

The Current Situation and Improvement Strategies of Primary School Teachers' Information Literacy in the Digital Age

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Abstract: Focusing on the current status of information literacy among primary school teachers in the digital age, this study surveyed 439 teachers through a questionnaire and found that their overall level was moderate. Teachers were strong in information awareness but weak in information knowledge, competence, responsibility, and professional development. There were no significant differences among teachers from different backgrounds, indicating a general need to enhance information literacy. The study proposes enhancement strategies and looks at future research directions to promote the overall enhancement of teachers' information literacy.

Keywords: Information Literacy; Teacher Information Literacy; Primary School Teacher.

1. Introduction

With the rapid leap forward in digital technology, especially the deep integration of artificial intelligence, big data, and other cutting-edge technologies, education is stepping into unprecedented transformation. The traditional education model is gradually being reshaped by computer technology-centered teaching tools, contextualized teaching strategies, and student-centered teaching concepts. In this wave of transformation, teachers' information literacy has been pushed to the forefront of education reform and has become a core element in measuring education quality and driving education innovation. Therefore, it is urgent for teachers to continuously refine their information literacy to lead and adapt to this education revolution.

Given its importance, the Chinese Ministry of Education has intensively launched a series of policy initiatives in recent years, such as the Standard for Information Technology Application Competence of Primary and Secondary School Teachers (Trial) (2014), the Action Plan for the Revitalisation of Teacher Education with the Action Plan for Education Informatisation 2.0 (2018), the Opinions of the National Project for Improving the Information Technology Application Competence of Primary and Secondary School Teachers 2.0 (2019), and the latest Teachers' Digital Literacy" education industry standard (2022), aiming to systematically enhance teachers' IT application ability and teaching quality. At the same time, the cultivation and enhancement of teachers' information literacy have been comprehensively carried out through diversified training platforms such as "National Training" and "Provincial Training".

As the backbone of the basic education system, the information literacy level of primary school teachers is not only directly related to the effectiveness of students' information literacy initiation, but also a key driving force for the overall progress of education. To accurately formulate an efficient training program, an in-depth understanding of the current status of primary school teachers' information literacy and its effectiveness in teaching practice has become an urgent need.

Given this, this study focuses on the following core questions:

What is the current level of primary school teachers' self-perception of information literacy? What are the specific aspects of it?

Are there significant differences in information literacy levels among primary school teachers with different demographic characteristics (e.g., age, gender, educational background, etc.)?

Through in-depth analyses and research on the above questions, we aim to paint a real picture of primary school teachers' information literacy in the context of the digital age and to provide a scientific basis and practical suggestions for educational administrations, school administrations, and individual teachers. On this basis, we will further explore and construct effective strategies and paths to enhance primary school teachers' information literacy, help them ride the wave of digital transformation, and lay a solid foundation for cultivating future-oriented high-quality talents.

2. Literature Review

Domestic research on teachers' information literacy has been quite large-scale, mainly focusing on its connotation composition, cultivation strategy, and evaluation system, but a unified evaluation standard has yet to be established. Scholars have revealed the current situation and deficiencies of teachers' information literacy from different dimensions. Jiao Zhongming et al. assessed rural teachers from six dimensions and found that they had shortcomings in information processing and creation [1]; Yang Yan et al. measured college teachers from four dimensions and pointed out that the ability to apply information needed to be improved [2]; and Ma Xinyan et al. emphasized the importance of teacher-specific information competence and social responsibility [3]. Chen Min et al.'s study was more systematic, constructing an assessment system containing five dimensions and pointing out teachers' deficiencies in basic information knowledge, teaching innovation, and professional competence growth [4]. Together, these studies confirm information awareness, knowledge, application

ability, and ethics as the core indicators for assessing teachers' information literacy.

