Analysis of Research Related to Artificial Intelligence in Teaching Management and Evaluation

-- Analysis Based on Chinese CNKI Data

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Abstract

With the development of artificial intelligence, many techniques of artificial intelligence are now gradually applied to the field of education. Educational management and evaluation, as an important part of educational teaching, are studied by many scholars at home and abroad to combine artificial intelligence and educational management and evaluation in order to improve the efficiency and effectiveness of educational management and evaluation. This paper uses Cite space to analyze and explain the literature related to the application of artificial intelligence to educational management and evaluation mainly on China Knowledge Network (CNKI), analyze the relevant connections and laws through graphs and charts, and summarize the main ideas and future research space of existing research literature.

Keywords

Artificial intelligence; Educational management; Educational evaluation.

1. Introduction

Since the beginning of the 21st century, computer technology represented by the Internet has promoted the development of information technology in various industries, causing disruptive changes in many fields such as e-commerce, short videos, and travel. In the education industry, online education supported by Internet technology has also become an important education method due to its characteristics of wide audience and not limited by time and space[1].In the past decade, artificial intelligence technology has become a hot topic in computer technology, and it has been widely applied to image processing, pattern recognition, natural language processing, recommendation systems, and other fields. As the concepts of "smart education" and "smart classroom" have been introduced and gradually developed into a large research field, AI technology has become an indispensable tool in educational activities. China's focus on the application of AI technology to education is a forward-looking development concept that will accelerate the transformation of education in the information age, which requires the use of modern technology to achieve an organic combination of scale education and personalized training. Artificial intelligence technology has an important role in helping to realize a scaled and personalized training approach.

Educational management and evaluation are important guarantees for the good implementation of educational activities. Educational management involves all key stages of the educational process, from teacher selection and educational resource allocation to policy formulation and implementation, all of which require the combination, supervision and

regulation of managers [2]. Thanks to the development of computer technology, education management has widely adopted various education management systems, such as academic information network and research and development network. The educational big data collected through various channels are also used to support various educational decisions[3].In terms of educational assessment, many efforts, including learner modeling, have made it possible to implement educational assessment in an informative way, and knowledge tracking, supported by deep learning technologies such as DKT, can automatically generate learners' mastery of each knowledge point, helping teachers to assess each student's learning[4].Based on the fact that AI has already played an important role in the process of educational management and evaluation, this paper integrates and literature text mining the literature related to the application of AI in educational management and evaluation in the past two decades, analyzes keyword co-occurrence, trend of publication volume, and literature sources by means of bibliometrics, summarizes the current research hotspots of AI technology in educational management and evaluation, and explores its application prospects and future trends.

2. Literature References

2.1. Research Methodology

Cites pace, also known as "citation space," is a citation visualization and analysis software developed in the context of scientometrics and data visualization to analyze the potential knowledge contained in scientific literature. The visual graphs obtained by this method are also called "scientific maps" because they present the structure and regular distribution of scientific knowledge through visualization. It is used to identify and display new trends and developments in the scientific literature. Through Cites pace, it is possible to understand which literature is groundbreaking and iconic in a certain research area, and how the research frontiers based on a certain knowledge base are evolving. Currently, cites pace-based analysis methods have been widely used in review writing. Cites pace-based analysis methods can be used for field hotspot analysis, research evolution path analysis, and research community analysis, which play a key role for researchers to track the development dynamics of academic fields[5].

2.2. Research Methodology

The data in this paper are mainly from the database of China Knowledge Network (CNKI). The resources of China Knowledge Network (CNKI) include the full-text database of Chinese journals, the full-text database of Chinese outstanding master's and doctoral theses, the full-text database of Chinese important conference papers, the full-text database of Chinese important newspapers, the full-text database of Chinese yearbooks, and the database of Chinese tool books. It provides people with accurate, authoritative and credible knowledge search services [6].

