The teachers' ability can be discussed again from the perspective of the fourth paradigm in the intelligent age

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Abstract: Teachers' digital ability is one of the core abilities for the professional development of school teachers in the future. This paper starts from the objective needs of accurate teaching development in the intelligent era, takes learner-centered concept as the starting point, and based on the fourth paradigm thinking of big data, discusses the digital ability and quality ability that teachers need to have after the role transformation.

Key words: Big data; The fourth paradigm; Number ability

With the emergence of a large number of information resources and the use of search engines, the contents and ways of school learning and life will undergo great changes. In 2020, the Global Economic Forum published an education white paper entitled "Future University: Defining a New Education Model for Four Industrial Transformations", which clearly defined the concept of "Higher Education 4.0 world architecture" in the future, pointing out that education schools in the future world include not only traditional schools, but also any places related to learning activities. Whatever changes in the shape of schools and teaching styles, the demands of a student-driven future of learning will reshape the role of the teacher.

I. Teachers' general professional competence

The book "Theory and Practice of Teacher Specialization" organized by the Demonstration Department of the Ministry of Education pointed out that having good professional knowledge, skilled technology and deep sense of responsibility can provide favorable support for the career development of college teachers. With the advance of the intelligent era, the diversification of people's ways of obtaining information, the integration of intelligent technology and teaching provide teachers and students with broader teaching content and resources, so new requirements are put forward for the ability of teachers in the 21st century. The following is the framework of teacher learning in the 21st century (as shown below).
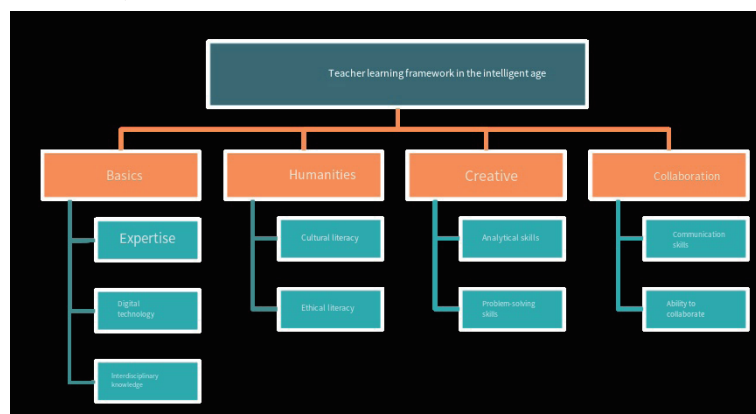
(21st Century Teacher Learning Framework)

The learning framework consists of four main parts, namely, the knowledge that teachers possess in the smart age is divided into basic, humanistic, creative, and collaborative. In terms of basic knowledge, teachers need to master professional knowledge, subject knowledge, teaching theory and practice knowledge. Professional subject knowledge is the core of teachers' knowledge structure, and the application of teaching theory and practice helps teachers deal with the problems encountered in teaching in a specific environment in time, and carry out the next action; In the aspect of digital technology, teachers use effective tools and software to find relevant features in complex random educational data to complete basic teaching tasks; The integration of interdisciplinary knowledge provides teachers with a more comprehensive vision, cultivates the ability of comprehensive thinking, and effectively promotes the exchange and cooperation between disciplines.

Humanistic knowledge covers knowledge in philosophy, history, literature, sociology and other fields, with a focus on the field of ethics. Creative knowledge involves the ability to use comprehensive knowledge and skills to produce new, useful, tangible or intangible products, as well as the ability to evaluate and interpret products. Collaborative ability refers to the ability of teachers to express ideas and listen to others through various digital communication media, as well as the ability to cooperate and adapt in a team during the teaching process.

II. Teachers' digital competence from the perspective of the fourth paradigm

Turing Award winner Jim Gray summarized the history of science and technology development into the following four development paradigms: The first paradigm is usually a kind of empirical data, derived from the long-term scientific observation record of a certain natural phenomenon and a series of experimental data summary; The second paradigm is theoretical science, which is the original mathematical explanation of some specific laws in nature; The third paradigm is computational science, which is scientific research through complex computational model reasoning and multi-system experimental simulation; The fourth paradigm is data science, that is, the data-driven scientific research method after experimental observation, theoretical deduction and computational simulation. It emphasizes how to rediscover history and further understand the human world through scientific data, and provides new theoretical methods, ideas and research perspectives for human cognition and scientific empirical research application.

It is extremely difficult to use the fourth paradigm to analyze social phenomena and nature, and relevant abilities are required to obtain hidden information in view of the difficulties encountered in each link. How to reflect in the teaching process and empower teachers with technology is bound to appear in the most core aspects of big data application technology.

1. Data awareness: big data collection and pre-processing

Data awareness refers to the ability to acquire, analyze, interpret, organize, and organize a large amount of information and data from multiple channels, so as to gain insight into the teaching process and use this information to improve the quality of teaching. Data consciousness includes data subject consciousness, data problem consciousness, data value consciousness, data sharing consciousness and data update consciousness. It is very important for teachers to have a good data awareness, which can help teachers to capture, identify, collect and use data more consciously, and also improve their sensitivity to valuable information, so as to make better use of data. Generally speaking, teachers need to have the ability of sensitive data collection, that is, how to effectively integrate and utilize the huge and numerous internal and external resources, online and offline resources, and how to select the best among thousands of data (learning attitude, learning style, learning style and learning effect) generated by learners and their learning situation. How to form the most suitable personalized plan for students' development, and how to develop the appropriate data (online platform to set phased tasks, gamified teaching) plan to adjust and awaken students' learning motivation, attitude and emotion. Therefore, having a good data awareness will get twice the result with half the effort in intelligent teaching.

