

Analysis on the Current Situation and Restricting Factors of Digital Literacy Ability of University Teachers in Shandong Province

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Abstract: At the moment when information technology has a profound impact on tertiary education, this article focuses on the digital literacy ability of teachers in Shandong Province. Through combing the relevant theories, investigating the current situation and analyzing the factors, this article finds that teachers in Shandong Province have certain characteristics in digital technology operation, resource utilization and teaching activities. Most teachers have mastered the basic digital technology tools, but they have not mastered professional and emerging technologies. Although the access to resources is wide, the integration efficiency is not high; Online teaching has been carried out, the depth and innovation need to be improved, and there are differences among teachers of different disciplines, teaching experience and college types. Constraints include external environment and teachers themselves. External policy support, facility completeness and regional ecology are insufficient. Teachers' own educational ideas, autonomous learning and career planning also affect the improvement of literacy. This study can provide a basis for improving the digital literacy ability of teachers in Shandong Province and promoting the digital development of tertiary education.

1. Introduction

With the rapid development of information technology, the wave of the digital age is impacting the field of tertiary education in an unprecedented situation [1]. The teaching mode of tertiary education is undergoing profound changes, from the traditional face-to-face teaching to the integration of online and offline multi-teaching mode [2]. In this context, the digital literacy ability of college teachers has become a key factor affecting the quality of education and teaching effect.

As a big education province, Shandong Province is rich in tertiary education resources, so it is of great significance to improve the digital literacy ability of college teachers to promote the modernization process of tertiary education in the province [3]. On the one hand, digital literacy ability can help teachers make better use of rich digital resources, innovate teaching methods, stimulate students' interest in learning and creativity, and then improve the quality of personnel training [4]. On the other hand, it is also an inevitable requirement for Shandong Province universities to conform to the trend of internationalization of education and connect with global quality education resources.

At present, many researches have been carried out on the digital literacy ability of university teachers. Part of the research focuses on the innovative application of digital technology in teaching and how teachers can adapt to the rapid development of online education by improving their digital literacy ability [5]. Some related studies mainly focus on the definition, components and promotion strategies of digital literacy ability [6]. However, the systematic research on the digital literacy ability of teachers in Shandong Province is still insufficient, especially the in-depth analysis of its present situation and constraints.

In view of this, this article aims to deeply explore the current situation of teachers' digital literacy ability in Shandong Province and analyze the factors restricting its development. It is expected that through this study, it will provide theoretical basis for Shandong Province universities to formulate

scientific and reasonable strategies to improve teachers' digital literacy ability, and promote the high-quality development of Shandong Province tertiary education in the digital age.

2. University teachers' digital literacy theory

The digital literacy ability of college teachers refers to a series of knowledge, skills and attitudes that teachers need to effectively use digital technology to carry out education and teaching activities in the digital age [7]. It covers a number of key elements. The application ability of digital technology is the foundation, and teachers need to skillfully operate all kinds of digital tools to achieve efficient teaching process management. The ability to integrate digital resources is equally important. Teachers should be able to screen, evaluate and integrate high-quality content from massive digital resources, so that it can be deeply integrated with curriculum teaching and enrich teaching materials [8]. The innovative ability of digital teaching reflects teachers' high-level accomplishment, which requires teachers to break through the shackles of traditional teaching mode, create novel teaching situations with the help of digital technology, and carry out interactive and inquiry-based teaching activities.

Digital literacy plays an indispensable role in college education and teaching. It helps to promote the reform of teaching mode, realize the change from teacher-centered to student-centered, and stimulate students' learning autonomy. By using digital technology, teachers can provide students with personalized learning paths to meet the learning needs of different students, thus improving the learning effect [9]. Teachers with good digital literacy ability can communicate and cooperate with their peers across regions more conveniently, share high-quality teaching resources and promote the overall improvement of education and teaching quality.