In order to obtain literature related to the topic of "Artificial intelligence in teaching management and evaluation", the "Advanced Search" function was used through China Knowledge Network (CNKI). In order to exclude the influence of irrelevant literature on the analysis and interpretation of the topic, manual deletion was used to remove non-journalistic literature and literature on topics that were seriously incompatible with the topic of this study. In order to exclude the influence of irrelevant literature on the analysis and interpretation of the topic, a manual deletion process was used to remove non-journal literature and literature with topics that did not match the topic of the study. A total of 310 documents were retrieved through the "advanced search" function, using the themes "artificial intelligence" and "teaching evaluation", and were manually removed to exclude irrelevant documents. After that, 310

documents were searched, and irrelevant documents were removed manually. The search scope was: General Library. A total of 326 documents were exported as the final documents for analysis.

3. Results and Analysis

3.1. Distribution of thesis publication time

The trend of the number of articles and publications on the application of artificial intelligence in teaching management and evaluation from 1990 to 2020 was obtained through the "Analysis of all search results" in the visual analysis function of China Knowledge Network (CNKI), as shown in Fig. 1. From Fig. 1, it can be seen that the number of publications from 1990 to 2004 has been at the lowest level, with a slight upward trend from 2004 to 2005, a decline from 2005 to 2006, and an up-and-down state from 2006 to 2016, with a relatively flat overall trend of fluctuation. From 2016 to 2019, a significant increase began to appear, and from 2019 to 2020, a downward trend again appeared. According to the relevant prediction of China Knowledge Network (CNKI), in 2021 compared to 2020, there will be an upward trend in the amount of literature published in the related fields.

From 1990 to 2004, research on the application of artificial intelligence to teaching management and evaluation was just in its initial stage, and the related technology and how to better integrate artificial intelligence with teaching management and evaluation were in the research stage. The traditional teaching management and evaluation model is obviously no longer suitable for the gradually developing teaching requirements, and researchers gradually focus on the application of AI-related technologies to promote teaching management and evaluation as an important part of education and teaching [7]. From 2004 to 2005, there was some progress in related research, which led to an upward trend in the number of publications. 2006 to 2016, researchers continued to explore the use of artificial intelligence in teaching management and evaluation, which led to an up-and-down trend in the number of publications. 2016 to 2019, there was an important breakthrough in related research, and the outline of how artificial intelligence can operate in teaching management and evaluation became clearer, and researchers had a clearer research direction. The number of articles published in this field showed a clear upward trend during this period. 2020, the number of articles published showed a downward trend, mainly due to the emergence of the global new crown epidemic, and this year, online teaching and learning occupied the main content of education and teaching [8]. In 2021, it is predicted that there will be a further upward trend in the number of publications in related fields. The main reason is that the new crown epidemic has caused people to rethink how to improve online teaching and learning, and teaching management and evaluation, as an important part of education and teaching, how KK can be conducted online to make it effective is a topic that researchers will continue to study, therefore, in 2021, the literature of related studies will show an upward trend according to the above reasons.
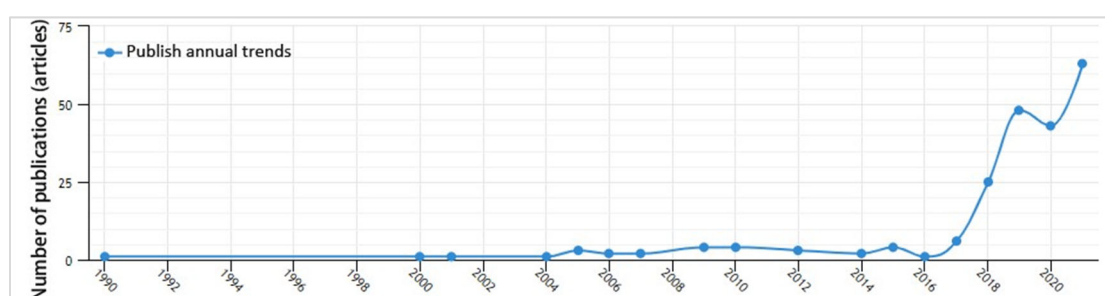
Figure 1. Trend of the number of articles on the use of artificial intelligence in teaching management and evaluation in China Knowledge Network (CNKI)

