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Research on the Current Status and Improvement Strategies of Digital Literacy Among Rural Kindergarten Teachers

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Abstract: ***With the rapid development of information technology, the field of education is undergoing profound digital transformation. In this context, the state has successively promulgated policy documents such as the "Plan for Strengthening Teachers in Basic Education in the New Era," designating teachers' digital literacy as a key area for development. This study investigated the current status of digital literacy among rural kindergarten teachers across five dimensions: digital awareness, digital knowledge, digital skills, digital application, and digital responsibility. The research findings indicate that the overall digital literacy of rural kindergarten teachers is at a medium-to-low level, with uneven development across dimensions. Specifically, the digital responsibility dimension scored the highest, while the digital skills dimension scored the lowest. To enhance the digital literacy of rural kindergarten teachers, it is imperative to transform their perceptions of digital teaching, strengthen their acquisition of digital knowledge and skills, improve digital hardware and software infrastructure, establish a sound evaluation mechanism for rural teachers' digital literacy, and increase investment in digital kindergartens to build open and shared kindergarten platforms.***

Keywords: Rural, Digital Literacy, Professional Development, Kindergarten Teacher**.**

1. Introduction

In 2020, the research report "Digital Transformation of Education: Connecting Schools, Empowering Students," jointly released by UNESCO, the International Telecommunication Union, and UNICEF, highlighted that in the context of rapid information technology development, traditional teaching modalities and classroom structures urgently require innovation. This report systematically elaborated on the specific requirements for digital transformation from three dimensions: teaching subjects (teachers and students) and teaching objects (teaching content), particularly emphasizing the critical role of digital technology tools in promoting pedagogical model changes. Concurrently, the European Commission's "Digital Education Action Plan (2021-2027)" issued in the same year explicitly identified "building a high-quality digital education ecosystem" and "strengthening digital capacity building to promote the transformation process" as two core development strategies [1]. These international policy initiatives provide an important theoretical framework and practical guidance for the global digital transformation of education.

The "Key Work Points of the Ministry of Education in 2022" document, released in China, also clearly outlined strategic measures for implementing educational digitalization. Subsequently, the "Key Work Points of the Department of Higher Education, Ministry of Education in 2022" was officially released, emphasizing the comprehensive promotion of the digitalization process in higher education teaching and the further improvement of the digital teaching system in higher education. This clearly indicates that China has entered a new stage of digital transformation in education, and the global digitalization of education and teaching is an irreversible fact. Enhancing the digital literacy of kindergarten teachers and promoting the digital transformation of education have become key directions for the current development of the education sector.

2. Research Design

2.1 Research Subjects

This study employed a combination of on-site and online distribution methods for the survey questionnaires. The paper-based and electronic questionnaires were identical in content, differing only in their completion format. A total of 230 questionnaires were distributed, with 220 returned, yielding a return rate of 95.7%. The returned questionnaires were screened based on the following principles for invalidity: first, contradictory answers; second, five consecutive identical answers; third, the number of selected answers did not meet the question requirements, such as selecting more than one option for a single-choice question. If any of the above issues were present in a returned questionnaire, it was deemed invalid. After screening and removing 12 invalid questionnaires, 208 valid questionnaires were obtained, resulting in an effective response rate of 94.5%.

Table 1: Basic Information Statistics of Survey Subjects

Sample Characteristics	Classification	Number of People	Percentage (%)
Gender	Male	4	1.92
	Female	204	98.08
Age	Under 25 years old	36	17.31
	25-35 years old	99	47.60
	36-46 years old	47	22.60
	Over 46 years old	26	12.49
Highest Education	High School or Technical Secondary School	8	3.8
	Junior College	76	36.54
	Bachelor's Degree	124	59.66
	Postgraduate	0	0
Major of Highest	Early Childhood Education Related	160	76.92

Education	Other Normal University Majors	29	13.94
	Non-Normal University Majors	19	9.14
Studied Computer Related Major	Yes	154	74.04
	No	54	25.96
Teaching Experience	Within 3 years	53	25.48
	3-10 years	91	43.75
	11-15 years	43	20.67
	Over 15 years	21	10.1
Professional Title	Undetermined	56	26.92
	Level 2	109	52.40
	Level 1	41	19.71
	Senior and above	2	9.7
Kindergarten Type	Public Kindergarten	122	58.65
	Private Kindergarten	63	30.29
	New Public Kindergarten	23	11.06
	Undetermined Kindergarten	68	32.69
Kindergarten Level	Provincial Level 1 Kindergarten	78	37.5
	Provincial Level 2 Kindergarten	62	29.81

