

Research on Educational Evaluation in the Era of Artificial Intelligence

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ABSTRACT. *Mainland China pushes for carrying out the reform of educational evaluation in the era of artificial intelligence. Based on deep mining and scientific analysis of multidimensional, large amounts of data in search of hidden relationships and value, artificial intelligence is promising to help educators transform educational evaluation from small samples or incomplete information-based suppositions into full data-based evidences. This paper first reviews the development of educational evaluation in the era of artificial intelligence, then proposes that artificial intelligence era of education brings huge influence, which brings impact will be created new education idea, the new teaching system, the new teaching way and method, and the new education and teaching evaluation.*

KEYWORDS: *Education evaluation, artificial intelligence, big data*

1. Review of the Relevant Studies at Home and Abroad

Artificial Intelligence (AI) was first studied at the Dartmouth conference in 1956. With a history of more than 60 years, the support of the state is the soil on which artificial intelligence depends for its survival and development. In terms of education, internationally, the United States released the national strategic plan for artificial intelligence research and development in 2016, which deeply discussed the development status and potential issues of human "industrial intelligence + education" and proposed the strategic direction of giving priority to the development of artificial intelligence in the field of education. In China, in May 2016, the national development and reform commission and other ministries jointly released the "Internet +" three-year action plan on artificial intelligence, which aims to foster the application scale of the 100-billion-level artificial intelligence market in 2018. The Wuzhen index: global AI development report (2016) released by Wuzhen think tank makes it clear that the application of AI technology in the field of education mainly includes intelligent evaluation, personality counseling, and child companionship. In July 2016, the state council issued the "development plan for a new generation of artificial intelligence" to give specific guidance on the development direction of

"artificial intelligence + education". The report on the work of the government at the 2018 National People's Congress (NPC) and the Chinese people's political consultative conference (NPC) made clear the need to strengthen the research and development and application of the new generation of artificial intelligence, and develop intelligent industries and expand intelligent life in the fields of health care, old-age care, education, culture and sports. The international conference on artificial intelligence and education with the theme of "planning education in the era of artificial intelligence: leading and spanning" was held in Beijing from May 16 to 18, 2019. The participants jointly discussed the capability and literacy requirements and the construction of the education system in the era of artificial intelligence, explored policies and strategies to help achieve the 2030 education goals, studied the innovative application of information technology represented by artificial intelligence in the field of education, and promoted international cooperation.

The formal study of "artificial intelligence + education" can be traced back to the article "artificial intelligence in education" published by Conati C. et al. in nature in 1976, in which the application of artificial intelligence in interpersonal communication and teaching was discussed theoretically. The research boom of "artificial intelligence + education" really started around 2010 with the development of big data technology, powerful computing power of computers, efficient data processing power and the rapid development of algorithms, which led to the rapid development of artificial intelligence technology. The development of artificial intelligence technologies such as adaptive learning, learning analysis and deep learning has further promoted the rapid development of "artificial intelligence + education". In order to comply with the development trend of artificial intelligence and the national development strategy demand, scholars at home and abroad are also very enthusiastic about the research on "artificial intelligence + education" in recent years. However, researchers pay more attention to the analysis of the changes of educational forms and characteristics in the era of artificial intelligence, and then explore new and efficient educational modes (for example, tang hanwei, 2018; Chang zhao-qin, Chen xiao-li, 2019; Li jian zhong, 2019; Wang shichong et al., 2019), and the corresponding evaluation theoretical system of artificial intelligence + education model has not yet been formed. Currently, the only evaluation research can be roughly divided into three categories, as follows:

1.1 Macro thinking of education evaluation in the era of artificial intelligence

The macro thinking of educational evaluation in the era of artificial intelligence mainly discusses the development trend of educational evaluation in the context of artificial intelligence. For example, Zhu chengchen and Yan guangfen (2018) proposed that in the era of big data, education information drives the intelligent operation of education evaluation, and promotes the continuous modernization, specialization and scientization of education evaluation. Modern education evaluation promoted by new technology presents three logical states: "active follow-up", "deep integration" and "demand guidance". Yan-linzheng and LiuHaiMing (2015) was also introduced in on the macro data application path in the

evaluation of education in the United States, which includes three dimensions : "big data and why use", "big data" and "how big data and use".It discussed how the United States at the national level to promote big data applications in education evaluation and for the large data booster education evaluation reference.

