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Constructing an Evaluation Index System for Teacher Digital Literacy based on Student Perception

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Abstract: The wave of digitalization is profoundly reshaping the educational landscape, making teacher digital literacy a critical factor in influencing teaching quality. However, existing research often neglects the perceptions of students, a vital audience, when developing evaluation systems for teacher digital literacy. This study begins with student perceptions, drawing on relevant findings and integrating them with educational practices. It identifies 15 evaluation indicators across five dimensions: digital teaching resource utilization ability, digital teaching design ability, digital teaching interaction ability, digital teaching evaluation ability, and digital security ability. Data were collected through surveys, and quantitative analysis methods were employed to assess the validity of the proposed evaluation system. The index system established in this study demonstrates a coherent dimensional structure and robust reliability and validity, providing a scientific and effective tool for evaluating teacher digital literacy. This research has significant implications for teacher professional development, the optimization of teaching practices, and the formulation of educational policies.

Keywords: Teacher Digital Literacy; Student Perception; Evaluation Index System; Factor Analysis; Educational Digital Transformation.

1. Introduction

In today's era, the intertwined waves of globalization and the rapid development of digital technology have initiated a profound "digital transformation" revolution, marking the beginning of a new chapter in the digital revolution. The concept of digital development permeates every corner of society, covering all fields and industries, including higher education, and has become a key force driving transformation and development across various sectors. The vigorous growth of digital technology has collectively propelled the rapid iteration of teaching environments and methods in higher education, facilitating a transition from traditional informatization and networking stages to a higher level of intelligence[1].

In this macro environment, as a crucial bastion for cultivating high-quality talents, whether higher education institutions in China can keenly and profoundly perceive and accurately grasp the trends of digital transformation in higher education amidst the rising tide of artificial intelligence, and timely and reasonably adjust the institutional construction system of schools and the behavioral norms of teachers, thereby achieving a leap in the quality of talent cultivation, has become a major issue concerning the future development and success of higher education[2].

As the core implementers of higher education, the level of digital literacy of higher education teachers directly determines the effectiveness and quality of the digital transformation of higher education[3]. The digital literacy of higher education teachers not only needs to align with the specific modes of higher education but also must fit the talent cultivation goals and academic development characteristics pursued by higher education. It is one of the indispensable key elements for successfully promoting the digital transformation of higher education. Among the various approaches to enhancing teachers' digital literacy, implementing a scientific, comprehensive, and targeted teacher evaluation mechanism has become one of the important ways to promote the continuous improvement of teaching quality and the ongoing advancement of professional capabilities[4].

From a macro perspective, constructing an evaluation system for teachers' digital capabilities is of great significance for promoting the digital transformation of education, adapting to future educational development trends, and guiding the development planning of teachers' digital capabilities[5]. From a meso perspective, this system helps higher education institutions systematically construct a digital literacy framework, formulate teacher training plans, and strategic planning, thereby strengthening the capacity building of the teaching workforce. From a micro perspective, this system can enhance the digital capabilities of higher education teachers, optimize teaching effectiveness, and significantly improve the quality of talent cultivation. Therefore, there is an urgent need to establish a forward-looking evaluation system for teachers' digital capabilities in China, which should not only clarify objectives but also include key elements and effective methods to promote the effective enhancement of teachers' digital capabilities.

Despite the current academic and educational practice fields' significant attention to teachers' digital literacy, and the numerous studies devoted to constructing evaluation frameworks for this literacy, most research primarily focuses on the technical abilities possessed by teachers or the top-down assessment perspectives of educational administrators[6][7]. This approach often neglects the perceptions of students, a crucial group as direct participants and experiencers of teaching activities. In fact, students are the direct recipients of teachers' digital literacy; they personally experience every aspect of how teachers utilize digital technology in their teaching processes. Their insights into the rationality, effectiveness, and facilitative role of teachers' digital technology application in their own learning are the most intuitive and genuine.

Therefore, this study focuses on the unique perspective of student perceptions, aiming to construct a comprehensive, systematic, and targeted evaluation index system for teachers' digital literacy. By deeply exploring students' cognitions, feelings, and expectations regarding teachers' digital literacy, we seek to uncover the key elements of digital literacy that genuinely influence students' learning experiences and outcomes, hidden behind teaching interactions. This approach not only enriches the theoretical research on teachers' digital literacy but also provides strong evidence for educational institutions to formulate precise teacher training plans and for teachers to clarify their self-improvement directions. Ultimately, this effort aims to create a more high-quality, efficient, and vibrant digital education ecosystem, supporting students to thrive in the wave of digitalization and maximizing the value of education.

