The Research Characteristics and Status on the Area of Educational Big Data from 2012-2019

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The Research Characteristics and Status on the Area of Educational Big Data from 2012-2019

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Abstract. To explore the status on the area of educational big data, 476 related articles form the from Web of Science core collection were analyzed by CiteSpace V. The results show that: (1) the area of Educational Big Data stared in 2012 and shows an upward trend year by year form 2014-2018, and the number of publications reached the historical peak in 2018. Williamson and Huda, USA and China, Educational sciences theory practice and Agro food industry hi tech top the list of contributing authors, country and publication respectively. (2) “eHealth research”, “current state”, “corporate use” “data entry”, “analytics discipline” and “psychological language” are the top six largest clusters on the area of educational big data from 2012-2019.

1. Introduction
The White Paper "Big Data for Development: Challenges and Opportunities" issued by the United Nations in 2012 clearly states that "the era of big data has arrived, and the emergence of big data will have a profound impact on all areas of society"[1]. With the combination of big data and education is the inevitable requirement of the development of the times, great progress has been made in the areas of big data in education by researchers at home and abroad, especially in China: The 13th Five-Year Plan for the Development of National Education issued by The State Council in 2017, clearly proposing that "accelerating the construction of education big data and open sharing" [2]. Chinese researchers have responded positively to the government's call and have carried out a large number of researches on educational big data [3, 4]. Some comparative analysis of the current situation of educational big data at home and abroad find that the research on big data of education in foreign countries is earlier, the theme is more perfect and the way is more pluralistic [5, 6], and they mainly focused on the education and teaching reform, teaching mode and application, educational data, analysis and personalized learning research, personnel training and teacher professional development [7-9]. However, compared with domestic research, when the research of educational big data was started and how the them and the method was more perfect in foreign countries were still unclear. This study therefore set out to explore the status on the area of educational big data in abroad by using the visualization software Citespace V.
2. Methodology

2.1. data sources
The search conducted in the Web of Science core collection yielded 476 articles under the topic of “big data & education”.

2.2. data processing
With the help of the CiteSpace software [10], we carried out the bibliometric analysis and visual analysis the RIS format of the 476 articles.

3. Results

3.1. Bibliometric analysis

3.1.1. Publishing trend. Fig. 1 demonstrates the publishing trend of studies on the area of educational big data. The earliest study of educational big data started since 2012, and then there were an upward trend year by year from 2014-2018. The number of publications reached the historical peak in 2018.

![Fig. 1 Publishing trend on the area of educational big data.](image)

3.1.2. Author statistics. Tab.1 depicts the top 10 contributing authors. As seen, all of them have published more than three articles and Williamson tops the list with seven articles.

| Rank | Author         | Frequency |
|------|----------------|-----------|
| 1    | WILLIAMSON B   | 7         |
| 2    | HUDA M         | 4         |
| 3    | LUPTON D       | 4         |
| 4    | MASELENO A     | 4         |
| 5    | BASIRON B      | 3         |
| 6    | HOWELL JA      | 3         |
| 7    | HUANG S        | 3         |
| 8    | JASMI KA       | 3         |
| 9    | ROBERTS LD     | 3         |
| 10   | SEAMAN K       | 3         |
3.1.3. Country statistics. Tab.2 outlines the top 10 countries contributing on the studies of educational big data. As shown, USA and China were the best performer, each of them has been contributing more than eighteen articles.

| Rank | Country           | Frequency |
|------|-------------------|-----------|
| 1    | USA               | 171       |
| 2    | PEOPLES R CHINA   | 85        |
| 3    | ENGLAND           | 48        |
| 4    | AUSTRALIA         | 30        |
| 5    | GERMANY           | 22        |
| 6    | SCOTLAND          | 18        |
| 7    | ITALY             | 15        |
| 8    | CANADA            | 14        |
| 9    | INDIA             | 14        |
| 10   | SPAIN             | 13        |

3.1.4. Source publication statistics. Tab.3 describe the top 10 source publication contributing on the studies of educational big data. As seen in Table 3, Educational sciences theory practice tops the list, followed by Agro food industry hi tech, which has been published more than ten articles.

