

ENHANCEMENT OF TEACHERS' DIGITAL LITERACY IN THE TRANSFORMATION OF EDUCATIONAL MANAGEMENT OF MINGDE SENIOR HIGH SCHOOL IN KAILI CITY

Wenyue Deng, Suttipong Boonphadung

*¹Student of Master in Education Administration, Graduate School, Suan Sunandha Rajabhat
University, Bangkok, Thailand*

Email: s67561802118@ssru.ac.th

²Education Administration, Graduate School, Suan Sunandha Rajabhat University, Bangkok, Thailand

Email: suttipong.bo@ssru.ac.th

ABSTRACT

This study examines the current state of digital literacy among teachers at Mingde High School in Kaili City, Guizhou Province, China, and its influencing factors, against the backdrop of educational management transformation. Employing a mixed-methods design combining quantitative questionnaires and qualitative in-depth interviews, data were collected from 310 teachers and administrators across three comparable high schools. The study focuses on five core dimensions: Digital Basic skills, Digital teaching integration ability, Digital educational management ability, Digital development attitudes and willingness, and Support conditions and development needs.

The research findings reveal a structural characteristic: while teachers' overall digital literacy remains at a moderate level, it exhibits significant differentiation—high attitudes, moderate capabilities, and low support. Further analysis indicates that personal factors such as gender, age, and years of teaching experience significantly influence the development of teachers' digital literacy, with middle-aged teachers aged 36-45 facing particularly pronounced challenges. Based on a theoretical framework driven by management transformation—capability development response—mechanism optimization feedback, this study proposes targeted improvement strategies from a management reform perspective.

Keywords: Digital literacy; Educational management transformation; High school teachers; Mixed research methods; Education in ethnic regions

INTRODUCTION

The digital transformation of education has become a global trend, profoundly influencing the reform and development of educational systems worldwide. China's national strategy document, 'Education Modernization 2035,' explicitly calls for accelerating educational reform in the information age and building a digital, personalized lifelong learning system. The report of the 20th National Congress of the Communist Party of China further designated advancing education digitization as a key strategic task. Against this macro-policy backdrop, teachers—as the core agents of educational

transformation—play a pivotal role, with their digital literacy levels directly impacting the effectiveness of education's digital transformation.

However, current research exhibits two distinct limitations. First, most studies focus on developed regions and high-performing schools, with significantly less attention given to county-level high schools in underdeveloped ethnic areas. Second, existing research predominantly treats digital literacy as an individual teacher competency, rarely examining it from the holistic perspective of school management system transformation. This research orientation overlooks a critical fact: the development of teachers' digital literacy is profoundly influenced by management factors such as school support conditions, training mechanisms, organizational culture, and evaluation orientations.

Mingde High School, located in Kaili City—the capital of Qiandongnan Miao and Dong Autonomous Prefecture—vividly illustrates the typical challenges faced by high schools in underdeveloped ethnic minority regions. Like schools across the province, it grapples with inadequate infrastructure, limited training resources, and cultural adaptation difficulties. This study uses the school as a primary case to fill existing research gaps, systematically examining the current state of teachers' digital literacy, influencing factors, and pathways for improvement from the perspective of educational management transformation.

OBJECTIVES

Based on the aforementioned theoretical framework, this study establishes two core objectives:

- 1: To study the level of digital literacy among teachers at Mingde Senior High School in Kaili City.
- 2: To study Teachers' Digital Literacy classify by Personal Factors.

METHODOLOGY

3.1 Research Design

This study employs a mixed-methods approach, specifically an interpretive sequential design. The first phase employed quantitative methods (questionnaire surveys) to collect measurable data, describing the current state of teachers' digital literacy and analyzing disparities among different groups. The second phase utilized qualitative methods (in-depth interviews) to interpret quantitative findings, exploring underlying causes and mechanisms behind the data.

RESULT

4.1 Overall Status of Teachers' Digital Literacy

Regarding Research Objective 1, which investigates the current level of digital literacy among teachers at Mingde Middle School in Kaili City, the questionnaire survey results indicate that teachers' overall digital literacy is at a moderate level. More significantly, the scores across the five dimensions

reveal a pronounced structural divergence, highlighting the core contradictions in the development of teachers' digital literacy.