2. Construction of the Evaluation Index System

This study is based on research regarding digital literacy within the New Media Alliance, integrating the findings of various scholars and considering the specific characteristics of higher education teachers' work. We have selected 15 evaluation indicators across 5 dimensions of digital literacy. The dimensions of the evaluation system include: Digital Teaching Resource Utilization Ability, Digital Teaching Design Ability, Digital Teaching Interaction Ability, Digital Teaching Evaluation Ability and Digital Security Ability. The specific indicators included in each dimension, along with their explanations and main reference sources, are presented in Table 1.

Table 1. Indicators and their explanations

Variable	Item	Indicators	Explanations
Digital Teaching Resource Utilization Ability	DTRUA1	Resource Acquisition and Integration	Teachers are adept at selecting and skillfully combining high-quality, relevant online resources that align with teaching goals and meet students' needs.
	DTRUA2	Resource Updating and Expansion	Teachers stay abreast of the latest developments in their fields and resource updates, introducing fresh and cutting-edge resources to broaden students' knowledge horizons.
	DTRUA3	Resource Applicability Assessment	Teachers accurately assess the effectiveness of digital resources for student learning based on feedback and promptly adjust and optimize how these resources are used.
Digital Teaching Design Ability	DTDA1	Goal Setting and Integration of Digital Technology	Teachers consider how to use digital technology to cultivate students' knowledge, skills, and digital literacy when setting teaching objectives, ensuring that these goals are feasible and measurable.
	DTDA2	Digital Design of Teaching Activities	Teachers meticulously plan a variety of teaching activities based on digital technologies to stimulate student interest and enhance multiple abilities, thus improving the learning experience.
	DTDA3	Personalized Learning Path Planning	Teachers utilize platform data to understand their students, customizing exclusive learning paths for them, recommending resources, assigning tasks, and providing guidance.
Digital Teaching Interaction Ability	DTIA1	Diversity of Classroom Interaction	Teachers employ the interactive features of online platforms to facilitate diverse classroom interactions, providing timely feedback and evaluations, thereby enlivening the classroom atmosphere and enhancing interaction quality.
	DTIA2	Timeliness of Teacher-Student Communication	Teachers engage in close communication with students through digital channels, answering questions and providing support while adjusting teaching based on feedback to strengthen teacher-student relationships.
	DTIA3	Stimulating Student Participation	Teachers use digital means to spark student interest, focusing on participation levels, encouraging active participants, and assisting less engaged students to promote overall involvement.
Digital Teaching Evaluation Ability	DTEA1	Formative Assessment	Teachers rely on platform data to objectively evaluate students' learning processes, identifying issues and providing recommendations to help students improve their strategies.
	DTEA2	Summative Assessment	Teachers utilize online examinations and assignment grading tools for summative assessments, analyzing results to provide data support for teaching reflection and improvement.
	DTEA3	Assessment Feedback	After completing evaluations, teachers promptly provide feedback to students, offering detailed analyses and interpretations, along with multifaceted suggestions to guide students' learning directions.
Digital Security Ability	DSA1	Digital Ethics Education	Teachers incorporate digital ethics and moral education into their teaching, using various methods to cultivate students' correct values and normative behaviors.
	DSA2	Teaching Data Security	Teachers implement technical and management measures to protect the security and privacy of teaching data while educating students on safeguarding personal information to create a secure environment.
	DSA3	Compliance with Digital Technology Use	Teachers adhere to legal regulations regarding the use of digital technologies, selecting lawful and compliant resources and methods in teaching, thus setting a lawful example for students.

3. Data Collection and Processing

The data collection for this study revolves around the core objective of understanding students' perceptions of teachers' digital literacy. This was primarily conducted through a questionnaire survey method, aiming to comprehensively and deeply extract effective information, laying a solid foundation for constructing a precise and reasonable evaluation index system.