3. The present situation of digital literacy ability of teachers in Shandong Province

With the wide application of information technology in the field of education, the digital literacy ability of teachers in Shandong Province has been developed to some extent, but there are also some characteristics and problems [10]. The following analyzes its current situation from several key dimensions. In terms of proficiency in digital technology operation, most teachers can master basic digital technology tools. However, for some professional teaching software and emerging digital technologies, such as virtual laboratory software and artificial intelligence-assisted teaching tools, the proportion of teachers who are proficient is low. According to the survey, only about 30% of teachers can skillfully use professional teaching software to carry out teaching activities (see Table 1).

Table 1: Proficiency Level of University Teachers in Shandong Province in Different Digital Technology Tools

Digital Technology Tool Category	Proficiency Rate	Main Application Scenarios	Difficulties in Mastery
Office Software	82%	Lesson plan writing, grade statistics, courseware creation	Application of complex functions and advanced features
Professional Teaching Software	30%	Simulation of specific subject experiments, practical teaching of professional courses	Complex software functions, and difficulty in aligning with teaching content
Basic Functions of Online Teaching Platforms	65%	Live course broadcasting, assignment distribution and grading, sharing of teaching materials	Rapid updates of platform functions, and untimely mastery of new features
Emerging Digital Technologies (e.g., AI-assisted teaching tools)	22%	Personalized learning path planning, intelligent assignment grading	Strong technical expertise, lack of relevant training and practical guidance

In terms of the utilization efficiency of digital resources, teachers have a wide range of channels to obtain digital resources, including various educational resource platforms and academic

databases. However, there are shortcomings in resource screening and integration. Although some teachers have access to a large number of digital resources, they lack effective judgment on the quality and applicability of resources. In the course design, it is difficult for many teachers to accurately select digital resources that are highly compatible with teaching objectives, which leads to the disconnection between teaching resources and actual teaching needs. Only 45% of teachers said that they can efficiently screen and integrate digital resources for teaching, which makes the rich digital resources fail to give full play to their due teaching value.

Judging from the development of digital teaching activities, online and offline mixed teaching has gradually become a trend. Most college teachers have carried out online teaching activities to varying degrees, but the depth and innovation of teaching activities need to be improved. Most teachers mainly teach knowledge in online teaching, lacking interactive and exploratory activity design. In addition, teachers of different disciplines, teaching experience and college types have obvious differences in their digital literacy ability. Compared with liberal arts teachers, science and engineering teachers are more prominent in digital technology operation and professional digital resources utilization; Teachers with shorter teaching experience are more receptive to emerging digital technologies and teaching models. However, teachers in key colleges and universities have more digital literacy ability than teachers in ordinary colleges and universities because of the support of school resources and more training opportunities. To some extent, this difference has affected the balanced development of the digitalization of education and teaching in Shandong Province.

4. Factors restricting the development of digital literacy ability of teachers in Shandong Province

The development of university teachers' digital literacy ability is restricted by many factors. It is of great significance to analyze these factors deeply for improving teachers' digital literacy ability. These restrictive factors can be mainly divided into external environmental factors and teachers' own factors.

From the perspective of external environmental factors, the support of educational policies has a key impact on the development of teachers' digital literacy ability. Although Shandong Province has issued a series of policies to promote education informatization, some policies are not implemented in place in the specific implementation process. Through combing and analyzing the relevant policies (see Table 2), this article finds that among the 10 policies issued in the past three years, the policy related to hardware construction accounts for 60%, while the policy aimed at training and encouraging teachers' digital literacy ability only accounts for 20%. This makes teachers lack sufficient policy guidance and support in improving their digital literacy ability.

Table 2: Comparison of Focus Areas in Education Informatization Policies in Shandong Province

Policy Focus Area	Number of Policies (Last Three Years)	Proportion	Evaluation of Policy Implementation Effectiveness
Hardware Construction	8	53.3%	Hardware facilities in some universities have improved, but there are issues of resource underutilization and insufficient maintenance
Teacher Digital Literacy Training and Incentives	3	20%	Limited training coverage, and incentive mechanisms have not fully motivated teachers
Formulation of Education Informatization Standards	2	13.3%	Standard formulation lags behind technological development, and some standards lack operability
Digital Educational Resource Construction	2	13.3%	The quantity of resources has increased, but the quality is uneven, and the sharing mechanism is imperfect

The completeness of digital infrastructure in colleges and universities is also an important constraint. Some colleges and universities have problems such as insufficient network bandwidth and outdated digital teaching equipment, which affect the development of teachers' digital teaching activities. Taking an ordinary university as an example, this article investigates the network and equipment in its teaching area (see Table 3). The results show that about 40% of the classroom network is unstable, and 30% of the digital teaching equipment has been used for more than 5 years,

and its performance is aging, so it is difficult to meet the needs of new digital teaching. This undoubtedly hinders teachers from applying advanced digital technology to teaching.