2.2 Research Tools

2.2.1 Reliability Test.

To ensure the reliability, consistency, and stability of the survey questionnaire results, SPSS27 was first used to conduct reliability tests on the scale data in the questionnaire and the data from the five dimensions of teachers' digital awareness, digital knowledge, digital skills, digital application, and digital responsibility. Cronbach's Alpha (α) value was used as a reference, and the test results are detailed in Table 2.

As shown in the Table 2, the overall reliability coefficient α value of the scale in the questionnaire is 0.919, and the reliability coefficients α values for the five dimensions of digital awareness, digital knowledge, digital skills, digital application, and digital responsibility are 0.761, 0.903, 0.900, 0.895, and 0.903, respectively. The overall reliability of the scale and the reliability coefficients α values for each dimension are all greater than 0.7, indicating good reliability and strong stability.

Table 2: Reliability Analysis of the Survey on the Current Status of Digital Literacy Among Rural Kindergarten Teachers

	Cronbach's Alpha	Number of Items
Digital Literacy	.919	32
Digital Awareness	.761	6
Digital Knowledge	.903	3
Digital Skills	.900	6
Digital Application	.895	11
Digital Responsibility	.903	6

2.2.2 Validity Test

The study used KMO and Bartlett's sphericity tests to analyze the validity of the scales in the questionnaire. The analysis results are shown in the table.

Table 3: Overall KMO and Bartlett's Sphericity Test Results for the Scale

KMO Sampling Adequacy Measure		.941
Bartlett's Sphericity Test	Approximate Chi-Square	6006.409
	Degrees of Freedom	496
	Significance	.000

From Table 3, it can be seen that the overall KMO value of the scale is 0.941, which is greater than 0.6, and the significance probability value is 0.000, which is less than 0.05. Both meet the standards, making it suitable for factor analysis.

Furthermore, principal component analysis was used to obtain the variance explained rate to determine the authenticity of the scale analysis results. The variance explained rate of the test is detailed in Table 4.

Table 4: Variance Explained Rate of the Scale

Component	Total	Initial eigenvalue variance percentage	% of Variance	Total	Extracted loadings squared and percentage of variance	% of Variance	Total	Rotated loadings and percentage of square variance	% of Variance
1	15.632	48.851	48.851	15.632	48.851	48.851	7.626	23.833	23.833
2	3.111	9.723	58.574	3.111	9.723	58.574	4.863	15.196	39.029
3	1.664	5.201	63.775	1.664	5.201	63.775	4.434	13.856	52.885
4	1.298	4.056	67.831	1.298	4.056	67.831	3.977	12.427	65.311
5	1.072	3.350	71.181	1.072	3.350	71.181	1.878	5.870	71.181

From Table 4, it can be seen that a total of 5 factors were extracted from the scale using principal component analysis, and their eigenvalues are all greater than 1. The variance explained rates for these 5 factors are 23.833%, 15.196%, 13.856%, 12.427%, and 5.870%, respectively. The cumulative variance explained rate after rotation is 69.218% > 60%, indicating that the factor analysis results of this questionnaire are reliable.

3. Research Results

3.1 Overall Digital Literacy Level of Rural Kindergarten Teachers

Statistical results show that the average digital literacy score of rural kindergarten teachers is 2.007, just reaching a medium level. From the perspective of each dimension, rural kindergarten teachers show good digital responsibility, while the remaining dimensions are at a qualified level, not reaching a medium level. Among them, digital skills have the lowest average score. The average scores of the five dimensions from highest to lowest are: digital responsibility (3.466), digital application (1.981), digital awareness (1.783), digital knowledge (1.582), and digital skills (1.222). Overall, the digital literacy of rural kindergarten teachers urgently needs improvement.

