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Strategies for Improving Data Literacy for Teachers in Universities

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ABSTRACT: Teachers in colleges and universities are an important force in cultivating high-quality talents and play an important role in promoting the high-quality development of higher education. Data literacy of college teachers is an important means to promote the high-quality development of teachers, and it is urgent to cultivate correct data concepts and form complete data literacy, so as to improve the teaching quality of higher education. This paper introduces the relevant concepts of data literacy, analyzes the practical significance of data literacy training for teachers in colleges and universities, and puts forward strategies for teachers to improve data literacy in colleges and universities, in order to promote the construction of data literacy system for teachers in colleges and universities.

KEYWORDS: Undergraduate education; Data literacy; Hoist.

I. INTRODUCTION

Teachers' information literacy can be regarded as the basis of teachers' data literacy, and teachers' data literacy is an extension of teachers' information literacy. The smart campus integrates emerging information technologies such as learning situation recognition, big data, intelligent perception, and social networks into campus construction to achieve efficient communication and collaboration, and provide teachers with massive process data and status data.

The task of institutions of higher learning is to train high-quality talents, which requires the construction of a high-quality teacher system. Teachers are the first resource for the high-quality development of education and the key support for self-reliance and self-improvement in science and technology, so we should focus on cultivating high-quality teachers. In order to meet the latest requirements of teacher team construction in the era of intelligent education, it is necessary to promote the cultivation and sustainable development of teachers' data literacy. Diverse educational data drives teachers to form corresponding data literacy and implement data-based education and teaching activities. However, in the practice of education and teaching, many teachers have problems such as biased understanding of data literacy, relatively weak data analysis skills, and relatively shallow depth of data practice, resulting in the relative lack of data literacy system construction of teachers in colleges and universities. Therefore, this paper introduces the relevant concepts of data literacy, clarifies the significance of improving data literacy for teachers in colleges and universities, and puts forward strategies for teachers to improve data literacy in colleges and universities, which provides strong theoretical support for solving the dilemma of teachers' data literacy system construction.

II. THE CONCEPT OF DATA LITERACY

In 2012, the U.S. launched the Education Innovation Program, which aims to improve teachers' data literacy through skills development such as data collection, data curation, and application. With the rapid development of information technology and the advent of the era of big data, data literacy has gradually received attention and become an important part of scientific literacy. At present, there is no unified definition of data literacy, and it is generally considered to be a comprehensive literacy of people working with large-scale data. Specifically, teacher data literacy refers to the knowledge, skills, and attitudes that teachers possess in data acquisition, processing, analysis, and application. For university teachers, data literacy is a necessary professional quality, which is not only related to the teaching level and research ability of individual teachers, but also plays a positive role in improving teaching quality and promoting educational innovation. Data-literate teachers are proficient in using a variety of data tools and methods to extract valuable information from massive amounts of data to provide strong support for teaching and research. After having data literacy, teachers can maintain a rational attitude towards data and scientifically use data to guide teaching practice.

Information literacy can be understood as the various information qualities possessed by individual members in the information society, including information awareness, information knowledge, information ability, information ethics, information psychology, etc. As an extension of information literacy, data literacy can be divided into four

dimensions: data awareness, data knowledge, data competence, and data ethics. Specifically: (1) Data awareness is an individual's feelings, intuition, attitudes, and will towards data. Data awareness plays a controlling role in the use of data to a certain extent, including data awareness, data sensitivity, and data value awareness. Teachers' data awareness is mainly reflected in being able to recognize the value of data, respond to objectively existing data, be keenly aware of the practical data generated in teaching, and consciously apply data and analysis results to all aspects of teaching. (2) Data knowledge is the foundation of data literacy, including related theories and skills, including big data knowledge, data theory knowledge, data analysis tools, etc. Teachers should first have a clear understanding of theoretical knowledge, understand the basic connotation, concepts and characteristics of big data, understand the types of data, and different presentation methods. In addition, teachers should have certain data processing skills and be able to analyze different types of data, and teachers should master some basic knowledge and operational skills of data processing tools. (3) Data ability is the ability to use data knowledge and manipulate data analysis results, data ability is the core of data literacy, and data ability determines whether the data obtained by individuals is meaningful. Teachers' data ability is reflected in the ability of teachers to use data analysis to analyze the learning situation, ask appropriate questions, formulate teaching plans based on data, make teaching decisions based on the results of data analysis, and dynamically adjust the teaching process. (4) Data ethics refers to following certain ethical norms in the process of acquiring, processing, analyzing, and using data, and not infringing on the legitimate rights and interests of society or others. Teachers' data ethics are embodied in obtaining and analyzing data legally and compliantly, protecting the privacy of teachers and students, respecting others, safeguarding the fruits of their own digital labor, and consciously maintaining data security.