The target respondents for the questionnaire included a wide range of students from various regions, educational levels, grades, and disciplines, encompassing humanities, sciences, and engineering. This diverse sampling approach aimed to ensure richness, diversity, and representativeness, enabling the research findings to be broadly applicable across various educational contexts and subject backgrounds. In terms of distribution methods, both online and offline channels were utilized to complement each other. Online, we leveraged professional questionnaire survey platforms to accurately target students from specific schools by sending customized questionnaire links. Additionally, various social media platforms were employed for extensive promotion, providing a detailed introduction to the research purpose, significance, and the importance of questionnaire completion, which encouraged students to participate actively and fill out the questionnaires truthfully, significantly enhancing the reach and response rate. Offline, representative classes from selected schools were approached to distribute paper questionnaires, where students were given on-site explanations of the filling requirements, answering norms, and precautions, ensuring they clearly understood the meaning of each question and could accurately express their genuine feelings and opinions, thereby guaranteeing the quality and validity of the questionnaire responses.

After a period of intensive collection work, a total of 300 questionnaires were retrieved. Subsequently, the research team promptly engaged in a rigorous screening and organizing process for the returned questionnaires. First, an initial check was conducted to assess the completeness of each questionnaire, discarding those with numerous missing answers, apparent random responses, or logical inconsistencies. Next, a secondary review was conducted on key questions and core indicators, further scrutinizing and eliminating those responses that were evidently unreasonable or contradictory. After multiple layers of review and meticulous screening, a final tally of 246 valid questionnaires was determined. These strictly vetted valid questionnaires became valuable resources and reliable bases for subsequent data analysis.

To rigorously validate the rationale and scientific nature of the carefully constructed evaluation index system, this study adhered to strict academic norms and data analysis procedures. Two key steps were employed: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), to comprehensively and thoroughly test the reliability and validity of the data collected from the 246 valid questionnaires. The exploratory factor analysis aimed to uncover the underlying common factor structure from the numerous original variables, revealing the intrinsic relational patterns between variables, and initially determining the dimensional composition and factor loadings of the evaluation index system, providing data support for optimizing and refining the index system. Confirmatory factor analysis, built upon the exploratory factor analysis, further employed structural equation modeling and other methods to validate and assess the fit of the pre-established index system model. By comparing the discrepancies between actual data and theoretical models, the reasonableness and effectiveness of the model were evaluated, ensuring that the constructed index system could accurately and authentically reflect the actual status of teachers' digital literacy from the perspective of student perception. This robust data support and theoretical foundation would provide solid backing for subsequent research conclusions, ensuring that the research results possess high scientific rigor, reliability, and practicality, thus effectively guiding the evaluation and enhancement of teachers' digital literacy in educational practices, and powerfully promoting the digitalization process in education towards a healthier and more efficient direction.

3.1. Exploratory Factor Analysis

When using factor analysis methods to conduct exploratory factor analysis, the KMO (Kaiser-Meyer-Olkin) test value ranges from 0 to 1. A value closer to 1 indicates a greater amount of shared variance among the variables, meaning a stronger correlation between the variables, which is more suitable for factor analysis. The Bartlett's test of sphericity is used to test whether the correlations among the variables are significant, specifically to test whether the correlation matrix is an identity matrix. If the test statistic is large and the corresponding p-value is less than the significance level (usually set at 0.05), the null hypothesis can be rejected, indicating that there is a correlation among the variables and that factor analysis is appropriate.

The KMO test results and Bartlett's test of sphericity for the data in this study are presented in Table 4. Specifically, the obtained KMO value was 0.781, which is greater than 0.7, indicating a high degree of correlation among the variables, thereby confirming that these variables meet the conditions for factor analysis. Meanwhile, the significance level of Bartlett's test of sphericity reached 0.001, indicating that these variables are suitable for factor analysis operations.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.781
Bartlett's Test of Sphericity	Approx. Chi-Square	1049.284
	df	105
	Sig.	.000

3.1.1. Explanation of Total Variance

In the factor analysis, principal component analysis was chosen for factor extraction, with a fixed number of factors set at five. The cumulative variance contribution rate reached 68.370%, indicating that the information loss is minimal. The cumulative variance contribution rate did not change after factor rotation, suggesting that the extraction of principal components is reasonable. The total variance explained by the predicted data is shown in Table 3.