The research contribution of macro thinking of education evaluation in the era of artificial intelligence is mainly reflected in which leads the development direction of education evaluation, promotes the improvement of modern education evaluation theory, and forces the change of traditional education evaluation model, so as to better meet the new requirements of the development of education evaluation in the era of artificial intelligence. Secondly, the advocacy of evaluation ideas and values will help to cultivate and pay attention to the individual differences of the evaluated objects, stimulate the imagination and creativity of the evaluated objects, and reflect the humanistic spirit in the evaluation process. Thirdly, the change of thinking mode of educational evaluation is consistent with the development of new artificial intelligence technology, and the combination of the philosophical thought of the holistic view of Chinese culture with the thinking mode of western logical reasoning and empirical analysis will promote the formation of scientific thinking method of educational evaluation.

1.2 The development of educational assessment in the era of artificial intelligence

The development of educational evaluation in the era of artificial intelligence is mainly based on data mining technology for learning analysis according to the results of analysis data to carry out targeted teaching activities. In terms of learners' individual, on the one hand the development trend of a single predictor can be inferred through the integration of multiple predictors, and be realized multidimensional information integration which includes learners' cognition, meta-cognition, learning motivation, learning attitude and learning emotion. And then build the learning model to forecast the future development trend of learning; on the other hand, by studying the correlation between variables and coding the research results as a principle, a mathematical model for optimizing teaching content and teaching order is constructed.

As for learning analysis, researchers have defined it in different ways. George, Siemens & Phillip (2011) believes that learning analysis refers to the measurement, collection, analysis and reporting of data sets related to learners and learning situations to understand and optimize learning and learning situations. Larry. Johnson, Samantha. Adams Becker, Holly Witchey, et al. (2011) has pointed out that learning analysis is to study and analyze the data of learners' learning participation, learning performance and learning process by loosely using dependent data collection tools and analysis techniques, so as to realize real-time correction of courses, teaching and evaluation. According to Chinese scholars guxiaoqing et al. (2012), learning analysis refers to the application of different analysis methods and data models to interpret the data related to learners' learning information. Or, based on the interpretation of the data, we can have a deep insight into the learners' learning performance and provide them with matching feedback to promote more

effective learning. Through the acquisition and analysis of the learner's response data, skill connection data and test result data, the degree of knowledge mastery of the learner is clarified. By collecting and analyzing the data of learners' learning behavior changes in classroom learning, the relationship between learners' different learning behavior patterns and their learning results is straightened out. Through the acquisition and analysis of learner satisfaction questionnaire data, we can understand the degree of satisfaction of learners with their own learning experience. Through the collection and analysis of domain module classification data, the correlation data between skills and problems and between problems, the learning components of effective learning, effective online teaching strategies and the overall effect of online courses can be promoted. Through the acquisition and analysis of the basic information data of students such as enrollment and enrollment source, the future learning development trend of learners is determined. By collecting and analyzing the data of students' academic performance, it can provide learning suggestions for learners and improve learning experience in real time.

Examples of learning analysis , as early as in 1968, the United States has established the national center for education statistics, which is responsible for collecting education statistics data and analyzing the significant statistical data (NCES) 2005. Another example, PISA is initiated by the organization for economic cooperation and development design program for international student assessment, giving a test every three years aiming to test the age of 15 students in reading literacy, mathematical literacy and scientific literacy ability of three areas of international comparative evaluation to evaluate the education system all over the world, and to determine how much they can achieve in general knowledge that is applied to real life. In other words, PISA is an international educational policy analysis tool whose main objective is to provide a new basis for policy dialogue and the definition and implementation of educational objectives (OECD, 2001).

