Expectations and Coping Strategies of Digital Literacy Improvement of Shaanxi University Teachers in the Context of "Trinity"

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Abstract: Under the framework of the "trinity" education system, the digital literacy level of university teachers has a decisive impact on promoting the development of blended online and offline teaching models, as well as improving the overall quality of digital education in universities. By exploring three related themes of digital literacy enhancement expectations of Chinese university teachers. Universities must be pioneering in educating people, scientific research, and attracting talent. Talent is the carrier of science and technology, the main body of innovation; talent is in the core and key position of the "trinity" and plays a supporting and leading role in the development of scientific and technological innovation. This paper proposes three strategies for improving the digital literacy of university teachers, namely, the country strategy, universities strategy, and teachers' strategy, to provide some reference for digital education and teaching of Chinese university teachers. It also provides the corresponding theoretical basis and practical reference for improving Chinese teachers' digital literacy.

1. Introduction

The report of the Party's 20th National Congress for the first time made overall planning and integrated deployment of education, science and technology, and talents. The trinity of education, science, technology, and talents is an organic whole with a strong internal logical connection. Among them, education is the foundation and premise, science and technology is the goal and motivation, and talent is the core and key. Under the "trinity" background, universities must be pioneering in educating people, scientific research, and attracting talent. The high-quality development of education needs to cultivate high-quality talents who will promote the high-level development of science and technology. In turn, the high-level development of science and technology provides a strong driving force and material conditions for the high-quality development of education and the training of high-quality talents, and the three interact and promote each other. Talent is the carrier of science and technology, the main body of innovation; talent is in the core and key position of the "trinity" and plays a supporting and leading role in the development of scientific

and technological innovation. In the context of "trinity," improving the digital literacy of university teachers is of great significance for realizing the national education informatization goal, meeting the demand for university informatization teaching, and promoting the professional development of university teachers.

Teachers are the direct practitioners of digital teaching. Under the strong promotion of education informatization 2.0 action plan and other policies, Chinese university teachers have initially possessed the ability of education and teaching informatization. From the perspective of the development of human society, education has experienced the era of oral transmission of knowledge in human society. It came to the 2. 0 era with paper books as the cultural carrier. It continues rapidly entering the 3.0 era with radio, television, and the Internet as technology carriers. It is accelerating into the 4.0 era supported by artificial intelligence technology. In the convergence and integration of 3.0 and 4.0 times, the enhancement of digital literacy of university teachers has become an unavoidable hot and difficult issue in higher education. As the direct practitioners of higher education teaching, university teachers must learn and adapt to the digital education concept and new teaching mode, constantly explore and improve their digital literacy, and cultivate qualified and competitive modernization talents for the future society.

2. Brief Introduction to Digital Literacy

Teachers' digital literacy is the core quality of digital education teaching ability for universities. In 1994, Israeli scholar Yorameset-Alkalai proposed digital literacy for the first time. In 2004 proposed that it includes "image-image literacy, re-creation literacy, branch literacy, information literacy and social-emotional literacy" [1]. The concept of digital literacy is evolving with the changes in information technology. Domestic scholars have also defined teachers' digital literacy from different dimensions. Wang Youmei et al. proposed that digital literacy is a comprehensive, dynamic, and open concept that is formed through the evolution of media literacy, computer literacy, information literacy, and network literacy [2]. Li Degang believes that digital literacy is in the digital environment, digital technology is used to recognize, criticize, and interact with digital content, multimedia language, and digital media.The ability to communicate [3]. Yi Ye and Xue Feng believe that teachers' digital literacy in higher vocational colleges mainly includes such elements as attitude and awareness, use and development of digital resources, digital teaching skills, enabling learners, and research and development [4]. Yan Guangfen pointed out that teachers' digital literacy includes five core elements: digital teaching, digital content creation, digital communication and collaboration, digital security, and digital evaluation [5].