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.280	15.197	15.197	2.280	15.197	15.197	2.255	15.035	15.035
2	2.133	14.221	29.418	2.133	14.221	29.418	2.111	14.075	29.109
3	2.122	14.146	43.564	2.122	14.146	43.564	2.107	14.046	43.156
4	1.892	12.613	56.177	1.892	12.613	56.177	1.924	12.826	55.981
5	1.829	12.193	68.370	1.829	12.193	68.370	1.858	12.389	68.370
6	.748	4.990	73.360						
7	.660	4.399	77.760						
8	.587	3.911	81.671						
9	.530	3.535	85.206						
10	.459	3.057	88.263						
11	.438	2.920	91.183						
12	.402	2.683	93.866						
13	.365	2.437	96.303						
14	.290	1.936	98.239						
15	.264	1.761	100.000						

3.1.2. Rotated Component Matrix

Using the Varimax rotation method, the factor loadings were arranged in descending order, and coefficients smaller than 0.4 were removed from the common factor columns to ensure that each observed variable does not overlap with other latent variable dimensions[8]. The rotated component matrix for the predicted data is presented in Table 4.

As seen in Table 4, DTRUA1–DTRUA3, DTDA1–DTDA3, DTIA1–DTIA3, DTEA1–DTEA3, and DSA1–DSA3 all belong to the same common factor, with no observed variables overlapping into other latent variable dimensions. This indicates that the observed variables under the same dimension have high correlations and strong explanatory power regarding the variance of their respective dimensions.

Table 4. Rotated Component Matrix

	Component				
	1	2	3	4	5
DTRUA1		.890			
DTRUA2		.796			
DTRUA3		.812			
DTDA1			.862		
DTDA2			.811		
DTDA3			.835		
DTIA1					.759
DTIA2					.734
DTIA3					.846
DTEA1				.798	
DTEA2				.802	
DTEA3				.780	
DSA1	.901				
DSA2	.849				
DSA3	.842				
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 4 iterations.					

3.2. Confirmatory Factor Analysis

Through the exploratory factor analysis mentioned earlier, it has been demonstrated that the scale constructed in this study has certain reliability and validity. To ensure the rigor of the scale, this study employed AMOS 24.0 to conduct confirmatory factor analysis. In the AMOS interface, four latent variables, fifteen observed variables, and fifteen residual variables were set up, and maximum likelihood estimation was chosen for model computation, as shown in Figure 1. The estimated loading coefficients between the observed variables and their corresponding latent variables are presented in Table 5.

First, a statistical significance test was conducted on the path coefficients of the model. The ratio of the unstandardized estimate of the regression coefficient (Regression Weights) to its standard error (S.E.) is referred to as the critical ratio, abbreviated as C.R. When the absolute value of C.R. exceeds 1.96, the significance P-value reaches the 0.05 level, denoted as ""; when the absolute value of C.R. exceeds 2.58, the significance P-value reaches the 0.01 level, denoted as ""; and when the absolute value of C.R. exceeds 3.29, the significance P-value reaches the 0.001 level, denoted as "". As shown in Table 5, the model exhibits good significance.