In contrast, foreign countries have demonstrated a high degree of maturity in terms of policy guidance, framework construction, and social support for teachers' information literacy. For example, Japan's list for evaluating teachers' ICT instructional competence, the EU's European Framework for the Digital Competence of Educators, UNESCO's ICT Competence Framework for Teachers (3rd edition) (2018) [5], Austria's Digital Skills Framework for Educators (2019) [6], and the Digital Teaching Professional Framework (2023) [7] of the Education and Training Foundation (ETF) in the UK, etc., which provide valuable learning and reference resources for the country.

Given this, this study combines domestic practice with international advanced concepts to innovatively construct a framework for primary school teachers' information literacy, covering five dimensions: information awareness, information knowledge, information competence, information responsibility, and professional development. Among them: information awareness emphasizes teachers' knowledge of and sensitivity to the value of information technology education and the development of adaptability to new technologies. Information knowledge covers the understanding of the basic principles, application areas, and resource tools of information science and technology, providing teachers with a solid knowledge base. Information competence includes a full range of skills in information retrieval, assessment, processing, and creation, helping teachers to make efficient use of information resources. Information Responsibility clarifies teachers' ethical and legal obligations in the use of information and promotes information equity and security. Professional development encourages teachers to continue learning and to improve themselves through continuing education, technical training, and pedagogical research to adapt to changes in education. This framework not only comprehensively covers the key qualities and competencies needed by teachers in the digital age, but also specifies the specific paths for teachers' professional growth, aiming to promote the comprehensive improvement and sustainable development of teachers' information literacy.

3. Method

3.1. Questionnaire Design

Based on the literature research and analysis of the research results of information literacy at home and abroad, an information literacy questionnaire for primary school teachers was designed. The questionnaire is mainly divided into two parts: the first part is a survey scale of teachers' information literacy level, including five dimensions: information awareness, information knowledge, information ability, information responsibility, and professional development, with a total of 35 questions. This section uses a 5-level scale, with five options: strongly disagree, disagree, neutral, agree, and strongly agree. Each option is assigned a score of 1, 2, 3, 4, and 5, respectively. The higher the total score, the higher the level of information literacy. The second part is a survey of teachers' background information, including gender, educational background, professional title, teaching experience, and teaching subjects, to analyze the differences in information literacy among the surveyed teachers in these areas.

3.2. Questionnaire Analysis

3.2.1. Content Analysis of the Questionnaire

To ensure the scientificity and rigor of the questionnaire scale, based on detailed literature research, this study finally selected the ACDC (Analysis of Common Digital Competences) scale [8], SRDL (the Self-Report Digital Literacy) scale [9], DigCompSAT (a self-reflection tool for the European Framework for the Digital Competence of Citizens) [10], TET-SAT (The technology-enhanced teaching self-assessment tool) scale [11] and DigCompEdu (European Framework for the Digital Competence of Educators) [12] as theoretical references for the design of the questionnaire scale. The research questionnaire was developed pre-validated and reviewed.

3.2.2. Validity Analysis

Using SPSS, an exploratory factor analysis was conducted on the questionnaire scale. Through the KMO and Bartlett sphericity tests, it was found that the KMO value was $0.942 > 0.7$, and the sphericity test was $p = 0.000 < 0.05$, reaching significance, indicating that the questionnaire can be subjected to factor analysis. In factor analysis, the principal component analysis method is applied. Five common factors with eigenvalues greater than 1 were extracted from 35 questions, and the results were consistent with the division of questionnaire design dimensions, with a cumulative variance explanation rate of $60.003\% > 60\%$, indicating that the scale has good explanatory validity. Confirmatory factor analysis was conducted using Amos, and the results showed that $\chi^2/DF = 1.339$, $CFI = 0.990$, $GFI = 0.962$, $RMSEA = 0.018$. According to the recommended criteria of Bentler (1990), it indicates that the fitting degree of the model is acceptable.