All in all, from the perspective of university talent training, needs in the digital era, digital literacy refers to a comprehensive ability for people to survive, work, study, and develop in the digital social environment, involving the understanding, use, evaluation, and creation of digital technology in economic and social development. It mainly includes basic elements such as information management, communication and sharing, cooperation, content and knowledge creation, moral responsibility, evaluation and problem-solving, and technical operation [6].
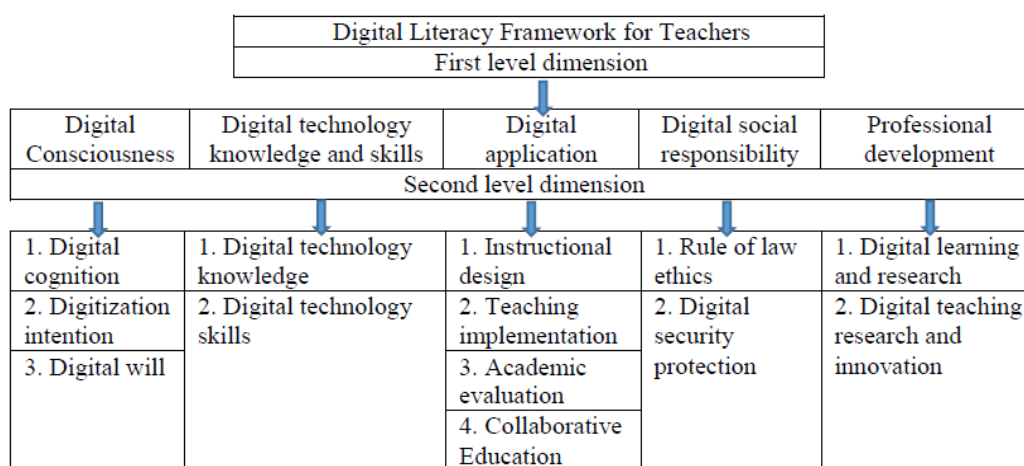
For university teachers, in different contexts, "digital literacy," "information literacy," and "network literacy" are widely used, which all involve the knowledge, skills, and attitudes required by teachers in the information society. In the world, Chinese university teachers also have a lot of digital literacy connotations, frameworks, models, and so on worth learning. For example, the European Union developed the Technology Enhanced Teaching Self-Assessment Tool based on the "Erasmus+" program. (European Commission. Self-Assessment (Tool, 2018) Evaluates teachers' digital teaching ability from four dimensions: digital teaching, digital content use and production, digital communication and collaboration, and digital citizenship. Each dimension includes multiple

fields. Each area consists of several specific teaching competencies. According to different levels each ability is divided into five levels: beginner, beginner, master, master, and expert, which is of great reference significance for the improvement of digital literacy of university lecturers. To further clarify the connotation and extension of teachers' digital literacy, in 2017, the European Commission Joint Research Center (JRC) the JRC has published the European Framework for the Digital Competence of Educators, which focuses on student numbers.

A multi-dimensional structural system is constructed from three aspects: literacy training, teachers' professional ability and teaching ability, and teachers' digital literacy is divided into six digital literacy domains: "professional participation domain," "digital resources domain," "teaching and learning domain," "assessment domain," "empowering learners domain" and "enhancing learners' digital literacy domain" [7]. In November 2022, China's Ministry of Education issued the "Teacher Digital Literacy" education industry standard.

3. Digital Literacy Framework for Teachers

China attaches great importance to cultivating and promoting teachers' digital literacy, and the 20th National Congress of the Communist Party of China clearly requires universities to promote education digitalization. On November 30, 2022, in order to thoroughly implement the spirit of the Party's 20th Major Congress, firmly promote the national education digital strategic actions, improve the standard system of education information, and enhance teachers' awareness, ability, and responsibility of using digital technology to optimize, innovate and transform education and teaching activities, the Ministry of Education formulated: The Digital Literacy Standards for teachers are now issued as standards for the education industry and will take effect as of the date of publication. This standard aims to build a framework for teachers' digital literacy and establish a training and evaluation system for teachers' digital literacy. Teachers' digital literacy defines the requirements of five dimensions: digital consciousness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development. The framework of teacher digital literacy includes five primary dimensions, 13 secondary dimensions, and 33 tertiary dimensions [8]. As shown in Figure 1:

Digital Literacy Framework for Teachers				
First level dimension				
Digital Consciousness	Digital technology knowledge and skills	Digital application	Digital social responsibility	Professional development
Second level dimension				
1. Digital cognition	1. Digital technology knowledge	1. Instructional design	1. Rule of law ethics	1. Digital learning and research
2. Digitization intention	2. Digital technology skills	2. Teaching implementation	2. Digital security protection	2. Digital teaching research and innovation
3. Digital will		3. Academic evaluation		
		4. Collaborative Education		

Resource:Teacher Digital Literacy Standard，MOE,2022.