2. Analysis consciousness: big data analysis and mining

Analytical consciousness refers to the ability of teachers to make use of big data technology to process and judge data more effectively and realize the decision-making of intelligent teaching system. The excellence of decision-making is reflected in the following three aspects: First, in the understanding of learners, in the past teaching practice, the learning level and ability of two students were often judged by an examination paper with the same score. Therefore, the adoption of teaching strategies will ignore the individual differences of students, and through the introduction of analysis technology, the inherent type of learners will present a new change; Secondly, in the type identification of students, personal subjective understanding leads to the misjudgment of students' style. With the development of big data technology and the progress of learning analysis technology, the student learning analysis system has the ability to identify learners' learning styles, media preferences, interests, cognitive levels, etc., and gradually adjust the judgment of learners according to the progress of learning. Finally, in terms of teaching strategy selection, learning analysis technology can help teachers to understand students' needs more quickly and avoid the illusion caused by blind information search or meaningless information. Through in-depth study of "not trying hard" and "wrong method", the confusion faced by students can be accurately located, so as to work out the best class plan to adapt to their unique needs and promote their personalized learning.

The process of big data analysis and mining in teaching implementation is mainly divided into the following steps: 1. Data preprocessing, including data discrimination, extraction, cleaning and so on. The pre-processed data will be transformed from complex data into a single, easy to process configuration. Through filtering, noise removal will remove the worthless data, so as to achieve better decision-making; 2. Using the pre-processed data, according to the teaching objectives and specific learning requirements, the students are unified as the subjects of autonomy and initiative, and the learning analysis technology is reasonably applied to conduct multi-level research, and the individual and appropriate algorithm model is formulated according to the learners' knowledge structure, hobbies, online learning behaviors, subjective learning needs and demands; 3. Based on the real-time development of students, the personalized resources and parameters in the model are dynamically adjusted to achieve the optimal model, and the personalized intelligent plan of learners is formed. The application of big data technology to data analysis falls into two categories: one is based on computer thinking, such as search, comparison sorting, traceability and other problems; One is to discuss the data correlation or common structure of clustering, classification, regression and other problems. Both of these categories are based on mathematical models, so it is helpful for teachers to master certain knowledge of mathematical statistics analysis and corresponding software operation to improve the quality of teaching.

3. Analytical consciousness: big data analysis conclusions

Analytical consciousness refers to the teacher's ability to interpret and analyze the personalized learning model in the intelligent teaching system. According to the analysis of learning resource demand and the internal logical relationship among learning objectives, relevant knowledge and skills, teachers use mathematical statistics, machine learning and deep learning methods to analyze and process data, establish multivariate functions affecting students' learning results, and study the relationship among variables such as learning resources, learning content and teaching behavior. By predicting the future trend of learners, teachers develop personalized learning unit sequences

(personalized student needs, teaching objectives, learning content formulation, flexible teaching methods, differentiated assignment, diversified evaluation strategies) to realize the concept of educating people from the essence and taking learners as the center.

4. Evaluation consciousness: Big data application practice

Evaluation consciousness refers to the ability of teachers to evaluate the overall function of teaching activities in an intelligent teaching system, taking various factors involved in teaching activities as evaluation objects. The ability to evaluate the teaching process. Teaching evaluation has changed from the traditional "empiricism" to the new "dataism", and educational data has become an important guiding ideology. The consciousness of teachers' evaluation includes the following three aspects: First, the evaluation of students' learning ability. According to the large amount of educational data produced by the intelligent system, use a variety of different evaluation methods to measure students' performance and give feedback in time; Second, the evaluation of the course. Through the feedback of modern information technology data, to understand the possible problems and shortcomings in the teaching process, timely improvement and adjustment, in order to improve the teaching quality and effect; Third, the evaluation of self-teaching ability. In the teaching work, reflection, summary, promote the continuous learning of teachers and teaching optimization.

5. Management awareness: big data human-computer interaction

Management consciousness refers to the teacher's teaching management ability in the intelligent teaching system. First of all, the management of students: the use of intelligent information platform makes the teaching management of teachers smoother and more efficient. For example, the intelligent attendance system, to achieve fast and accurate assessment, so as to improve the learning environment, enhance the enthusiasm of learning. Relying on the real-time monitoring of artificial intelligence technology and multimedia technology, it is convenient for teachers to accurately know the performance of students from time to time, and take appropriate measures to help students develop good independent learning habits and improve students' self-discipline. Secondly, the management of intelligent system requires teachers not only to be familiar with the relevant procedures of various intelligent systems, manage and coordinate all kinds of educational resources, but also to have the ability to apply intelligent products to educational scenes and skillfully integrate with students' existing knowledge structure and project learning tasks; Finally, teachers use intelligent technology to create a technology-driven, dynamic teaching atmosphere, so that each learner can be fully developed. They introduce advanced smart technologies to promote the development of smart campuses, change traditional education methods, and make the classroom more tech-oriented and creative

III. Concluding Remarks

The era of intelligence means that the original structure is broken, the original standardization is replaced by diversification, requiring teachers to use their own wisdom in the intelligent education environment to continue to learn, improve their own ability, to become a new era of teachers to promote the application of new technology in teaching.

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