In the era of artificial intelligence, the contribution of the development of educational evaluation to the exploration lies in the realization of the deep integration of artificial intelligence technology and educational evaluation, the transformation of the methodology and paradigm of educational evaluation, and the transformation of educational evaluation from psychological measurement, mathematical matrix, value judgment to constructive. To promote the return of the value of educational evaluation, from a single instrumental rationality to the value of the unity of instrumental rationality and humanistic rationality; To promote the reform and innovation of educational evaluation methods and means, from the traditional scale test, the establishment of archives to the intelligent big data mining and learning analysis; It promotes the transformation of educational evaluation thinking mode and evaluation mode, and realizes the transformation of educational evaluation from small sample thinking to holistic big data thinking, from judgment mode to response mode. To make education data resource sharing platform, to carry out the individual diagnosis and evaluation of information of education data acquisition and mining, intelligent information processing, data platform of sharing resources construction, personalized diagnosis and feedback of evaluation information, the diversification of evaluation function orientation clear direction for

the development of modernization and specialization

1.3 Development of teaching evaluation technology in the era of artificial Intelligence

The exploration of teaching evaluation technology in the era of artificial intelligence is mainly based on the exploration of automatic evaluation method of intelligent technology. "automation", "visualization", "precision" and "scale" are the prominent characteristics of this kind of evaluation technology.

Automation, using artificial intelligence technology, tracks the learners' learning behavior, records the learning path and keeps abreast of learning situation, such as on-line automatic correcting other grade nets, not only can realize real-time evaluation to the student composition but also reflect students composition and reference corpus with instant feedback (RuLiNa etc., 2019).

In terms of visualization, artificial intelligence technology enables interactive and adaptive scenario-based tasks to be applied to teaching evaluation, recording the learning traces of the evaluated objects, and realizing visual evaluation. Visualization could assist the non-verbal and verbal expression of the evaluated object, and it can visually transform the task text and tracks of the psychological cognitive process of the evaluated object (pirnay-dummer, Ifenthaler, & Spector, 2010).

In terms of visual products, a learning analysis dashboard for learners and teachers to provide visual learning trajectories has also been developed, which can track time and social interactions to gain insight into collaboration, use of documents and tools, and artifacts made by students (Verbert, Duval, Klerkx, Govaerts, & Santos, 2013).

Although these dashboards are far from providing detailed evaluation data tracks that can be created, it has been found that even using these limited opportunities to analyze their learning can support learners' reflection, improve self-assessment, and also improve course satisfaction (Verbert, et al., 2013). For example, Harvard University has created a game-based assessment of scientific thinking, which determines the ability of middle school students to design scientific surveys and construct causal explanations through the collection and analysis of various data of assessment objects (clarke-midura et al., 2012).

In a game-based educational assessment, the more detailed traces of the assessed are easily identified and are designed to be immersive and emotionally engaging rather than simply entertaining (Aldrich, 2005). In these game-based examples, high-resolution feedback is always on the screen, providing the player with an up-to-date view of progress, hints of upcoming challenges, and a view of long-term goals (Prensky, 2001). The researchers hope to educate policymakers about the importance of teachers and learners by presenting visual data methods and impacts, as well as developments in data processing, which will judge student performance better.

Scale, in order to explore the use of artificial intelligence which is used technology to solve the problem of the difficulties the large-scale education examination is currently committed to conquer the direction in the field of education and information technology. In terms of technology products, Thinkster Math is a tutorial application that combines real teaching courses with personalized teaching styles. The app assigns each student a behind-the-scenes mentor who watches their mental processes step by step on the iPad screen.

The main contribution of teaching evaluation technology exploration in the era of artificial intelligence is to further improve the validity and reliability of automatic evaluation based on intelligent technology, especially to improve the accuracy of evaluation. The real realization of man - machine integration, point - with - plane, multi - dimensional teaching evaluation. Firstly, the basis and reference standard of educational evaluation is no longer completely dependent on previous experience, but is based on the use of artificial intelligence technology to collate and analyze a large number of educational statistical data. Secondly, the education evaluation supported by big data diversifies the focus of education evaluation. Finally, educational assessment based on educational data solves the problem of "evidence one-sidedness" in the previous educational assessment methods effectively. (wuxiaowei, 2014). Based on the big data of education, more new solutions can be provided for education assessment. Educational big data not only promotes the development of educational evaluation concepts and objects, but also expands the scope of educational evaluation. It also urges educational management departments to continuously adjust the evaluation standards and measure the quality of school education more objectively. (zhang yan nan, 2016.)