Figure 1: Framework of Teacher's Digital Literacy

The Ministry of Education has developed and implemented industry standards for teacher digital literacy education to promote the national education digitalization strategy, improve the education informationization standards system, and enhance teachers' awareness, ability, and responsibility in optimizing, innovating, and transforming educational and teaching activities through digital

technology.

These standards apply to the training and evaluation of teachers' digital literacy and include specific content such as principles and methods for selecting digital devices, software, and platforms in educational and teaching activities; the ability to use digital evaluation tools to analyze students' learning situations, and to apply intelligent grading systems, question bank systems, and assessment systems to analyze students' knowledge preparation, learning ability, and learning styles; and the ability to discover students' learning differences and provide targeted guidance through the use of digital technology resources(MOE, 2022).This standard is not only a summary of all teachers' information-based education and teaching ability but also a rigid requirement for the standardization and systematization of digital literacy of university teachers.

4. The Expectation of Digital Literacy Improvement of University Lecturers

In information education and teaching activities, the digital literacy of university lecturers has always been a prerequisite for the smooth development of online and offline teaching activities. A University teacher' own digital literacy level has an important impact on the online and offline teaching effect of students. The expectation of improving digital literacy is that university teachers will continue to improve their digital literacy after teaching in colleges and universities according to their teaching experience and academic research needs. This continuous state of digital literacy improvement can encourage university teachers to maintain the psychological recognition and behavior trend of digital literacy improvement.

Based on in-depth interviews and data collection, this study summarizes six codes and 15 sub-codes in response to the descriptions and answers of 6 university teachers in Shaanxi Province about their expectations for improving digital literacy. Therefore, under the theme of digital literacy improvement expectation, the code and sub-code are summarized into three sub-themes, namely: university teachers' expectations for the improvement of their own digital literacy; university teachers' expectations for the improvement of students' digital literacy and university teachers' expectations for the improvement of teachers' digital literacy.

4.1. University Teachers' Expectations for Improving Their Digital Literacy

The sub-topic of university teachers' expectations for their digital literacy improvement includes two codes: external factors and internal factors. There are six sub-codes in total, as shown in < Table 1 >, that is: 1) learn new digital teaching theories; 2) acquire new digital teaching skills; 3) use the new digital teaching platform in Korea; 4) win awards in the informatization lecture competition; 5) publish papers on digital teaching; and 6) successfully promote senior titles.

Table 1: Six University Teachers' Expectations for the Improvement of their Digital Literacy

Sub-theme	Code	Sub-code	Participant Source
University teachers' expectations for their own digital literacy improvement	1.Internal factor	1.1 Learn new digital teaching theories	All
		1.2 acquire new digital teaching skills	All
		1.3 be able to use the new digital teaching platform in Korea	Ms. Xia,Ms. Wang, Mr. Liu,Mr.Yao, Ms. Li
	2.External factor	2.1 get awards in the informatization lecture competition	Ms. Wang,Ms. Li
		2.2 publish papers on digital teaching	Ms. Xia,Mr. Liu
		2.3 successfully promoted to senior titles	All

Through in-depth interviews with six teachers at Shaanxi University, the purpose of digital

literacy promotion is clarified. From the self-improvement perspective, digital literacy is also necessary for university teachers to effectively carry out information teaching. Teachers can personally learn advanced digital teaching theory knowledge during the teaching period, Master digital teaching skills, and have the operation skills of an information teaching platform. In addition, through the improvement of digital literacy, university teachers can better participate in information teaching competitions, Publish academic papers in order to obtain better salary and welfare benefits, and promote personal career development and professional title promotion; these factors are also the main factors that promote the digital literacy of teachers during their teaching in universities.

4.2. University Teachers' Expectations for the Improvement of Students' Digital Literacy

As the first resource of university digital education, teachers are an important driving force in promoting students' digital literacy education. While university teachers are committed to cultivating outstanding digital talents, they also hold different digital literacy education expectations for their students. With the continuous change of digital technology in the university education system, the digital literacy level of university students is also put forward higher requirements. The digital literacy of university students has become the key factor affecting their academic performance under the "trinity." Under the topic of digital literacy education expectations of university teachers, there are three expectation codes, namely the expectation of university students' cognition and attitude towards digital literacy education, the expectation of university students' mastery of digital technology tools and the expectation of university students' digital literacy use scenarios.

