on literacy journalism, literacy criticism and electronic literature appeared. Since 2012, China has appeared on the timeline as a keyword.

3.4.4 Keyword Burst Terms

Burst terms show the most active area of research at a specific point in time. According to the keyword burst terms, we can judge the frontier and trends of related research fields. Figure 10 shows the strongest citation bursts of media literacy keywords in CNKI between 2010 and 2019. It could be seen that "media literacy," "new media," "college students," "self-media" and "social media" were the top five research hotspots of media literacy. Among them, "media literacy" was an active topic from 2016 to 2019, "new media" from 2013 to 2019, "college students" from 2014 to 2019, "self-media" from 2014 to 2019, and "social media" from 2016 to 2019.

Figure 10. The burst of keywords from CNKI

Figure 11 shows the strongest citation bursts of media literacy keywords in WOS between 2010 and 2019. It could be seen that "literature," "digital," "authorship," "media" and "new literacy" were the top five research hotspots of media literacy. Among them, "literature" was active from 2010 to 2011, "digital" from 2012 to 2013, "authorship" from 2016 to 2017, "media" from 2010 to 2012, and "new literacy" from 2012 to 2014.

The research frontier of media literacy in China mainly focused on the field of new media and self-media, with the research group mainly consisting of college students. Besides, it could be inferred that research on new media, self-media, and social media among college students was likely to occupy an
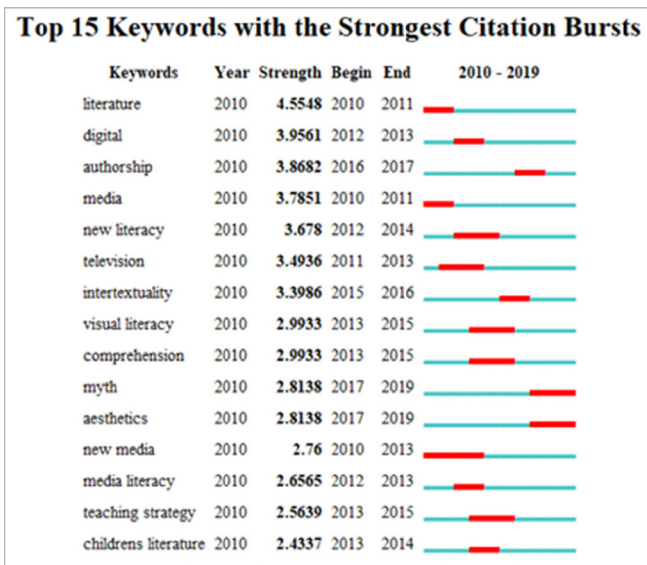
Top 15 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2010 - 2019
literature	2010	4.5548	2010	2011	
digital	2010	3.9561	2012	2013	
authorship	2010	3.8682	2016	2017	
media	2010	3.7851	2010	2011	
new literacy	2010	3.678	2012	2014	
television	2010	3.4936	2011	2013	
intertextuality	2010	3.3986	2015	2016	
visual literacy	2010	2.9933	2013	2015	
comprehension	2010	2.9933	2013	2015	
myth	2010	2.8138	2017	2019	
aesthetics	2010	2.8138	2017	2019	
new media	2010	2.76	2010	2013	
media literacy	2010	2.6565	2012	2013	
teaching strategy	2010	2.5639	2013	2015	
childrens literature	2010	2.4337	2013	2014	

Figure 11. The burst of keywords from WOS

important position in the next period. The research frontier of media literacy in international academia was mainly focused on the field of literature. Both in the Chinese and in the international literature, new media and self-media were the frontier topics in the media literacy field.

4 Discussions and Conclusions

This study used CiteSpace to visualize and analyze the research achievements of media literacy from 2010 to 2019 in CNKI and WOS. By analyzing the knowledge maps of authors, institutions, and keywords for media literacy research, the development trends and research contexts of media literacy in the past decade have been shown visually. This study not only explained the differences and similarities in media literacy between Chinese and international publications, but also provided references for researchers and practitioners in the field of media literacy.

4.1 Comparison of Authors and Institutions

From this study, it can be seen that international research on media literacy was gradually increasing, while Chinese research was still in a period of steady development. The number of international publications was three times that of China in recent years. Chinese scholars and institutions have not entered the top 10 in the field of international media literacy research. Chinese and international publications presented different cooperative maps for authors and research institutions. Chinese scholars have formed five core research groups, while international scholars have formed two cohesive groups. Chinese institutions have formed five core research groups while international institutions have also formed five, but cohesive groups. In China, communication universities and normal universities paid higher attention to media literacy than

other types of universities, while in the international publications the prolific institutions were comprehensive universities and research institutes.

However, Chinese scholars and institutions have not formed a cooperative map with scholars and institutions from other countries. The establishment of an academic research team can not only promote the improvement of academic research level, but also greatly promote the construction of discipline and research teams, and improve the status and influence of an academic group in the international community. It is necessary to strengthen the collaboration between international and Chinese scholars in the field of media literacy, and to build an academic community among different regions and disciplines [12, 16]. In addition, the quality of academic team members should be improved, academic leaders should be trained, and the professional development of the younger generation of scholars should be promoted.

4.2 Comparison of Research Hotspots and Trends

Research on media literacy in Chinese publications began more than half a century later than in the international publications. Paying close attention to the international research hotspots and trends can provide new perspectives for Chinese research, and achieve the transformation of Chinese research topics and trends. The results showed the main research subjects in the international media literacy were vulnerable groups, especially children. However, in China the main research subjects were teenagers and college students. International research of media literacy focused on films, fiction, and other media content and the media industry, while in China the focus was media literacy education and online media. The main research topics and hotspots in media literacy could be roughly summarized into four categories: theoretical research, practical research, learning environment and resources, and media technology.