3.2. Country and institutional distribution

The distribution of institutions that publish literature related to the use of AI in teaching management and design was obtained from China Knowledge Network (CNKI), and the total number of publications in related fields for each institution was counted. From the overall row, the number of publications of each institution is generally balanced, among which Beijing Normal University has 10 publications, which is 4 more than the second one, Huazhong Normal University. The number of articles issued by Beijing Normal University is 10, which is 4 more than that of Central China Normal University, which is the second one. The number of articles issued by Southwest University, East China Normal University and Northeast Normal University are 4. Those with 3 articles are Shaanxi Normal University, Nanning University, and Northwest Normal University. It can be seen from the graph that the number of articles issued by teacher-training universities is significantly higher than other schools in this field, and of course there are some non-teaching schools that also have the highest number of articles issued, so it can be concluded that in the relevant field of research, teacher-training universities have their own advantages, but non-teaching schools are also not to be underestimated, and they show their own interest and ability in this field of research.
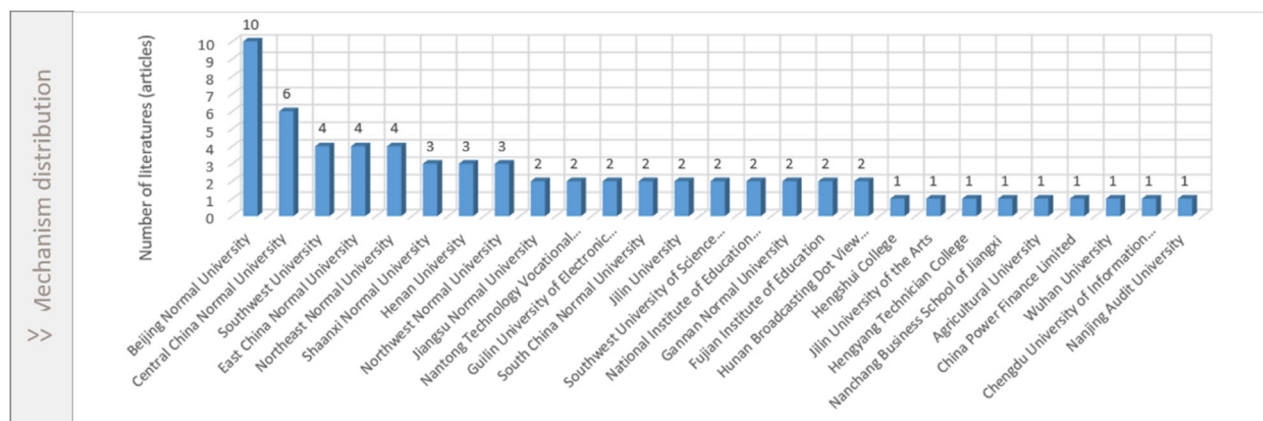
Figure 2. Institutional publication volume on the use of artificial intelligence in teaching management and evaluation from China Knowledge Network (CNKI)

3.3. Hot word analysis

The key words are used to summarize the core content of all kinds of literature at all levels. Readers can search the literature through the key words and also understand the main content of the relevant literature through the key words. Keywords are often the embodiment of hot research trends, so the co-occurrence analysis of keywords is used to obtain hot research words in this field. The recurring words in the article can be extracted by Citespace algorithm. Through the co-occurrence analysis of Citespace keywords, the research hotspots in the sample literature can be obtained at last. The idea of Citespace co-occurrence analysis is based on the fact that when two keywords appear in a literature at the same time, there is a co-occurrence relationship between the two keywords. The higher the co-occurrence frequency of the two words, the closer the co-occurrence relationship between the two words will be considered, which is represented by the distance between nodes in the graph in Citespace. The closer the nodes are, the closer the relationship is.