Table 5: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers

	Mean	Standard Deviation	Variance
Digital Literacy	2.007	.265	.070
Digital Awareness	1.783	.241	.058
Digital Knowledge	1.582	.592	.350
Digital Skills	1.222	.211	.045
Digital Application	1.981	.266	.071
Digital Responsibility	3.466	.474	.224

3.2 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers

3.2.1 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Gende

As shown in Table 6, there is no significant difference in the average scores of male and female teachers across all dimensions, indicating that the digital literacy levels of male and female rural kindergarten teachers are comparable, with no significant gender advantage.

Table 6: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Genders

	Male (N=4)	Female (N=205)
Digital Awareness	1.865	1.781
Digital Knowledge	1.268	1.5882
Digital Skills	1.292	1.220
Digital Application	1.976	1.982
Digital Responsibility	3.292	3.470

3.2.2 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Age.

As shown in Table 7, rural kindergarten teachers of different ages exhibit varying levels across dimensions. Teachers aged 25-35 years old have the highest digital literacy levels across all dimensions, while teachers over 46 years old have the lowest. Specifically, young teachers under 25 years old scored higher in digital skills, digital application, and digital responsibility than teachers over 36 years old, while teachers aged 36-46 years old scored higher in digital awareness and digital knowledge than teachers under 25 years old.

Table 7: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Ages

	Under 25 years old (N=36)	25-35 years old (N=99)	36-46 years old (N=47)	Over 46 years old (N=26)
Digital Awareness	1.718	1.824	1.795	1.692
Digital Knowledge	1.564	1.626	1.603	1.401
Digital Skills	1.251	1.268	1.180	1.082
Digital Application	2.015	2.047	1.916	1.806
Digital Responsibility	3.495	3.512	3.486	3.218

3.2.3 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Educational Background.

As shown in Table 8, rural kindergarten teachers with different educational backgrounds generally show a trend of higher digital literacy with higher educational attainment, with junior college-educated teachers having slightly higher digital literacy than bachelor's degree-educated teachers. In terms of digital awareness, junior college-educated teachers had the highest average score (1.798), while high school or technical secondary school-educated teachers had the lowest (1.433); in terms of digital knowledge, junior college-educated teachers had the highest average score (1.683), while high school or technical secondary school-educated teachers had the lowest (1.080); in terms of digital skills, bachelor's degree-educated teachers had the highest average score (1.235), while high school or technical secondary school-educated teachers had the lowest (1.026); in terms of digital application, junior college-educated teachers had the highest average score (2.000), while high school or technical secondary school-educated teachers had the lowest (1.732); in terms of digital responsibility, junior college-educated teachers had the highest average score (3.485), while high school or technical secondary school-educated teachers had the lowest (3.042).

Table 8: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Educational Backgrounds

	High School or Technical Secondary School (N=8)	Junior College (N=76)	Bachelor's Degree (N=124)
Digital Awareness	1.433	1.798	1.796
Digital Knowledge	1.080	1.683	1.552
Digital Skills	1.026	1.221	1.235
Digital Application	1.732	2.000	1.986
Digital Responsibility	3.042	3.485	3.483

3.2.4 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Major.

As shown in Table 9, rural kindergarten teachers with different majors exhibit varying levels of digital literacy across dimensions. Teachers with other normal university majors have the highest digital literacy, followed by early childhood education majors, and non-normal university majors have the lowest.

Table 9: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Majors

	Early Childhood Education Related Major (N=160)	Other Normal University Majors (N=29)	Non-Normal University Majors (N=19)
Digital Awareness	1.789	1.804	1.692
Digital Knowledge	1.522	2.121	1.267
Digital Skills	1.216	1.279	1.180
Digital Application	1.965	2.099	1.940
Digital Responsibility	3.442	3.586	3.491

3.2.5 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Teaching Experience.

Table 10: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Teaching Experiences

	Within 3 years (N=53)	3-10 years (N=91)	10-15 years (N=43)	Over 15 years (N=21)
Digital Awareness	1.812	1.823	1.714	1.696

Digital Knowledge	1.622	1.867	1.332	1.201
Digital Skills	1.285	1.285	1.112	1.012
Digital Application	2.049	2.082	1.846	1.712
Digital Responsibility	3.487	3.591	3.357	3.286

As shown in Table 10, rural kindergarten teachers with different teaching experiences exhibit varying levels of digital literacy across dimensions. Overall, rural kindergarten teachers with shorter teaching experience have higher digital literacy, with teachers having 3-10 years of teaching experience showing the highest digital literacy. The digital literacy levels from highest to lowest are: teachers with 3-10 years of experience, teachers within 3 years of experience, teachers with 10-15 years of experience, and teachers with over 15 years of experience. This analysis result is similar to the analysis result of teacher age differences, indirectly indicating the internal consistency of the research data.