Table 2: The expectations of six university teachers on the improvement of students' digital literacy

Sub-theme	Code	Sub-code	Participant Source
University teachers' expectations for the improvement of students' digital literacy	1.Cognitive and attitudinal expectations	1.1 University students' cognition and attitude towards digital literacy education (positive or negative)	All
		1.2 University students use various learning management platforms for information search, acquisition, management or innovative use	All
	2.The expectation of mastering the tools of digital technology	2.1 University students use various learning management platforms for information search, acquisition, management or innovative use	Ms. Xia Ms. Wang Mr.Yao Ms. Li
		2.2 University Students use time and task management tools, document management tools and online collaboration tools	All
	3.Expectations for use scenarios	3.1 University students apply digital literacy to specific life, learning and innovation scenarios	All
		3.2 University students apply digital literacy to online learning scenarios, mobile learning scenarios and informal learning scenarios	Mr. Liu Mr.Yao

These three expected codes contain six subcodes, which are: 1) University students' cognition and attitude toward digital literacy education (positive or negative); 2) University students' use of various learning management platforms to search, acquire, manage, or make innovative use of information; 3) University students' use of word processing tools, presentation tools and video editing tools; 4) University students' use of time and task management tools, document management tools and online collaboration tools, etc; 5) University students apply digital literacy to specific life,

learning, and innovation scenarios; 6) University students apply digital literacy to online learning scenarios, mobile learning scenarios and informal learning scenarios. These expected codes and subcodes are shown in Table 2.

Digital literacy and skills are essential skills for university students to work in the future. The interview survey found that the six university teachers all have high expectations for the digital literacy education of university students. The main point of view is that the higher the digital literacy of students, the higher the cooperation with teachers, and the better the classroom effect.

4.3. University Teachers' Expectations of the Digital Environment for the Improvement of Digital Literacy

Generally speaking, the digital environment is a new interface for interaction between people and cyberspace. It integrates text, images, images, sounds, lights, and interactive behaviors to form a human-controllable virtual environment space, which brings specific feelings to university teachers in the environment and can effectively transmit and collect digital information. Under the theme of the digital environment, the expectation of university teachers to enhance digital literacy is the domestic digital environment. Under the code of domestic digital environment, there are six sub-codes, see Table 3, namely: 1) domestic campus facilities; 2) digital education resources; 3) digital platform training; 4) foreign campus facilities; 5) digital education resources; 6) digital platform training.

Table 3: The expectations of six university teachers on the digital environment

Sub-theme	Code	Sub-code	Participant Source
University teachers' expectations of the digital environment	Domestic digital environment	1.1 domestic campus facilities	All
		1.2 digital education resources	All
		1.3 digital platform training	All

The six university teachers also hope to improve their digital literacy in a good digital environment, but because each teacher works in different universities, has different majors, adopts different teaching methods, and even has different choices for teaching platforms. Some teachers have high digital literacy and want to carry out this new digital teaching experiment in the course. They can use these digital teaching platforms to make the course vivid and colorful, which is very popular with students and the teaching effect is obvious. This is the so-called good course. For some teachers, because of professional courses, this course does not require too many digital skills; as long as the traditional teaching methods are used, the course can be carried out, and the effect is obvious.

5. Suggestions for the Improvement of Digital Literacy Expectations of University Teachers

Under the background of "trinity," higher education has entered the era of digital education and teaching, and the most important thing for university teachers to enhance their digital literacy is to help them strengthen and consolidate their digital literacy awareness. University teachers need to find the reasons for themselves because internal causes have always determined the development of things. Only when university teachers clearly understand the connotation and value of digital literacy and are willing to accept the change of digital teaching can they ensure the effective implementation of their digital literacy expectations and achieve the high-level purpose of improving digital literacy and serving society. Digital literacy expectations for university teachers:

First, university teachers should popularize digital literacy knowledge and grasp the correct concepts of digital knowledge, digital information, digital security, and evaluation of digital

knowledge. In the era of digital education, teachers should apply the digital knowledge they have mastered to digital education and teaching practice in colleges and universities to build a solid and broad reserve of digital knowledge. To cultivate university students in the digital age who integrate digital ability, digital literacy, and social responsibility, and highlight the professional nature of teachers to promote digital development.