Table 1 Analysis of Mean and Standard Deviation of Teachers' Digital Literacy Dimensions (n=310)

Dimensions	$\bar{x}$	S.D.	Interpretation
1. Digital Basic Skills	3.59	0.70	Moderate Level
2. Digital Teaching Integration Ability	3.44	0.73	Moderate Level
3. Digital Educational Management Ability	3.51	0.69	Moderate Level
4. Digital Development Attitude and Willingness	3.85	0.64	High Level
5. Support Conditions, Difficulties and Development Needs	3.31	0.45	Moderate Level
Total	3.54	0.57	Moderate Level

Note: Interpretation criteria: 1.00-2.33 = Low Level; 2.34-3.66 = Moderate Level; 3.67-5.00 = High Level

A fundamental pattern characterized by leading attitudes and moderate capabilities. Among the five dimensions, digital development attitudes and willingness scored highest ($\bar{x}$ =3.85) and reached a high level—the only dimension achieving this distinction. This finding indicates that the teaching community holds a positive and affirming attitude toward digital development, widely recognizing the significant value of digital literacy for teaching and professional growth.

All three competency dimensions scored at an intermediate level. The scores for digital foundational skills ($\bar{x}$ =3.59), digital educational management capabilities ($\bar{x}$ =3.51), and digital teaching integration abilities ($\bar{x}$ =3.44) were comparable, all falling within the intermediate range. Teaching integration abilities received the lowest score, reflecting significant challenges teachers face in deeply integrating digital technologies with subject-specific instruction.

The Support Conditions dimension scored the lowest ($\bar{x}$ =3.31), revealing management shortcomings. Among reverse-scored barrier items, "complex operation of digital tools" received the lowest score, while "insufficient learning time due to excessive workload" exhibited the highest standard deviation. These findings suggest that the primary constraints to enhancing teachers' digital literacy stem not from attitudes or willingness, but from management-level issues.

The pathway from willingness to capability is blocked. This study identifies the core contradiction: while teachers demonstrate strong willingness to develop, the conversion of this willingness into capability is constrained by insufficient support conditions, resulting in a structural imbalance characterized by *high attitude, moderate capability, and low support*.

4.2 Analysis of the Influence of Personal Factors

To address Research Objective 2, which explores individual factors influencing the development of teachers' digital literacy, this study focused on analyzing the impact of three variables—gender, age, and years of teaching experience—to identify key groups requiring capacity development.

Table 2 Influence of Personal Factors on Teachers' Digital Literacy

Variable	Group	N	Dim1	Dim2	Dim3	Dim4	Dim5	Total	Statistic	p
Gender	Male	73	3.84	3.67	3.72	3.92	3.43	3.72	t=3.092	.002**
	Female	237	3.51	3.38	3.45	3.83	3.27	3.49		
Age	≤25	22	3.91	3.79	3.88	4.01	3.45	3.80	F=11.750	<.001***
	26-35	64	3.98	3.82	3.94	4.03	3.47	3.85		
	36-45	156	3.40	3.27	3.31	3.77	3.22	3.40		
	46-55	49	3.37	3.25	3.34	3.78	3.30	3.41		
	≥56	19	3.98	3.70	3.71	3.92	3.39	3.74		
Teaching	≤5 yrs	50	3.97	3.83	3.92	4.05	3.47	3.85	F=18.088	<.001***
Experience	6-10 yrs	53	3.74	3.59	3.75	3.96	3.35	3.68		
	11-20 yrs	166	3.34	3.22	3.25	3.70	3.20	3.34		
	≥21 yrs	41	3.91	3.69	3.76	4.11	3.51	3.79		

*Note: Dim1=Digital Basic Skills; Dim2=Digital Teaching Integration Ability; Dim3=Digital Educational Management Ability; Dim4=Digital Development Attitude and Willingness; Dim5=Support Conditions and Development Needs. *p<.05, **p<.01, ***p<.001*

Gender Differences: Male teachers scored higher overall, but no difference was found in attitudes. Independent samples t-tests revealed that male teachers scored significantly higher than female teachers on overall digital literacy and most dimensions (t=3.092, p=.002). This difference was most pronounced in the foundational skills dimension. Notably, the attitudes and willingness dimension was the only one where no significant gender difference was observed, suggesting that bridging the gender gap hinges not on altering attitudes, but on creating better learning conditions for female teachers.