By importing relevant literatures from China National Knowledge Network (CNKI) into Citespace for keyword co-occurrence analysis, the results shown in Table 1 can be obtained [9].

Table 1. High-frequency hot words in the field of artificial intelligence used in teaching management and evaluation by frequency

Index	Hot words	Frequency	Centrality	Year
#1	Artificial intelligence (ai)	109	0.37	2005
#2	Educational Informatization	30	0.10	2018
#3	Big data	27	0.09	2017
#4	Learn	26	0.09	2001
#5	Education evaluation	22	0.07	2006
#6	Smart education	17	0.05	2018
#7	Artificial intelligence technology	15	0.05	2018
#8	Education management	11	0.04	2010
#9	Information technology (it)	9	0.03	2018
#10	Educational governance	6	0.02	2020
#11	Learning evaluation	6	0.02	2005
#12	Evaluation	6	0.02	2002
#13	Smart education	5	0.01	2020
#14	Educational management information	5	0.01	2019
#15	Educational modernization	5	0.01	2018

Table 1 shows that artificial intelligence is the most frequent and central term. From 2001, the word "learning" became a hot word, and the year 2001 can be regarded as the year of combining artificial intelligence with the field of teaching. In 2005, "artificial intelligence" and "learning assessment" became buzzwords, and it can be considered that artificial intelligence was gradually applied to learning assessment. In 2006, "educational evaluation" emerged and became the buzzword of the year, which showed that researchers had realized the value of educational evaluation and conducted further research on it. In 2010, "educational evaluation" and "educational management" became buzzwords one after another, which shows that there is a correlation between educational evaluation and educational management. In 2017, "big data" became a hot word, and in 2018, "education informatization," "smart education," "artificial intelligence technology" and "information technology" became hot words. "In 2019, "education management information" will be a hot word, and in 2020, "intelligent education" will be a hot word. In 2020, "intelligent education" will be a hot word. From 2001 to the present, the integration of artificial intelligence with educational management and evaluation has been deepening [10].

4. Research Hotspots and Trends

4.1. Research hotspots

By searching the relevant literature on "AI+ Education evaluation " and "AI+ education management" on China Knowledge Network, we found that the research hotspots on AI+

education evaluation are mainly in two aspects: on the one hand, the theory, concept and evaluation standard of education evaluation should be changed. On the one hand, it requires a change in the theory, concept and evaluation standard of educational evaluation. The evaluation criteria should have both screening value and individual value-added evaluation; the evaluation results should convey both explicit and implicit information. It should focus not only on the automated evaluation of learning outcomes, but also on the full multimodal evaluation of the classroom learning process. Educational evaluation in the era of artificial intelligence should change perspectives by combining environmental and systemic changes, integrating international examination and evaluation experience on the basis of comprehensive evaluation, centering on core literacy, relying on big data, and carrying out a new type of curriculum evaluation that combines dynamic and static evaluation, stage evaluation and summative evaluation, and domestic and international reference[11].On the other hand is the research and practical application of AI educational evaluation techniques, tools and systems. The immediate assessment methods realized through AI technologies (e.g., the criticism network) are no longer limited to a closed form of assessment, but can give effective feedback and evaluation of students' essay-like learning through an open form. Determining the measurement and analysis criteria for developing learning assessment tools will contribute to the reliability and validity of learning assessment tools. Artificial intelligence technology, through the collection and inclusion of extensive, interconnected, and meaningful educational data, can promote automated assessment and efficient feedback to learners, and also facilitate integration and decision-making for managers, and the talent evaluation system will further shift from screening, selection, and elimination to diagnosis, improvement, and optimization, and the talent cultivation concept will further shift from knowledge-based and employment-oriented to core literacy and Comprehensive quality. Classroom teaching evaluation under artificial intelligence can be designed by collecting voice, posture, facial and physiological signal data and carrying out recognition and analysis algorithms, including speech recognition, natural language processing, posture recognition, expression recognition and EEG-based emotion recognition, pointing to four application scenarios of classroom language analysis, classroom behavior analysis, classroom emotion analysis and classroom teaching evaluation system[12]. In the research on intelligent evaluation systems we found that the current systems of artificial intelligence applied to educational evaluation mainly include: ① automated evaluation system for ICT skills and program assignments (through three steps of information acquisition, knowledge reasoning and comprehensive evaluation, it dynamically tracks the user's operation behavior and diagnoses, evaluates and gives feedback on the operation process, which can largely improve the learning efficiency); ② automated short text evaluation system (which can realize automated evaluation and feedback in the fields of speech, short essay and mathematics); ③ automated spoken language evaluation system (which is able to conduct automated testing and evaluation of spoken language speech in many languages). Among them, some scholars in the study of automated assessment systems believe that automated assessment systems can achieve objective, consistent, efficient and highly usable assessment results, provide immediate feedback, greatly reduce teachers' burden, and provide a real and reliable basis for teaching decisions [13].