Second, it aims at a few university teachers' dismissive attitude and lazy consciousness toward the expectation of improving digital literacy. In particular, it is necessary to combine external factors and efforts to maintain one's digital literacy and improve expectations. First of all, in addition to creating a good digital learning atmosphere and providing external material support such as teaching software and hardware facilities, university teachers should face the reality of digital teaching and follow the trend. Negative treatment cannot solve the problem but will affect their career and even students' learning. Secondly, university teachers should take the model teachers of digital literacy teaching as an example and learn from their spirit of exploring digital literacy education and teaching. Learn their skills in using digital literacy to improve teaching outcomes. Finally, they should continue to be willing to learn and use the relevant content of digital literacy improvement, exert the value of digital literacy into digital education and teaching, and turn it into a continuous driving force to promote digital teaching practice and scientific research development and strengthen the ideology of teachers' active learning and digital literacy improvement.

Third, when university teachers receive or actively conduct training, it is best to carry out digital teaching and research activities: teaching observation, case analysis, and teaching demonstration. Through these invited famous teachers, teachers can actively and humbly learn from the famous teachers of general or professional courses during their on-site teaching. When observing the course, teachers can carefully listen to the on-site teaching of famous teachers with problem awareness and make teaching notes. We should actively interact and discuss with famous teachers in the on-site questioning session. Moreover, seriously consider how these famous teachers integrate digital awareness into teaching. What digital skills do they use? What digital teaching processes and course design details should I learn? After receiving training, university teachers should often reflect on their problems in digital teaching. In self-reflection, self-awareness, and self-improvement, teachers will gradually improve their digital literacy, forming the philosophical wisdom of individual digital improvement.

To sum up, university teachers' promotion of digital literacy needs the concept first. Only when they attach great importance to and accept the idea can they treat the promotion of digital literacy with the right concept. University teachers should be good at adjusting their slack psychology and negative attitude. They can only promote digital practical teaching and personal digital scientific research development by accumulating theoretical knowledge related to digital literacy. During the training, university teachers need to take the initiative to learn, be good at reflection, and actively practice to unify their own thoughts, concepts, and actions, form a trinity model of digital literacy improvement, and comprehensively improve their digital literacy level.

6. Three-Level Strategies for Improving the Digital Literacy of University Teachers

The author will conduct research and discussion from three levels: the country, universities and teachers:

At the national level, the development of digital literacy is crucial to promoting education informatization, and the improvement of digital literacy is the foundation of national informatization development, a necessary condition for improving the quality of talent training, and an important part of overall national information construction.

At the level of colleges and universities, the improvement of digital literacy helps to improve

teaching quality and efficiency, which requires colleges and universities to establish a sufficient number of teachers with high digital literacy to realize the gradual popularization and application of information technology in universities and realize the modernization of education through information technology.

At the level of university teachers, the improvement of digital literacy can enhance their ability of information acquisition, processing, communication, and innovation, help teachers better adapt to the teaching work in the information age, effectively integrate information technology into teaching, provide students with high-quality education and improve their professional competitiveness. The author will combine the "trinity" background from the national level, the university level, and the university lecturer level, respectively, to sort out three levels of digital literacy improvement strategies for university teachers.

First, at the national level. In recent years, the state has successively issued several policy documents that put forward corresponding requirements for cultivating teachers' digital literacy. In January 2018, the Central Committee of the Communist Party of China and The State Council issued the Opinions on Comprehensively Deepening the Reform of the Construction of Teachers in the New Era, proposing the requirement that "teachers take the initiative to adapt to new technological changes such as artificial intelligence and actively and effectively carry out education and teaching". In March 2021, the General Office of the Ministry of Education issued a Notice on the Recommendation and selection of the second batch of Artificial Intelligence to promote the construction of teacher team Construction Pilots, which emphasized the "construction of an intelligent education system for teachers"; In December 2022, the Ministry of Education issued the "Teacher Digital Literacy" industry standard, giving a series of opinions, notices, and standards such as the universal "Teacher Digital Literacy Framework" for all types of schools. In the era of big data, the integration and development of higher education teaching are getting closer and closer. As the top designer and commander of university lecturers' digital literacy improvement project, the state's top priority is to protect the digital literacy improvement of lecturers through rigid policies and regulations and formulate a series of targeted digital literacy improvement plans for university lecturers. Focusing on digital strategic planning, data value mining, digital literacy improvement, and digital facilities construction of university teachers, adjust and reshape the university education and teaching ecosystem, and improve the quality of colleges and universities. To carry out the digital transformation of university lecturers in higher education to promote the modernization of higher education teaching is the only way to realize the digital modernization of higher education, and also the only way to build China into an educational power.