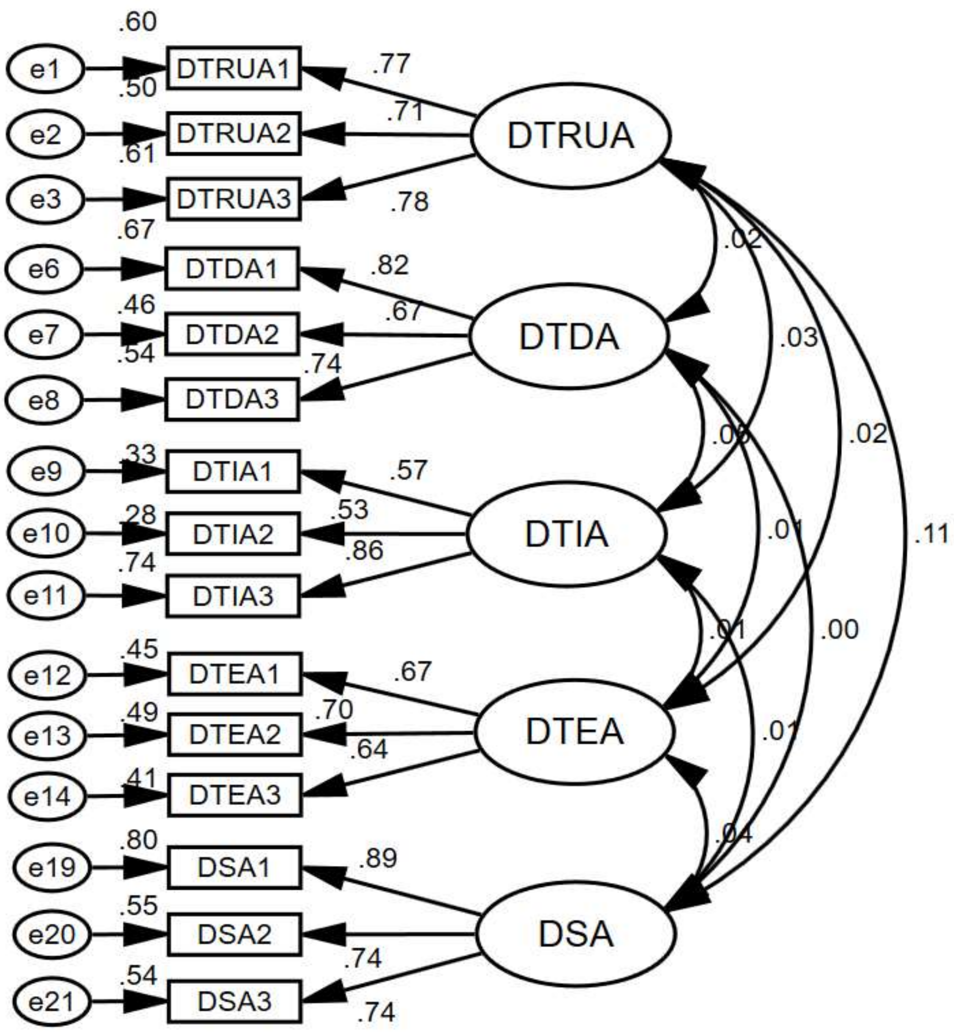

Figure 1. Confirmatory Factor Analysis Model

Table 5. Estimated Loading Coefficients Between Observed Variables and Their Corresponding Latent Variables

			unstandardized coefficients	S.E.	C.R.	P
DTIA3	<---	DTIA	1.000			
DTIA2	<---	DTIA	.600	.114	5.249	***
DTIA1	<---	DTIA	.671	.125	5.367	***
DTDA3	<---	DTDA	1.000			
DTDA2	<---	DTDA	.938	.105	8.954	***
DTDA1	<---	DTDA	1.118	.123	9.123	***
DTEA1	<---	DTEA	1.000			
DTEA2	<---	DTEA	1.049	.157	6.691	***
DTEA3	<---	DTEA	.928	.138	6.743	***
DSA3	<---	DSA	1.000			
DSA2	<---	DSA	.984	.091	10.863	***
DSA1	<---	DSA	1.261	.113	11.119	***
DTRUA3	<---	DTRUA	1.000			
DTRUA2	<---	DTRUA	.894	.094	9.482	***
DTRUA1	<---	DTRUA	.954	.098	9.717	***

In confirmatory factor analysis, convergent validity is measured using standardized factor loadings (Standardized Regression Weights), composite reliability (CR), and average variance extracted (AVE)[9]. Generally, a standardized loading above 0.5, a composite reliability above 0.7, and an AVE above 0.4 indicate good convergent validity. As shown in Table 6.

Table 6. standardized coefficients, CR, and AVE values for the measures

Item	standardized coefficients	CR	AVE
DSA1	0.893	0.835	0.630
DSA2	0.743		
DSA3	0.736		
DTDA1	0.817	0.788	0.555
DTDA2	0.675		
DTDA3	0.736		
DTEA1	0.673	0.711	0.451
DTEA2	0.702		
DTEA3	0.639		
DTIA1	0.574	0.700	0.450
DTIA2	0.526		
DTIA3	0.863		
DTRUA1	0.773	0.799	0.570
DTRUA2	0.706		
DTRUA3	0.783		

3.3. Fit Indices Test

The overall model fit is presented in Table 7, with all the goodness-of-fit indices meeting the recommended criteria[10]. Consequently, the hypothesized model proposed in this study exhibits an adequate fit to the empirical data, thereby validating the measurement model.