3.2.6 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Professional Title.

As shown in Table 11, rural kindergarten teachers with different professional titles exhibit varying levels of digital literacy across dimensions. Relatively, teachers with higher professional titles have higher digital literacy.

Table 11: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Professional Titles

	Undetermined (N=56)	Level 2 (N=109)	Level 1 (N=41)	Senior and above (N=2)
Digital Awareness	1.707	1.802	1.837	1.692
Digital Knowledge	1.387	1.677	1.571	2.107
Digital Skills	1.179	1.231	1.256	1.188
Digital Application	1.900	1.985	2.086	1.929
Digital Responsibility	3.381	3.462	3.610	3.167

3.2.7 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Kindergarten Type.

As shown in Table 12, kindergarten teachers with different professional titles exhibit varying levels of digital literacy across dimensions. Relatively, teachers in rural public kindergartens have higher digital literacy than teachers in rural private kindergartens, with teachers in new public kindergartens having higher digital literacy than those in ordinary public kindergartens. This is related to the employment requirements, work requirements, training mechanisms, and digital teaching environment of public kindergarten teachers.

Table 12: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Kindergarten Types

	Public Kindergarten (N=122)	Private Kindergarten (N=63)	New Public Kindergarten (N=23)
Digital Awareness	1.780	1.761	1.856
Digital Knowledge	1.538	1.607	1.752
Digital Skills	1.222	1.169	1.368
Digital Application	1.989	1.933	2.077
Digital Responsibility	3.485	3.352	3.681

3.2.8 Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Kindergarten Level.

As shown in Table 13, the higher the level of the rural kindergarten where the teacher is located, the higher their digital literacy. Level 1 kindergartens have the highest average scores in all five dimensions: digital awareness, digital knowledge, digital skills, digital application, and digital responsibility. Level 2 kindergartens are slightly lower than unrated kindergartens in the digital responsibility dimension, but higher than unrated kindergartens in all other dimensions.

Table 13: Descriptive Analysis of Digital Literacy Among Rural Kindergarten Teachers by Different Kindergarten Levels

	Unrated Kindergarten (N=68)	Provincial Level 2 Kindergarten (N=78)	Provincial Level 1 Kindergarten (N=62)
Digital Awareness	1.734	1.773	1.847
Digital Knowledge	1.330	1.592	1.847
Digital Skills	1.177	1.208	1.288
Digital Application	1.884	1.964	2.111
Digital Responsibility	3.434	3.400	3.586

4. Problems in Digital Literacy Among Rural Kindergarten Teachers

4.1 Digital Awareness Needs Improvement

Correct digital understanding is the foundation and prerequisite for teachers to adapt to the digital transformation of education in the digital age. Teachers' digital understanding not only affects the transformation of their teaching philosophies, the innovation of teaching methods, and the achievement of teaching effectiveness, but also influences the digital literacy development of young children. However, rural kindergarten teachers have insufficient understanding of the importance of digital technology in early childhood education. The survey results show that although most teachers recognize the promoting role of digital technology in kindergarten educational activities, home-school cooperation, and personal professional development, their value recognition of digital technology is not high. Only about 40% of teachers "strongly" agree, while more than half of teachers "relatively" agree, and a small number of kindergarten teachers do not agree with the value of digital technology in early childhood education and teaching. More than half of the teachers felt that the integration of digital technology and early childhood education brought the challenge of "transforming educational and teaching concepts," and proposed training demands for "improving the understanding of digital transformation in early childhood education," indicating that teachers' digital understanding still has room for improvement.

4.2 Digital Knowledge Needs Enhancement

Digital knowledge is a prerequisite for teachers to carry out digital teaching. The survey found that rural kindergarten teachers' digital knowledge is at an average level. Most teachers adopt relatively simple ways to acquire digital teaching resources, mainly by downloading from the internet or using resources that come with software. A small number of rural kindergarten teachers still believe that they have not mastered the channels for acquiring kindergarten digital teaching resources, are unfamiliar with the theories and methods of kindergarten digital teaching design, and do not know how to integrate digital technology into kindergarten teaching activities.