Second, the university level. In combination with their own digital education and teaching practice, colleges and universities build a new integrated smart campus education and teaching platform by extracting digital education value, constructing ecological education and teaching management, and upgrading curriculum information technology. This study combines the development goals of digital education and teaching in schools, strengthens the construction of ecological management of teacher-student teaching information system, and unifies campus digital management facilities, smart campus cloud center, smart campus cloud platform, and smart comprehensive application system. In daily teaching, it is necessary to upgrade the digital education management technology in time, strengthen the construction of campus digital centers, formulate education and teaching data standards, and improves the data management of university teachers and students. This study can realize accurate and scientific educational decision-making as soon as possible, and provide strong support for improving digital literacy of college teachers. This study establishes a one-stop service platform, implements paperless office, etc., and effectively realizes a virtuous education and teaching management cycle of teachers and students running less errands and running more data. These measures aim to help university lecturers organize and carry out

education and teaching activities more effectively, focus on digital education and teaching positions, and actively explore ways and means of deep integration of modern information technology and education and teaching in teaching work to promote the renewal of university education concepts, the reform of teaching mode, and the reconstruction of governance system. This study actively promotes the development of university lecturers in the direction of Internet + education informatization.

Third, the level of teachers. The "Teacher Digital Literacy" education industry standard issued by the Ministry of Education has formulated the overall framework of teacher digital literacy, which includes five first-level dimensions, 13 second-level dimensions, and 33 third-level dimensions, among which the first-level dimension includes five aspects such as digital awareness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development. This has pointed out the cultivation direction for university teachers and clearly defined the awareness, ability, and responsibility requirements for enhancing digital literacy. From the perspective of talent training needs in the digital era, digital literacy refers to a comprehensive ability that people need to survive, work, study, and develop in the digital social environment, involving the understanding, use, evaluation, and creation of digital technology in economic and social development. It mainly includes basic elements such as information management, communication and sharing, cooperation, content and knowledge creation, moral responsibility, evaluation and problem-solving, and technical operation [9]. University teachers should change the original education and teaching concepts, adopt digital teaching methods in time, reasonably use new media resources, play a demonstration role as teachers, help university students establish correct values, and improve the quality of education and teaching. In the daily teaching of universities, university teachers need to be able to sift through digital devices. It is to select the appropriate digital teaching equipment and application tools according to the digital teaching content and learning objects and effectively use digital technology to promote education and teaching. University teachers need to strengthen the use of digital teaching materials and be skilled in using digital technologies such as two-dimensional code and hyperlinks to electronic teaching materials. University teachers need to have good man-machine coordination adaptability. Under the promotion of digital technology in education and teaching, they need to transform into a dual-teacher type, which requires university teachers to cooperate with digital teaching equipment to promote teaching design, interactive links, teaching evaluation, and other educational and teaching objectives. In order to grasp teaching dominance, especially in the use of digital technology to carry out teaching, university teachers must scientifically and reasonably complete the division of curriculum objectives. Teachers and students must realize the advantages of digital resources complementary, and then work together to achieve the established teaching objectives.

7. Conclusions

To sum up, after the COVID-19 epidemic, the traditional classroom teaching mode of higher education has undergone a subversive transformation, and smart campus and online teaching have gone hand in hand and have become the main digital education teaching mode in universities worldwide. Online teaching is important in effectively promoting the smooth development of digital education management and information-based education in colleges and universities. As the front-line members of digital education and teaching in colleges and universities, university teachers enjoy the dividends of their own education and teaching ability development in the digital education era while improving their digital literacy. University teachers must also clearly and profoundly understand the connotations and characteristics of digital education and teaching, seize good development opportunities, and improve their digital literacy. From the three levels of the

country, colleges and teachers should actively strengthen their digital education and teaching ability, and comprehensively improve their digital education and teaching management level and university education and teaching ability. Promoting digital literacy among university teachers is an urgent and long-term three-dimensional project. This big project is not only an inherent requirement to speed up the digital transformation of universities but also an important starting point to train and build digital talents in the future society, whether at the national, university, or university faculty levels. Paying attention to this great project that needs to fight a protracted war is necessary. To promote the digital literacy of university teachers, the country strengthens the construction of a digital literacy system and cultivates awareness of teachers' digital literacy through policies and regulations. A digital education ecological environment should be created at the university level, and teachers should be trained digitally. Alternatively, the university teachers' voluntary initiative to learn, to build a digital education community in colleges and universities, etc., can effectively construct a new ecology for the promotion of digital literacy of university teachers, carry forward the new style of digital literacy of university teachers, and reach a new height of national education and teaching digitalization.

Acknowledgements

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