3.2.3. Reliability Analysis

This study used the Cronbach's Alpha coefficient in internal consistency to test the reliability of the questionnaire and obtained a Cronbach's Alpha coefficient of 0.927 for the primary school teacher information literacy questionnaire. The reliability coefficients for the five dimensions of information awareness, information knowledge, information ability, information responsibility, and professional development were 0.915, 0.762, 0.941, 0.849, and 0.846, respectively. Therefore, the reliability of this questionnaire is good.

3.3. Procedure/Information Collection and Participants

At the end of 2023, we released an online survey questionnaire through the QZ platform, and sent the link or QR code to the WeChat group of primary school teachers in Pingdingshan City, allowing respondents to quickly complete and submit the questionnaire online. A total of 450 teachers anonymously participated in the questionnaire survey. After screening, 11 invalid questionnaires with missing data, contradictory answers, or too short or too long response time were eliminated, resulting in a final return of 439 valid questionnaires, with a valid return rate of 97.6%. The demographic characteristics of the valid samples are shown in Table 1. Among them, in terms of gender, males account for 200%, with women accounting for 800. In terms of educational background, 15.9% have a diploma, 82.9% have a bachelor's degree, 1.1% have a master's degree, and 0% have a doctoral degree or higher; In terms of teaching subjects, mathematics accounts for 37.8%, Chinese accounts for 27.8%, English accounts for 6.8%, physical education accounts for

5.7%, computer science accounts for 2.1%, and art and science accounts for 6.2%; In terms of teaching experience, 36.2% have 0-8 years of teaching experience, 27.8% have 9-16 years of teaching experience, 19.1% have 17-25 years of teaching experience, and 16.9% have 26 years or more of teaching experience; In terms of professional titles, 2.7% hold

the third level of primary school, 55.1% hold the second level, 33.9% hold the first level, and 8.2% hold the senior level. The overall distribution of the sample is consistent with the actual distribution of primary school teachers and is representative to some extent.

Table 1. Distribution of demographic characteristics of samples

Variable	Option	Frequency	Percent
Gender	Male	88	20.0%
	Female	351	80.0%
Educational background	Junior college	70	15.9%
	Undergraduate	364	82.9%
	Master	5	1.1%
	Doctor	0	0%
Subject	Mathematics	166	37.8%
	Language	182	41.5%
	English	30	6.8%
	Sports	25	5.7%
	Computer (Information Technology, General Technology)	9	2.1%
	Other (music, art, science)	27	6.2%
Teaching experience	0-8 years	159	36.2%
	9-16 years	122	27.8%
	17-25 years	84	19.1%
	26 years and above	74	16.9%
Professional title	level III primary school teacher	12	2.7%
	level II primary school teacher	242	55.1%
	First-grade teacher	149	33.9%
	Senior teacher	36	8.2%

4. Results and Discussion

4.1. General Overview of the Information Literacy Level of Primary School Teachers

When exploring the current situation of information literacy among primary school teachers, we conducted an in-depth analysis based on the self-assessment data of teachers (see Table 2 for details), which provided a more comprehensive and detailed understanding of the level of information literacy among primary school teachers. This analysis not only reveals the specific performance of teachers in the core dimensions of information literacy but also paints a picture of the overall information literacy of primary school teachers.

Table 2. The Information Literacy Level of Primary School Teachers

Variable	Mean	Std. Deviation
Information Awareness	3.90	0.63
Information Knowledge	3.23	0.63
Information Capability	3.20	0.56
Information Responsibility	3.24	0.56
Professional Development	3.25	0.65
Information Literacy	3.33	0.41