4.3 Digital Skills Need Strengthening

Digital skills directly affect the effectiveness of digital teaching. The survey shows that the digital teaching resource editing tools used by rural kindergarten teachers are relatively limited. Most teachers are only proficient in using 2 types of text editing tools, audio editing tools, and video editing tools, and mainly use easy-to-learn and easy-to-operate editing tools such as WPS and CapCut for simple editing processes like screenshots, screen recording, and format conversion of teaching resources. They lack proficiency in professional editing tools such as Photoshop and Premiere Pro. 31.2% of teachers cannot create micro-lessons suitable for young children, and over 60% of teachers hope to improve their digital teaching resource creation, processing, and digital technology integration capabilities, ranking first among all training demands, indicating that teachers recognize that their digital teaching resource development capabilities need to be strengthened.

4.4 Digital Application Needs Improvement

Conducting digital teaching activities is crucial for improving teaching effectiveness, promoting educational innovation, cultivating young children's digital literacy, promoting educational equity, and advancing the digital transformation of early childhood education. However, rural kindergarten teachers lack both the motivation and ability to conduct digital teaching. The survey found that the frequency of digital teaching activities carried out by kindergarten teachers is not high, with only 3.4% of teachers conducting them daily, and most teachers conducting digital teaching less than once a week. The insufficient digital technology integration capability of early childhood teachers leads to a lack of in-depth exploration and utilization of the value of digital technology in teaching activities. Digital teaching is simply transformed into using PPT as an introduction to teaching activities to attract children's attention and stimulate learning interest, or playing videos during daily activity transitions. Educational informatization theory points out that educational informatization is not a simple superposition of digital technology and teaching, but an organic integration, emphasizing design, application, and innovation.

4.5 Digital Responsibility Needs Reinforcement

The internet is not beyond the law; adhering to legal and ethical norms is a requirement and bottom line for using digital technology. The survey found that the vast majority of rural kindergarten teachers can set an example and consciously regulate their online behavior. However, when citing others' research results or digital teaching resources, they often overlook the protection of intellectual property rights. According to the survey statistics, only about 37.5% of teachers are fully able to "cite the source when quoting materials obtained from the internet or other channels." Some teachers even deliberately remove source identifiers from images and other resources, subjectively believing that since they are shared on the internet, they are for public use and do not need to be cited.

5. Research Reflection

5.1 Transform Digital Teaching Concepts and Strengthen the Learning of Digital Knowledge and Skills

As enlighteners of children's intelligence, leaders of their growth, and cultivators of their habits, kindergarten teachers should realize that their digital literacy is not only related to personal development but also to the development of young children and early childhood education. They should face changes with a positive and open attitude, actively break free from the shackles of old educational and teaching thinking, recognize the important role of digital technology in educational and teaching activities, home-school cooperation, and professional development, develop a high sense of identity with the value of digital technology, step out of their current comfort zone, actively adapt to the educational changes brought by the development of the times, and consciously take on the important task of cultivating young children's digital literacy.

With the development of the digital age, digital technology is widely used in education and teaching. The continuous updating of digital knowledge and skills puts forward new requirements for teachers' digital literacy. Teachers can only meet the needs of digital education development by timely mastering dynamically changing digital knowledge and improving the use of digital technology. Although kindergarten teachers have entered the working stage from the school learning stage, it does not mean that they can stop learning and stagnate. The mastery of knowledge and technology is the foundation and key to practical application. As stated in "Xue Ji" (Record of Learning): "Though there is a way, if one does not learn, one does not know its goodness; therefore, only after learning does one realize one's shortcomings, and only after realizing one's shortcomings can one reflect on oneself." Constant learning is necessary to realize one's shortcomings. Kindergarten teachers should recognize the problems in their basic digital technology knowledge and skills, establish a lifelong learning awareness, and adapt to the new requirements for knowledge and skill improvement brought about by social changes through lifelong learning [2]. First, they can start with their own needs and interests, make reasonable use of fragmented time, carry out ubiquitous learning, widely and deeply understand the connotations, functions, and problem-solving procedures and methods of cutting-edge technologies such as multimedia, artificial intelligence, and virtual reality, and continuously pay attention to the development trends of digital technology, constantly update and accumulate new knowledge and technologies, develop regular learning habits, and make up for the shortcomings in digital technology knowledge. Second,

they can practice operating digital equipment such as electronic whiteboards, integrated machines, and projectors in their spare time, and independently learn how to use text, audio, and video editing software through granular teaching resources such as short teaching videos, master more functions of software and equipment, and try to process and produce micro-lessons, short videos, animations, etc., according to teaching needs, gradually improving their digital technology skills.