III. THE SIGNIFICANCE OF IMPROVING DATA LITERACY FOR TEACHERS IN UNIVERSITIES

(1) Contribute to the cultivation of students with data literacy
In the era of big data, the society's requirements for talents are gradually increasing, and cultivating students' data literacy has become one of the important tasks of college education. The level of data literacy of college teachers directly affects the cultivation effect of students' data literacy, and colleges and universities pay attention to the training of teachers' data literacy, which plays an important role in cultivating students with data literacy. Teachers with high data literacy can subtly influence students in their teaching, guide students to understand the importance of data, and learn to use data analysis and solve problems. Through the demonstration and guidance of teachers, students can gradually develop data thinking and data analysis skills, and lay a solid foundation for future study and work. In addition, teachers can design data-based learning tasks and practical activities for students to develop data literacy in practice. In actual teaching, teachers can guide students to participate in the process of data collection, collation and analysis, so that they can experience the value of data, stimulate students' interest in learning, and improve their data literacy level.

(2) It will help to enhance the professional competitiveness of college teachers
In the era of big data, the professional competitiveness of college teachers no longer only depends on traditional academic achievements and teaching experience, and the improvement of data literacy has become one of the important indicators to measure the comprehensive quality of teachers. Teachers with data literacy are better able to understand and apply data, and demonstrate higher professionalism and competence in education and teaching. The improvement of teachers' data literacy is helpful for teachers to carry out high-level academic research, and in the process of scientific research, teachers can discover new research perspectives through data analysis and mining, and promote the development of subject areas. This kind of data-based research ability can not only enhance the academic influence of teachers, but also contribute to the discipline construction of universities. In addition, data-literate teachers can better adapt to the development trend of information-based teaching, master modern teaching technologies and tools, and give full play to the advantages of big data platforms to promote their own career development. It can be seen that the cultivation of data literacy of teachers in colleges and universities can enhance their professional competitiveness and enhance their influence in the academic community.

(3) Contribute to promoting the innovative development of higher education
In the context of big data, the innovative development of university education is inseparable from the data literacy of teachers. By cultivating and improving teachers' data literacy, teachers can dig deep into the information behind the data, discover the problems existing in education and teaching, and promote the reform and innovation of education and teaching. Cultivating teachers' data literacy in colleges and universities can help teachers carry out interdisciplinary teaching and research. By integrating the data resources of different disciplines, teachers can explore new teaching models and methods, promote interdisciplinary integration and promote the innovation and development of higher education. In addition, by cultivating teachers' data literacy, they can be encouraged to actively participate in education and teaching innovation projects, promote higher education to keep pace with the times, and better adapt to the needs of social development.

(4) Contribute to improving the quality of education and teaching in colleges and universities

In the era of big data, colleges and universities pay attention to cultivating teachers' data literacy, which can effectively improve the quality of education and teaching. By cultivating teachers' data literacy, teachers can more accurately grasp the learning status of students, understand students' learning habits, interests and hobbies, and find out students' learning deficiencies in time, so as to formulate teaching plans that are more in line with students' needs. In addition, after improving their data literacy, teachers can make full use of data analysis tools to monitor and feedback the teaching process in real time, find problems and make improvements. This kind of data-based accurate teaching and personalized guidance can not only stimulate students' interest and enthusiasm for learning, but also improve the effectiveness of education and teaching and students' learning outcomes. Therefore, cultivating the data literacy of college teachers based on the background of big data is helpful to improve the quality of college education and teaching, and realize the modernization and scientificization of education and teaching.