4.2. Research trends

Through the analysis of the existing literature, we found that the development trend of AI in educational evaluation has gradually moved from theory to practice, from the development of evaluation standards and educational evaluation changes to the specific application of AI educational evaluation tools[14].In the current research on AI and educational evaluation, on the one hand, it is the research conducted for the impact of AI technology on the original theories, concepts and standards supporting educational evaluation, and on the other hand, it

is the research on the design and development of AI educational evaluation techniques, tools and systems to make specific practical applications. However, these researches are still at the stage of small-scale experimental exploration, lacking the relevant theoretical support for AI educational evaluation, and there are few large-scale AI educational evaluation practices. In the future development, first, we should explore the construction of specialized evaluation indexes, which should explore the principles of interpretation and guidance of quantitative data and consider the focus of different types and disciplines of classroom teaching evaluation; second, we should strengthen personalized teacher behavior feedback, such as using AI to identify and give feedback on teachers' classroom posture and carry out observation and evaluation of teachers' teaching ability; third, we should focus on the developmental future education challenges, clarify teacher role changes, and focus on the protection of private data for educational evaluation. It is important to note that technology is neutral, and it depends on the guidance of advanced educational ideas. With the gradual development of AI in education, we must be careful to avoid the mistake of "technological determinism". Artificial intelligence technology should not only follow the laws of technology, but also the laws of human physical and mental development, and establish a correct view of learning, teachers and students, knowledge, curriculum, educational evaluation, educational management, etc. In order to give full play to the advantages of artificial intelligence technology and improve the quality and efficiency of education [15].

5. Conclusion

Artificial intelligence is playing an increasingly important role in educational evaluation, and its traditional role as a mere technical support for evaluation has been gradually broken. The future educational evaluation will reflect the characteristics of artificial intelligence in the definition of evaluation objectives, the function of evaluation subjects, the selection of evaluation methods, the formulation of evaluation standards and the application of evaluation results. The concept of artificial intelligence will certainly penetrate into the education evaluation reform and affect the process and even the direction of education evaluation reform as a whole. Firstly, it is necessary to change the idea of education evaluation, strengthen the leadership of the new concept of education evaluation, especially highlight the guidance of process evaluation and value-added evaluation; secondly, it is necessary to expand the function of artificial intelligence education evaluation and promote the development of artificial intelligence evaluation technology; thirdly, it is necessary to consolidate the support system of artificial intelligence education evaluation, strengthen the construction of intelligent education evaluation infrastructure, improve the education evaluation system, and strive to enhance the whole society's Education evaluation literacy.

Acknowledgments

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