Teachers have demonstrated a solid foundation in the five

core dimensions of information literacy. This balanced development trend is an important manifestation of the active adaptation and self-improvement of the teacher group in the process of educational modernization. The evaluation results with an average score higher than 3 indicate that teachers generally recognize the importance of information technology in education and teaching, and have a certain basic knowledge and application ability of information technology. In terms of the standard deviation of the evaluation data, the standard deviation of each dimension ranges from 0.40 to 0.65, indicating that the internal differences in the information literacy level of the teacher group are relatively small. This finding further proves the stability of the information literacy level of primary school teachers and provides strong support for us to develop unified and effective improvement strategies. Based on the evaluation results of various dimensions, we conclude that the overall average of primary school teachers' information literacy level is 3.33, with a standard deviation of 0.41. This data indicates that teachers' information literacy is at a medium-high level. This conclusion not only affirms the current efforts of teachers but also indicates that they have great potential for development in the future process of educational modernization. With the continuous development of information technology and the deepening of education reform, we have reason to believe that the information literacy level of primary school teachers will continue to improve, contributing more to the cultivation of talents with high information literacy in the new era.

4.2. Detailed Analysis of Each Dimension

4.2.1. Information Awareness

The mean score of this dimension is 3.90 (SD=0.63), indicating that teachers have a sustained interest in and active exploration of information technology. They recognize the value of information technology and are willing to invest time and energy in learning new technologies and exploring new methods to better serve the growth and development of students. It can be seen that the profound impact of the information age on education and teaching, as well as a series of education information policies issued by the state and local governments, such as teacher training and resource construction, have greatly stimulated the enthusiasm of teachers and made them more determined to walk on the road of information-based teaching.

4.2.2. Information Knowledge

The mean value of this dimension is 3.23 (SD=0.63), revealing that teachers have some basic knowledge of information technology, such as basic operations and the use of commonly used software. This provides necessary support for them to apply information technology in teaching. However, with the rapid development of information technology, new knowledge and technologies are constantly emerging, and teachers' knowledge reserves in information security, data analysis, advanced software applications, and other fields are relatively insufficient. This limits their ability to apply information technology more widely and deeply in teaching. Therefore, strengthening targeted and systematic information technology training, especially for new technologies and applications, is of great significance for improving teachers' information literacy.

4.2.3. Information Capability

The mean score of this dimension is 3.20 (SD=0.56), reflecting the challenges faced in translating information technology into practical teaching ability. Teachers' practical abilities in information technology application, instructional design, resource integration, and teaching evaluation are still average. Although they have a certain theoretical basis and practical experience, they may still encounter technical obstacles, resource integration problems, etc. in actual operation. Nevertheless, many teachers are still brave enough to try new teaching models and methods, such as using multimedia teaching and online learning platforms, to enhance students' learning experience and effectiveness. To further improve teachers' information literacy, it is necessary to strengthen practical guidance and technical support to help them better integrate information technology into teaching design and practice.

4.2.4. Information Responsibility

The mean score of this dimension is 3.24 (SD=0.56), indicating that teachers have a certain understanding of information security and ethical norms, which helps maintain a healthy and safe teaching environment. However, with the widespread application of information technology in education and teaching, teachers' awareness of information responsibility needs to be further strengthened. They need to pay more attention to information security issues and protect students' privacy and data security; At the same time, we should also abide by the ethical norms of information technology use and set a good example for students.

4.2.5. Professional Development

The mean score of this dimension is 3.25 (SD=0.65), which shows that teachers are open to continuing education and

teaching innovation, indicating that they are willing to continuously learn new knowledge and skills to improve their professional quality, and also show some interest in teaching research and innovation. This positive attitude towards learning is of great significance for teachers' professional growth and improving teaching effectiveness. However, there is a slight deficiency in using information technology to promote their professional development. Some teachers may still be accustomed to traditional professional development methods and neglect the potential of information technology in them. Therefore, it is necessary to encourage teachers to explore the application of information technology in professional development, which will help broaden learning paths and accelerate the professional growth of teachers.