IV. STRATEGIES FOR IMPROVING DATA LITERACY FOR UNIVERSITY TEACHERS

(1) Actively carry out vocational training activities, relying on the whole process of training to strengthen teachers' data literacy

Scientifically carry out data literacy training activities for in-service teachers. In the process of teachers' professional development, it is necessary to combine the needs of college teachers for the application of big data technology, in addition to teachers' independent learning, we should also use multiple in-service training methods such as school-based training and online training, and encourage teachers to participate in provincial training and national training courses, so as to strengthen the data literacy of college teachers. The training content should cover courses such as using data to promote teaching and using data to evaluate performance culture, and attention should be paid to guiding teachers to understand the significance of data application, so as to strengthen teachers' professional quality through in-service training. Colleges and universities need to scientifically formulate data literacy training objectives for teachers through reasonable training strategies based on the analysis of teachers' basic information and relevant data from their work files, and guide teachers to actively participate in training activities, so as to effectively improve their data literacy.

Do a good job of pre-service data literacy enhancement training for new teachers. Pre-service education is an important means to improve the data literacy of college teachers. Colleges and universities need to recognize that data literacy has become an indispensable and important competency for teachers in the era of big data, and should be regarded as an important competency criterion for the recruitment and selection of university teachers. It is necessary to strictly control the introduction of talents, focus on assessing and testing the data literacy of teachers, and screen out professional teachers who meet the requirements of professional data application in various disciplines, so as to enhance the overall data literacy level of college teachers. At the same time, before teachers officially take up their posts, colleges and universities need to organize targeted pre-service training, and focus on the cultivation of data literacy ability, focusing on strengthening the data perception awareness of new teachers, and effectively improving their data collection, data analysis, data storage and data application capabilities through corresponding training courses.

Incorporate the cultivation of data literacy into the target system of teacher professional education. However, the current curriculum system for normal students mainly focuses on the cultivation of professional knowledge, and fails to focus on strengthening the data literacy of normal students, so they may have the problems of insufficient data knowledge and weak data application ability after entering the workplace after graduation. Therefore, in order to strengthen the data literacy of college teachers, it is necessary to start from the teacher cultivation stage, add data analysis, data processing, data research and judgment and other related courses for teacher education students, and effectively strengthen the data analysis ability, data interpretation ability and data utilization ability of normal students through the reasonable embedding of data literacy knowledge and skills in professional courses, combined with the development of targeted education practice activities, so that their data literacy can meet the requirements of teachers. In this way, the data literacy of college teachers can be strengthened and improved through the cultivation of data capabilities of professional talents.

(2) Promote teaching reform through data analysis and improve data literacy with the help of teaching practice

Create a platform for the promotion of multiple data applications. In order to effectively strengthen the data literacy of college teachers, it is necessary to build a data application promotion platform guided by the effective application of data, and with the support of this platform, teachers can provide support for the use of modern information technology. Teachers can use WeChat and other software to communicate with students, collect student behavior data and online assessment performance data, and continuously adjust and optimize teaching plans through the integration and analysis of these data, and use the platform to promote successful teaching cases. In this process, it can not only strengthen the level of information technology application of teachers, but also help to strengthen teachers' awareness and ability of data application. Teachers can use microblogs and forums to share and exchange experience in the application of digital technology and resolve problems encountered in data application, which can drive teachers to actively apply data to

optimize teaching work, and then gradually strengthen teachers' data literacy in the effective practice process. Build diversified data application scenarios. Colleges and universities need to create data application scenarios based on multiple dimensions to create conditions for teachers' data literacy. It can effectively integrate data statistics and data evaluation content into the original single teaching situation, strengthen the application depth of big data technology, promote teachers' in-depth interpretation of student behavior data, and then gradually strengthen teachers' data literacy on the basis of continuous enrichment and extension of data application scenarios, and promote teachers to form good data understanding ability and data migration ability through the construction of multiple data application scenarios. In the course of teaching work in colleges and universities, cameras can be used to record the entire teaching process, and teachers can further analyze their own teaching behavior and students' learning behavior by watching the video. Taking English major teaching as an example, the frequency of a certain word in different teaching scenarios can be summarized through data analysis, and then the internal relationship between knowledge absorption and scenarios can be correctly understood, which can be used as the basis for the adjustment of teaching plans. In this process, teachers' data acquisition, data analysis and data application capabilities will be effectively improved.