Table 3: Survey on Network and Equipment Conditions in Teaching Areas of Regular Universities

Survey Item	Proportion of Problems	Impact on Teaching Activities (Scale of 1-5, with 5 being severely impactful)
Unstable Network	40%	Level 4, often causing teaching stuttering and interaction delays
Digital Teaching Equipment Usage Duration Exceeding 5 Years	30%	Level 3, decreased equipment performance affecting teaching presentation effects
Aging Performance of Digital Teaching Equipment Affecting Teaching	25%	Level 4, slow software operation, and some functions unusable
Insufficient Network Bandwidth in Teaching Areas	20%	Level 4, slow loading of online teaching resources, affecting the smoothness of live broadcasts

The development ecology of regional digital education can not be ignored. In some areas, universities lack a platform for sharing and exchanging digital education resources, and it is difficult for teachers to obtain advanced digital teaching experience and achievements from other universities. The cooperation between enterprises and universities in the field of digital education is not close enough, which leads to teachers' inability to get in touch with the latest application cases of digital technology in the industry in time, which limits the expansion of teachers' digital literacy ability. From the analysis of teachers' own factors, the speed of updating educational ideas is the key to restrict the development of digital literacy ability. Some teachers are deeply influenced by the traditional educational concept, and think that classroom teaching is still the most effective teaching method, and they don't know enough about the importance of integrating digital technology into teaching. According to the survey, about 35% teachers think that digital technology is only an auxiliary means of teaching, not the core element of teaching mode reform. This concept makes them lack the internal motivation to improve their digital literacy ability. The motivation and ability of autonomous learning also affect the improvement of teachers' digital literacy ability. With the rapid development of digital technology, teachers need to learn new knowledge and skills independently. However, some teachers are not motivated to learn independently because of their busy work and lack of learning planning. Some teachers lack effective autonomous learning methods, and in the face of massive digital learning resources, they don't know how to filter and use them, which leads to poor autonomous learning effect.

Career development planning also plays an important role in improving teachers' digital literacy ability. The improvement of digital literacy ability is not fully considered in the career development planning of some teachers, and the digital teaching achievements are not included in the important indicators of career promotion. This makes teachers lack clear goals and directions when improving their digital literacy ability, which further affects their energy and time.

5. Conclusions

This article probes into the present situation and restrictive factors of digital literacy ability of teachers in Shandong Province, aiming at providing reference for improving the quality of tertiary education in this province. At present, although teachers' digital literacy ability has developed, there are many problems. In the operation of digital technology, the basic tools are well mastered, and the application of professional and emerging technologies is lacking; In the utilization of digital resources, there are many access channels but the efficiency of screening and integration is low; When digital teaching activities are carried out, the form has changed but the depth and innovation are insufficient, and the literacy ability of different types of teachers is obviously different. Among the external environmental factors, the education policy is insufficient to train and encourage teachers' digital literacy ability, the digital infrastructure of colleges and universities has problems in network and equipment, and the development ecology of regional digital education lacks resource sharing and close cooperation between schools and enterprises. Among the teachers' own factors, the outdated educational concept, insufficient motivation and ability of autonomous learning, and the neglect of digital literacy in career development planning all hinder their development.

To improve the digital literacy ability of teachers in Shandong Province, we need to optimize the external environment and improve teachers' own literacy. The government should improve policies and increase investment in teacher training and incentives; Colleges and universities need to strengthen infrastructure construction and create a good digital education ecology. Teachers themselves should renew their educational ideas, improve their autonomous learning ability and plan their career development reasonably. Only in this way can we promote the high-quality development of Shandong Province's tertiary education in the digital age.

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