| Rank | Source Publication                                         | Frequency |
|------|-----------------------------------------------------------|-----------|
| 1    | EDUCATIONAL SCIENCES THEORY PRACTICE                     | 13        |
| 2    | AGRO FOOD INDUSTRY HI TECH                               | 10        |
| 3    | INTERNATIONAL JOURNAL OF EMERGING TECHNOLOGIES IN LEARNING| 9         |
| 4    | ENGINEERING                                              | 8         |
| 5    | BIG DATA                                                  | 7         |
| 6    | CHIMICA OGGI CHEMISTRY TODAY                             | 7         |
| 7    | THEORY AND RESEARCH IN EDUCATION                          | 7         |
| 8    | IEEE ACCESS                                               | 6         |
| 9    | INTERNATIONAL JOURNAL OF ADVANCED COMPUTER SCIENCE AND APPLICATIONS | 6     |
| 10   | BIG DATA SOCIETY                                          | 5         |

3.2. Knowledge mapping results

3.2.1. High frequency keywords. Tab.4 and Fig. 2 draws the top 10 high frequency keywords as well as their frequencies on the studies of educational big data. “big data” is the most frequently keywords. And “education”, “learning analytics”, “analytics” and “technology” are positioned in the 2nd, 3rd 4th and 5th places on the list. It is indicated that analytics and technology, especially the learning analytics attracts researchers’ attention.

| Rank | Keywords         | Frequency |
|------|------------------|-----------|
| 1    | big data         | 254       |
| 2    | education        | 79        |
| 3    | learning analytics | 39      |
| 4    | analytics        | 36        |
| 5    | technology       | 34        |
3.2.2. Popular research topics. Fig 4 outlines the top six largest clusters, which were “eHealth research”, “current state”, “corporate use” “data entry”, “analytics discipline” and “psychological language”. As shown, the largest cluster is “eHealth research” (#0), which contains 19 articles and its S value is 0.87. The high-frequency keywords of this cluster contain “management”, “impact”, “social media” and “system”. The second largest cluster is “current state” (#1), which contains 15 articles and its S value is 0.74. The high-frequency keywords of this cluster contain “data science” and “data analytics”. The third largest cluster is “corporate use” (#2), which contains 13 articles and its S value is 0.77. The high-frequency keywords of this cluster contain “science”, “network”, “knowledge” and “service”. The fourth largest cluster is “data entry” (#3), which contains 13 articles and its S value is 0.63. The high-frequency keywords of this cluster contain “learning analytics”, “higher education”, “performance” and “algorithm”. The fifth largest cluster is “analytics discipline” (#4), which contains 12 articles and its S value is 0.93. The high-frequency keywords of this cluster contain “big data”, “education”, “analytics” and “technology”. The last largest cluster is “psychological language” (#5), which contains 10 articles and its S value is 0.77. The high-frequency keywords of this cluster contain “health” and “ontology”.

|   |   |
|---|---|
| 6 | higher education |
| 7 | challenge |
| 8 | science |
| 9 | data science |
| 10 | management |
Fig. 3 Clusters of the current researchers

4. Conclusions and further research

Some comparative analysis finds out that the research on big data of education in foreign countries is earlier, the theme is more perfect and the way is more pluralistic, so this study set out to reveal the status on the area of educational big data in abroad by using the visualization software Citespace to confirm it. The bibliometric analysis results show that the on the area of educational big data was stared in 2012 when the White Paper "Big Data for Development: Challenges and Opportunities" was issued by the United Nations [1]. There were an upward trend year by year from 2014-2018, and 2018 reached a historical peak. Williamson tops the list of contributing authors with seven articles, and USA and China were the best performer of the contributing countries, each of them has been contributing more than eighteen articles. Educational sciences theory practice tops the list of the contributing source publication, followed by Agro food industry hi tech.

In the section of Knowledge mapping analysis, the high frequency keywords shown that “learning analytics”, “analytics” and “technology” top the list of high frequency keywords except the search term ( big data and education), indicating that analytics and technology, especially the learning analytics attracts researchers’ attention. The clusters analysis results show that “eHealth research”, “current state”, “corporate use” “data entry”, “analytics discipline” and “psychological language” are the top six largest clusters, which are the popular research topics on the area of educational big data from 2012-2019.

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