4.3 Comparison of Research Frontiers

The research frontier of media literacy in China was mainly focused on the field of new media and self-media, with the research groups mainly comprising college students. It could be inferred that research on new media, self-media, and social media involving college students was likely to occupy an important position in the future. The research frontier of media literacy in the international publications was mainly focused on the literature field. With the rapid development of information technology, new media and self-media have been greatly developed. Both in China and around the world, new media and self-media were the frontiers in the media literacy field. In the new media and self-media environment, people were both producers and consumers of media content. It was

both an opportunity and a challenge for us to deal with and use media correctly and rationally. The research of new media and self-media environment had important practical significance.

4.4 Limitations and Future Research

Some limitations in this study are as follows: First, only two databases were selected to obtain the target papers written in Chinese and English, respectively, which may affect the results of the analysis to some extent. Future research may consider obtaining more comprehensive data from more databases. Second, more comprehensive results would be achieved by including articles written in other languages. Third, CiteSpace with knowledge mapping analysis can help provide extensive surveys of certain research fields, but it is not suitable for in-depth analysis of single articles. Future research may consider combining CiteSpace with other software to conduct in-depth analysis of a single article on media literacy [13-17].

Acknowledgments

References

[1] W. G. Christ, W. J. Potter, Media Literacy, Media Education, and the Academy, *Journal of Communication*, Vol. 48, No. 1, pp. 5-15, March, 1998.

[2] Y. Geng, Y. Xu, The Development of Media Literacy Curriculum in Foreign Countries and Its Future Development During the Years of 2003 and 2013, *China Educational Technology*, Vol. 335, No. 12, pp. 31-37, December, 2014.

[3] M. Zhao, W. Liu, On the Media Literacy Education in America: History, Problems and Developing Trends, *Elementary & Secondary Schooling Abroad*, Vol. 268, No. 4, pp. 16-20, April, 2015.

[4] Y. Geng, P. Wang, The Evolution Trend of EU Media Literacy Policy in Digital Environment, *Modern Communication*, Vol. 234, No. 1, pp. 147-151, January, 2016.

[5] P. Wu, S. Du, Research on the Status of Media Literacy of Chinese University Students, *China Educational Technology*, Vol. 289, No. 2, pp. 29-32, February, 2011.

[6] Y. Q. Geng, New Developments in Media Literacy in the Context of the Information Epidemic: Overseas Experiences and Chinese Strategies, *News and Writing*, No. 8, pp. 13-23, August, 2020.

[7] M. McLuhan, *The Medium Is the Massage: An Inventory of Effects*, USA: Penguin Books Press, 1967.

[8] U. Bronfenbrenner, *The Ecology of Human Development: Experiments by Nature and Design*, Cambridge: Harvard University Press, 2009.

[9] C. Chen, Searching for Intellectual Turning Points: Progressive Knowledge Domain Visualization, *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 101, No. supplement 1, pp. 5303-5310, April, 2004.

[10] C. Chen, Citespace II: Detecting and Visualizing Emerging Trends and Transient Patterns in Scientific Literature, *Journal of the Association for Information Science and Technology*, Vol. 57, No. 3, pp. 359-377, February, 2006.

[11] C. Chen, F. Ibekwe-Sanjuan, J. Hou, The structure and Dynamics of Cocitation Clusters: A Multiple-perspective Cocitation Analysis, *Journal of the American Society for Information Science and Technology*, Vol. 61, No. 7, pp. 1386-1409, July, 2010.

[12] G. S. Lan, S. Y. Zhang, Y. C. Zhang, The Comparative Study of Media Literacy and Information Literacy-based on the Perspective of Knowledge Mapping Visualization Analysis, *China Modern Distance Research*, No. 6, pp. 32-39, December, 2014.

[13] Y. S. Su, C. H. Chou, Y. L. Chu, Z. Y. Yang, A Finger-worn Device for Exploring Chinese Printed Text with Using CNN Algorithm on a Micro IoT Processor, *IEEE Access*, Vol. 7, pp. 116529-116541, August, 2019.

[14] Y. S. Su, C. F. Ni, W. C. Li, I. H. Lee, C. P. Lin, Applying Deep Learning Algorithms to Enhance Simulations of Large-Scale Groundwater Flow in IoTs, *Applied Soft Computing*, Vol. 92, pp. 106298, July, 2020.

[15] C. H. Chou, Y. S. Su, C. J. Hsu, K. C. Lee, P. H. Han, Design of Desktop Audiovisual Entertainment System with Deep Learning and Haptic Sensations, *Symmetry*, Vol. 12, No. 10, pp. 1718, October, 2020.

[16] Y. S. Su, C. L. Lin, S. Y. Chen, C. F. Lai, Bibliometric Study of Social Network Analysis Literature, *Library Hi Tech*, Vol. 38, No. 2, pp. 420-433, December, 2019.

[17] Y. S. Su, H. R. Chen, Social Facebook with Big Six Approaches for Improved Students' Learning Performance and Behavior: A Case Study of a Project Innovation and Implementation Course, *Frontiers in Psychology*, Vol. 11, Article No. 1166, July, 2020.

Biographies

Wei He received her B.S. degree in Educational Technology from Jiangxi Normal University, Nanchang, China, in 2019. Now she is studying for a master's degree at Nanjing Normal University.

Xiaohong Liu received her B.S. degree in Educational Technology from Jiangxi Normal University, Nanchang, China, in 2018. Now she is studying for a master's degree at Nanjing Normal University.

Li Zhao, female, Nanjing, China. She is currently an associate professor of the School of Education Science, Nanjing Normal University, Ph.D., Master Supervisor. She is mainly engaged in media literacy, visual literacy and technology application in education.