Although the educational evaluation research in the era of artificial intelligence has made important contributions to the macro thinking, development direction and the exploration of micro technical means, the following problems remain to be solved in the educational evaluation in the era of artificial intelligence, based on the research status at home and abroad:

Firstly, the educational evaluation in the era of artificial intelligence is mainly based on the macroscopic principles, and the construction of concrete and feasible evaluation schemes is insufficient.

Second, in the era of artificial intelligence, educational evaluation focuses more on the exploration of intelligent evaluation means, and the educational evaluation system conforming to the trend of intelligence has not yet been established.

Third, the content dimension involved in education evaluation in the era of artificial intelligence has not been established.

2019 consensus of Beijing international conference on artificial intelligence and education are also pointed out that "given that the artificial intelligence in learning can improve the subjects, interdisciplinary ability, comprehensive ability and creativity, there is no rigorous scientific basis, considering the development of monitoring and evaluation mechanism, measure of artificial intelligence in education, the effect of teaching and learning, in order to provide reliable and solid evidence

base" (MiaoFengChun, 2019:13).

It can be seen that the construction of an effective and feasible evaluation mechanism is a new requirement for educational evaluation in the era of artificial intelligence, and an important part of the comprehensive development of artificial intelligence + education.

2. The Unique Academic Value, Application Value and Social Significance of this Topic Compared with the Existing Research

With the rapid development of artificial intelligence, profound changes are taking place in the field of education. The development of new technologies such as the Internet and artificial intelligence is constantly reshaping the form of education, and the way of acquiring and imparting knowledge and the relationship between teaching and learning are undergoing profound changes. In this context, it is particularly important to establish an educational evaluation system that conforms to the new characteristics of education in the era of artificial intelligence.

2.1 Academic value

(1) Theoretical optimization, from the theoretical level to optimize the educational evaluation, improves the scientific nature of the educational evaluation. With the continuous update and development of artificial intelligence technology, the original theoretical system of educational evaluation has been unable to fully support the requirements of educational evaluation in the new era. Therefore, the theoretical research on educational evaluation in the era of artificial intelligence is extremely urgent. This topic tries to make a special discussion on the theoretical issues related to educational evaluation and carry out a basic research, so as to make a theoretical generalization and summary of the educational evaluation theory, and to make a breakthrough in some major theoretical issues related to educational evaluation in the era of artificial intelligence.

(2) Subject improvement from the perspective of subject construction, which promotes the development and improvement of educational evaluation subject in the new era background. Based on the research of this theoretical problem, this paper constructs the educational evaluation system in the era of artificial intelligence, which will help to further clarify the subject nature, subject orientation, subject classification and subject setting of the subject of educational evaluation, and promote the scientific and rational construction of the subject.

2.2 Application value and social significance

The construction of educational evaluation theory in the era of artificial intelligence is a new requirement put forward by the integration of artificial intelligence technology and educational evaluation in the new era.

(1) The construction of educational assessment theory is a measure to adapt to educational reform and national development strategy. The proposal and design of this subject is to observe the organic meeting point of the educational reform and the national development strategy in the new era, grasp the development direction of educational evaluation, explore the realization path of educational reform, and make the educational evaluation get the development direction and speed in harmony with The Times. Under the background of the era of artificial intelligence, the application and promotion of the new educational evaluation system in higher education and basic education will make a positive contribution to the national implementation of the development strategy of artificial intelligence and the deepening of the reform of educational evaluation.

(2) The construction of educational assessment theory will provide implementation reference for educational assessment in the era of artificial intelligence. Only by establishing a reasonable and scientific education evaluation system, correcting guide the direction of the artificial intelligence era education evaluation, especially at the top of education evaluation system design, which makes the education evaluation system has the overall importance and forward-looking, and then puts forward the feasible education evaluation scheme, the smooth implementation of education evaluation for artificial intelligence era can provide strong reference.

(3) The construction of educational evaluation theory will provide a vital basis for educational and teaching decision-making. Education assessment of the fusion of artificial intelligence technology to education evaluation from the traditional 'empirical' to 'data' provides a reliable technical support. Meanwhile, the education teaching process and management of the whole education teaching statistics collection, storage, the data can also be arranged through data analysis to provide basis for decision-making for the education assessment and education.

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