Guide teachers to actively apply data analysis to implement reforms. Practice is an important way to strengthen the data literacy of college teachers, and colleges and universities need to rely on teaching practice, apply data analysis to the process of teaching reform and innovation, and improve teachers' data literacy step by step with the help of teaching practice on the basis of correctly understanding the formation and development process of teachers' data literacy. Teachers should be required to actively pay attention to the data of students' learning behaviors, and teachers should be required to adjust and optimize teaching methods based on data integration and analysis, and use data analysis to promote the optimization of teaching activities. At the same time, on the basis of the data analysis of students' learning behavior, it is necessary to carry out targeted reform and innovation of teaching practice. In this process, teachers can gradually strengthen their data perception ability through practice, and at the same time, they can effectively accumulate experience in data acquisition, data analysis, data research and judgment, and data decision-making.

(3) Open up data resources in an orderly manner, and optimize the environment for cultivating data literacy through policy-driven
Government departments should give full play to the role of guidance and promotion, learn from the successful experience of other countries in improving teachers' data literacy, and provide guidance for the strengthening of teachers' data literacy in colleges and universities. First of all, China's education management should pay attention to the cultivation of teachers' data literacy, and on the basis of ensuring data security, open public data resources in an orderly manner, and realize the effective sharing of data resources. At the same time, the education authorities should introduce relevant policies, such as adding data literacy assessment content to the teacher entry qualification examination, so as to generate a strong impetus for the self-strengthening of data literacy of new teachers. It can also refer to the data literacy cultivation method of teachers in the United States, launch corresponding data decision-making projects, formulate different data literacy test standards for teachers in college management and teaching, and use this standard as an important basis for evaluating the data literacy ability of college teachers, so as to guide college teachers to actively improve their own data literacy. In addition, it is necessary to focus on the cultivation of data literacy in the process of national information literacy education, implement data literacy education in all stages of compulsory education in primary and secondary schools and high schools, improve the data awareness of Chinese citizens as a whole, create a benign data culture atmosphere, and generate a strong driving force for the improvement of data literacy of college teachers.

(4) Relying on the research and development of curriculum groups and project practice, and using special training methods to strengthen the cultivation of data literacy of college teachers
It is necessary to make full use of various resources within the school, and the data resource management center of the school library should be taken as the core, and with the coordination and cooperation of various departments, special training activities for teachers should be created, and the data literacy of college teachers should be strengthened in a targeted manner by relying on resources such as subject courses and research projects. We can learn from the successful experience of American colleges and universities to cultivate teachers' data literacy with the help of subject courses. For example, school librarians can carry out the course "Spatial Geography and Data Guardianship" for teachers in the Department of Atmospheric Sciences, which takes the whole life cycle of spatial geography as the content, and school librarians should provide all-round guidance for the application of data discovery, data acquisition, data transformation, data processing, data analysis, and data sharing for college teachers, and introduce examples to effectively strengthen the data collection and utilization ability of teachers in this specialty. At the same time, the data literacy of university teachers can be improved with the help of project practice. For example, a project for local social service organizations can be set up in the practical learning center, and the school librarian can assist university teachers to jointly complete engineering design projects, which can strengthen the data management ability of university teachers in the process, objectively evaluate their design results, organize targeted project discussion meetings, and provide support and assistance for teachers to obtain project data and formulate data management plans. Through the application of these two special

training methods, the core skills of data literacy of college teachers can be strengthened, and the adaptability of college teachers to the era of big data can be enhanced.

V. CONCLUSION

In the context of the era of intelligent education, the construction of education and teaching environment and emerging technologies are constantly innovating, the way of collecting and storing data in education data is becoming more and more common, and the intelligent tools and platforms for analyzing education data based on visualization are becoming more and more complex, thus forming the three dilemmas of teachers in concept cognition, data skills and application process. Therefore, teachers urgently need to integrate data into their professional knowledge and ability structure to form their data literacy. The dynamic changes in teaching forms require front-line teachers to pay attention to the integration of data literacy-related skills and knowledge, which requires the integration of teachers' data literacy with traditional subject pedagogical knowledge, so as to promote teachers to generate a new knowledge system. Therefore, on the basis of emphasizing the importance of data literacy, the future-oriented teacher training should link teachers' data literacy with pre-service and in-service teacher training, as well as teacher training, and continue to optimize teachers' data knowledge and data skills on the basis of innovating the concept of data application, so as to truly innovate and develop teachers' data practices and promote teachers' professional development in the era of intelligent education.

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