Table 7. Model fit

Fitting Indicator	Actual value	Adaptation Standard	Fitting Judgment
CMIN/DF	<3.00	0.985	Qualified
IFI	>0.90	0952	Qualified
TLI	>0.90	0.951	Qualified
CFI	>0.90	0.943	Qualified
RMSEA	<0.05	0.035	Qualified
GFI	>0.90	0.960	Qualified
PGFI	>0.50	0.640	Qualified

4. Research Conclusions

This study successfully constructed a teacher digital literacy evaluation index system based on student perceptions through a rigorous process of data collection, processing, and analysis. Comprehensive and in-depth verification of this system led to the following conclusions across multiple dimensions:

4.1. Effectiveness and Rationality of the Teacher Digital Literacy Evaluation Index System Dimensions

1) Factor Analysis Validates Dimension Structure: The results of exploratory factor analysis indicate that the data in this study are suitable for factor analysis. The five factors extracted through principal component analysis account for a cumulative variance contribution rate of 68.370%, suggesting that the extracted factors effectively summarize the information of the original variables with minimal information loss. The rotated component matrix clearly shows that the indicators under each dimension belong distinctly to their respective factors, indicating high correlation among indicators within the same dimension and strong explanatory power for that dimensions variance. The indicators closely align with their core concepts, forming a logically clear and structurally sound teacher digital literacy evaluation system.

2) Alignment with Educational Practice Needs: The five dimensions constructed in this study are closely aligned with the actual workflows and key competency requirements of teachers in digital teaching environments. The system comprehensively covers all aspects of teachers' use of digital literacy in teaching activities, from acquiring, integrating, and updating digital teaching resources to designing lessons based on digital technology, facilitating classroom interaction, assessing student performance, and addressing digital ethics and safety awareness. This high degree of alignment with educational practice ensures that the evaluation index system accurately reflects teachers' digital literacy performance in real teaching contexts, providing a solid theoretical and practical foundation for assessing teacher digital literacy. It also assists in guiding teachers to enhance their digital literacy in a targeted manner to better adapt to the evolving demands of education in the digital age.

4.2. Comprehensive Assessment of Index System Reliability and Validity

1) Reliability Analysis Ensures Measurement Stability: Reliability is a key indicator of the reliability of the index system. In this study, both exploratory and confirmatory factor analyses were conducted to verify the reliability of the index system from multiple perspectives. In exploratory factor analysis, the indicators of each dimension exhibited high loadings on their respective factors, indicating strong stability in measuring the corresponding dimensions. In confirmatory factor analysis, standardized factor loadings (most greater than 0.6) and composite reliability (CR) values (e.g., the CR value for the digital security competency dimension was 0.835) further demonstrate that the measurement results of each dimension within the index system have high reliability, enabling a stable reflection of students' perceptions of teacher digital literacy and reducing the impact of measurement errors on research outcomes.

2) Validity Analysis Confirms Indicator Effectiveness: Validity analysis is used to examine whether the index system accurately measures the intended concepts. This study comprehensively verified the validity of the index system through various methods. The clear presentation of factor structures in exploratory factor analysis preliminarily confirms the structural validity of the index system, with indicators reasonably distributed across the expected factors, consistent with theoretical assumptions, indicating that the system can effectively measure different aspects of teacher digital literacy. Confirmatory factor analysis provided a more precise assessment of structural validity through model fit

indices, all of which met acceptable standards, demonstrating a high degree of fit between the hypothesized model and empirical data, further confirming that the index system possesses good structural validity and convergent validity. Additionally, the construction of the index system referenced a substantial amount of relevant literature and incorporated the opinions of education experts and actual teaching conditions, ensuring content validity, allowing the indicators to comprehensively and accurately reflect the connotations and extensions of teacher digital literacy.

4.3. Important Guidance for Educational Practice

1) Supporting Teacher Professional Development: The evaluation index system constructed in this study provides teachers with a clear self-assessment framework, allowing them to identify their strengths and weaknesses in various dimensions of digital literacy based on student feedback. For example, if a teacher scores low on digital teaching interaction capability, they can enhance this area by improving their skills in using online interactive tools and optimizing interaction strategies. Educational institutions can also design personalized training programs based on this index system, offering targeted training content for teachers' varying needs across different dimensions of digital literacy, such as conducting specialized training for teachers who are weak in utilizing digital teaching resources, thereby effectively promoting the overall enhancement of teacher digital literacy and advancing their professional development to new heights.