4.3. Analysis of the Differences in Information Literacy among Primary School Teachers

A gender-independent sample t-test was conducted on teachers' information literacy, and the results showed that $p=0.404>0.05$, indicating that there was no significant difference in information literacy between the surveyed subjects based on gender. This shows that with the popularization of information technology, both men and women not only realize the importance of information technology but also have equal opportunities to access and use various technological tools. A single-factor ANOVA analysis of teachers' information literacy in terms of educational background, teaching subject, teaching experience, and professional title showed that p values were 0.18, 0.81, 0.97, and 0.98, respectively, all greater than 0.05. This result indicates that there are no significant differences in teachers' information literacy in these areas, showing a relatively balanced development trend. This shows that with the deepening of education reform and the development of information technology, teachers in different disciplines need to constantly update their knowledge and skills to meet the needs of teaching. Many regions and schools have also formulated corresponding policy support and incentive mechanisms to improve teachers' information literacy, such as providing training opportunities and setting up incentives, and have promoted learning and communication among teachers through building platforms and organizing exchange activities. These measures help to stimulate teachers' learning motivation and enthusiasm for development, thereby narrowing the differences in information literacy among teachers from different backgrounds.

5. Conclusion and Limitations

5.1. Conclusion

In today's era of global information technology in education, the information literacy of primary school teachers is not only the cornerstone of their professional development but also a key driving force for promoting the modernization and high-quality development of basic education. This study conducted a survey on the current status of information literacy among 439 primary school teachers in Pingdingshan City, revealing the current situation and challenges of primary school teachers in the field of information literacy in the context of the digital age. The survey results show that although teachers generally exhibit a high degree of sensitivity and positive information awareness towards information technology, there is still room for improvement in terms of the breadth and depth of information knowledge,

the practice and innovation of information technology application capabilities, the cognition and practice of information security responsibilities, and the exploration and construction of professional growth paths. It is noteworthy that this study found no significant differences in information literacy among teachers of different genders, educational backgrounds, professional titles, teaching experience, and teaching disciplines, which provides valuable empirical evidence for developing cross-group and universal information literacy improvement strategies.

Based on this, we propose the following multi-dimensional improvement strategies: first, build a systematic information technology training system that focuses on combining theory with practice to ensure that every teacher can solidly master the basic knowledge and core skills of information technology; Secondly, through the establishment of practical exercises and case studies in real teaching scenarios, teachers' innovative thinking is stimulated and their ability to flexibly apply information technology in complex teaching environments is enhanced; Furthermore, strengthen information security education and training, guide teachers to establish a correct view of information ethics, and earnestly fulfill their responsibility to protect information security; Finally, a comprehensive and multi-level support system for teachers' professional development should be established, leveraging online and offline resources to provide teachers with continuous learning opportunities and growth spaces, and promoting the simultaneous leap in their information literacy and professional competence. Through the implementation of the above strategies, we expect to fully stimulate the potential of primary school teachers in the information age, promote the deep integration of information technology and education and teaching, and jointly contribute to the cultivation of talents with high information literacy in the new era, laying a solid foundation for education.

5.2. Limitations

Although this study strives to comprehensively and deeply analyze the current situation and problems of primary school teachers' information literacy, there are still inevitable limitations. Firstly, the limitation of the research sample lies in its geographical and disciplinary scope. It only focuses on primary school teachers in Pingdingshan City in the major disciplines of Chinese, mathematics, and English, and fails to comprehensively cover teachers across the country and in more disciplines. Future research should further expand the sample scope to enhance the universality and representativeness of the conclusions. Secondly, the limitations of the research method are mainly reflected in the use of self-assessment to collect data. Although self-assessment can reflect teachers' self-awareness and subjective feelings, its results are often influenced by factors such as individual self-assessment ability and social desirability effects, which may lead to some deviation between the assessment results and actual abilities. To more objectively and accurately evaluate teachers' information literacy level, it is suggested that future research adopt diversified evaluation methods, such as combining contextualized assessment projects, observation records, peer evaluation, and other

means, while using information technology platforms to develop more scientific and efficient assessment tools to improve the accuracy and effectiveness of evaluation.

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