5.2 Improve Digital Hardware and Software Facilities and Establish a Sound Evaluation Mechanism for Rural Teachers' Digital Literacy

Digital infrastructure is the prerequisite for cultivating and enhancing teachers' digital literacy and the material guarantee for combining teachers' digital literacy with teaching practice. According to on-site surveys, rural kindergartens have incomplete digital teaching infrastructure and insufficient digital software resources. Such teaching conditions are not conducive to the cultivation of digital literacy among rural kindergarten teachers and hinder the development of digital education.

Leveraging the implementation of the national "Digital Rural Development Strategy Outline" [3], schools should increase investment in digital hardware facilities, update old equipment, popularize smart campus networks, smart libraries, and smart academic affairs systems, and build digital smart campuses. At the same time, kindergartens should introduce social capital and contact enterprises or institutions with rich teaching resources to assist in the construction of digital infrastructure in rural kindergartens. In addition, efforts should be intensified to maintain and inspect digital equipment, with professional personnel regularly checking digital basic equipment to ensure its normal use. Schools should also cultivate the equipment protection awareness of faculty, staff, and students, and report problems for repair in a timely manner to ensure the normal operation of digital teaching equipment. The improvement of digital literacy among rural kindergarten teachers is a long and arduous task that requires continuous efforts. In this process, schools need to build a sound evaluation mechanism to provide continuous support and assistance. Therefore, rural kindergartens should improve the evaluation mechanism for teachers' digital literacy to play a supervisory and incentive role, thereby mobilizing the enthusiasm of kindergarten teachers in cultivating digital literacy.

5.3 Increase Investment in Digital Kindergartens and Build Open and Shared Kindergarten Platforms

Due to the scattered nature of rural kindergartens, poor inter-kindergarten communication, limited number of kindergarten teachers, and limited teaching levels, internal training can hardly meet the digital teaching needs of teachers. Therefore, education authorities should establish urban and rural teacher digital training platforms. Specific measures include: First, make full use of various resources provided by master teacher studios to enable teachers to improve their professional abilities through master teacher research, master teacher classrooms, and master teacher evaluations. Based on the "five-level linkage" professional development system [4] proposed in the "Opinions on Strengthening the Construction of Rural Teacher Teams in the New Era" (2020) by the Ministry of Education and other six departments, implement the "Dandelion 2.0" plan at the achievement dissemination level. This plan innovatively adopts the "1+N³" collaborative development model (i.e., 1 master teacher studio links N rural kindergartens, N types of curriculum resources, and N research topics), incorporating teachers' independently developed rural-themed electronic picture books, seasonal micro-courses, and rural STEAM curriculum packages into the scope of professional development evaluation, ultimately forming a teacher professional development paradigm with rural agricultural characteristics. Second, encourage teachers to widely participate in community discussions and online training activities on different themes, and improve teaching methods and optimize teaching content through communication and sharing. In addition, when encountering problems in digital teaching, rural teachers can promptly seek help from urban teachers or relevant technical personnel to ensure the effective implementation of digital teaching and improve teachers' digital teaching abilities.

Compared with urban schools, rural schools lack digital resources, making it difficult for teachers to find suitable teaching resources. There is a lack of communication and exchange among rural schools, which may lead to redundant teaching resource construction, wasting teachers' time and energy. Therefore, rural kindergarten clusters can be established to build geographically contiguous kindergarten development communities. Specific measures include: establishing inter-kindergarten teacher mobile workstations, implementing distributed storage and intelligent push of digital education resources, and building a kindergarten-family-community education data center. In particular, a multi-dimensional support model for teacher professional development needs to be established, comprehensively considering parameters such as age, educational background, and position level, and designing an intergenerational collaborative smart teaching and research model—that is, building a complementary learning community of "young teachers at the technical execution level + senior teachers at the teaching decision-making level" to achieve intergenerational transmission of digital education wisdom through cognitive apprenticeship.

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