2) Optimizing Teaching Processes and Enhancing Quality: Schools and teachers can utilize this index system to regularly collect data on students' perceptions of teacher digital literacy and use this information to continuously optimize teaching processes. During the lesson design phase, referencing the indicators related to digital teaching design capability enables teachers to better utilize digital technology to create teaching activities that meet students' needs and learning styles, such as developing personalized learning paths based on student data analysis (refer to the personalized learning path planning indicator). In classroom teaching, based on the digital teaching interaction capability indicators, teachers can increase the diversity and effectiveness of interactive elements, such as conducting group discussions on online platforms (refer to the classroom interaction diversity indicator), thereby enhancing student participation and learning motivation. In the teaching evaluation phase, by using indicators from the digital teaching evaluation capability dimension, teachers can more scientifically apply formative and summative evaluation methods, promptly adjust teaching strategies, and thereby improve teaching quality, ultimately providing better educational services to students.

3) Providing Evidence for Education Policy Formulation: The evaluation index system for teacher digital literacy based on student perceptions offers policymakers a perspective and data support directly from the beneficiaries of educational services (students). Policymakers can use the insights and demands reflected in this index system to formulate more scientifically sound and targeted policies for the digital development of education. For instance, if it is found that teachers generally have weak digital security capabilities, policies may prioritize strengthening teacher training in digital security and investing in related resources, thereby promoting schools to enhance their digital security management systems. Additionally, this index system aids in the rational allocation of educational resources, ensuring that resources are prioritized for improving teacher digital literacy in critical areas, thereby fostering comprehensive and in-depth development of the digital transformation of education and ensuring that education policies better serve educational practice, enhancing overall educational effectiveness.

5. Limitations of the Study and Future Research Directions

5.1. Limitations Analysis

Although the sample in this study includes students from various regions, schools, grades, and majors to some extent, it still has limitations. The sample is primarily concentrated in a limited geographical area, which may not fully represent students' perceptions of teacher digital literacy across different educational levels and cultural backgrounds nationwide. Therefore, the breadth and representativeness of the sample need further expansion. Additionally, although the questionnaire design underwent multiple rounds of optimization, the complexity and dynamism of the concept of teacher digital literacy may mean that some key indicators are not fully covered or that certain indicators are not expressed with sufficient precision. This could potentially impact the comprehensiveness and accuracy of the evaluation.

5.2. Future Research Prospects

To address the limitations of the sample, future research should further expand the sample range to include a broader geographical area, different types of schools (including schools in remote areas and special education schools), and a wider range of student groups (such as students of different age groups and educational stages). By validating and refining the index system with a more representative sample, its universality and scientific rigor can be enhanced. Furthermore, researchers could explore the impact mechanisms of various background factors (such as school type, subject differences, and individual student characteristics) on students' perceptions of teacher digital literacy. This would provide a deeper theoretical basis for more accurately enhancing teacher digital literacy.

References

[1] Li, M., & Yu, Z. (2022). Teachers' satisfaction, role, and digital literacy during the COVID-19 pandemic. Sustainability, 14(3), 1121.

[2] Potyrała, K., & Tomczyk, Ł. (2021). Teachers in the lifelong learning process: examples of digital literacy. Journal of Education for Teaching, 47(2), 255-273.

[3] Sánchez-Cruzado, C., Santiago Campión, R., & Sánchez-Compaña, M. T. (2021). Teacher digital literacy: The indisputable challenge after COVID-19. Sustainability, 13(4), 1858.

[4] Widana, I. W. (2020, July). The effect of digital literacy on the ability of teachers to develop HOTS-based assessment. In Journal of Physics: Conference Series (Vol. 1503, No. 1, p. 012045). IOP Publishing.

[5] Nguyen, L. A. T., & Habók, A. (2024). Tools for assessing teacher digital literacy: a review. Journal of Computers in Education, 11(1), 305-346.

[6] Li, M., & Yu, Z. (2022). Teachers' satisfaction, role, and digital literacy during the COVID-19 pandemic. Sustainability, 14(3), 1121.

[7] Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. Educational technology research and development, 68(5), 2449-2472.

[8] Hair J F J, Anderson R E J, Tatham R L, et al. MultivariateData Analysis, 5th Ed[M]:All Publications, 1998.

[9] Segars A H. Assessing the Unidimensionality of Measurement. AParadigm and Illustration within the Context of Information SystemsResearch[J]. Omega, 1997, 25 (1) :107-121.

[10] Hooper D, Coughlan J, Mullen M R. Structural Equation Model-ling Guidelines for Determining Model Fit[J]. Electronic Journal onBusiness Research Methods, 2008, 6 (1) :141-146.