Age Differences: Mid-career teachers face the greatest challenges. Single-factor ANOVA revealed significant age-related differences across all dimensions (F=11.750, p<.001). Notably, these differences exhibited a nonlinear pattern: younger teachers aged 26-35 and senior teachers aged 56 and above scored higher, while mid-career teachers aged 36-45 consistently scored lowest. This distribution—high at both ends and low in the middle—challenges the conventional perception that technical competence declines with age. Interview findings reveal that mid-career teachers are at the peak of their professional workload, juggling heavy teaching responsibilities and family obligations.

Teaching Experience Gap: The 11-20 year group represents a capability gap. The distribution mirrors age patterns ($F=18.088$, $p<.001$), showing higher scores at both ends and lower scores in the middle. The group with 11-20 years of teaching experience—the largest cohort at this school, comprising over half of the sample—scored lowest across all dimensions, representing a “capability valley.” Without effectively addressing the challenges faced by this cohort, the school’s overall digital literacy level will struggle to improve.

Implications for Managing Group Differences: This study identifies three key groups for competency enhancement: middle-aged core teachers aged 36-45 or with 11-20 years of teaching experience, female teachers, and teachers with heavy workloads. These groups share common characteristics: they possess positive attitudes but lack sufficient time and energy, facing a dilemma of *good intentions but limited capacity*.

4.3 Interview Findings: In-Depth Interpretation of Quantitative Results

In-depth interviews with five teachers corroborated and deepened the findings of the quantitative research. At the competency development level, young teachers demonstrate stronger digital tool proficiency, while middle-aged teachers cite time constraints as the primary obstacle. One veteran educator candidly remarked: “I want to learn, but managing daily teaching and classroom duties already leaves me overwhelmed—there’s simply no uninterrupted time to master new skills.”

At the management support level, interviews revealed several systemic issues: fragmented management platforms necessitate duplicate data entry; digitally-based professional development activities are perceived as overly formalistic; technical support responses are insufficiently timely. At the developmental needs level, teachers expressed clear expectations for targeted training closely integrated with subject teaching, expert guidance, inter-school exchanges, and AI application training.

Figure 1 Teachers' Digital Literacy Status: Structural Divergence Analysis

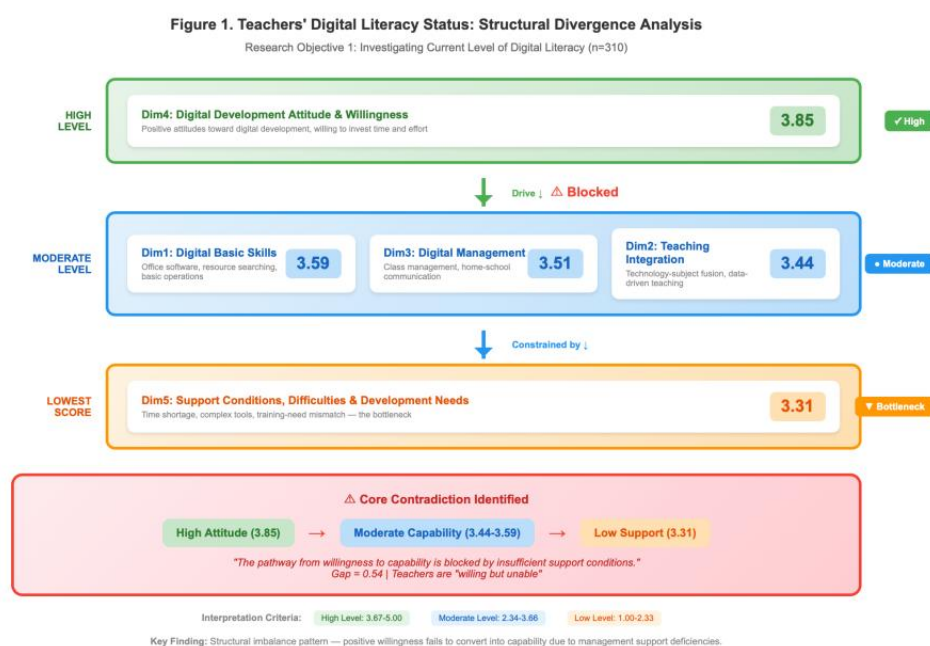
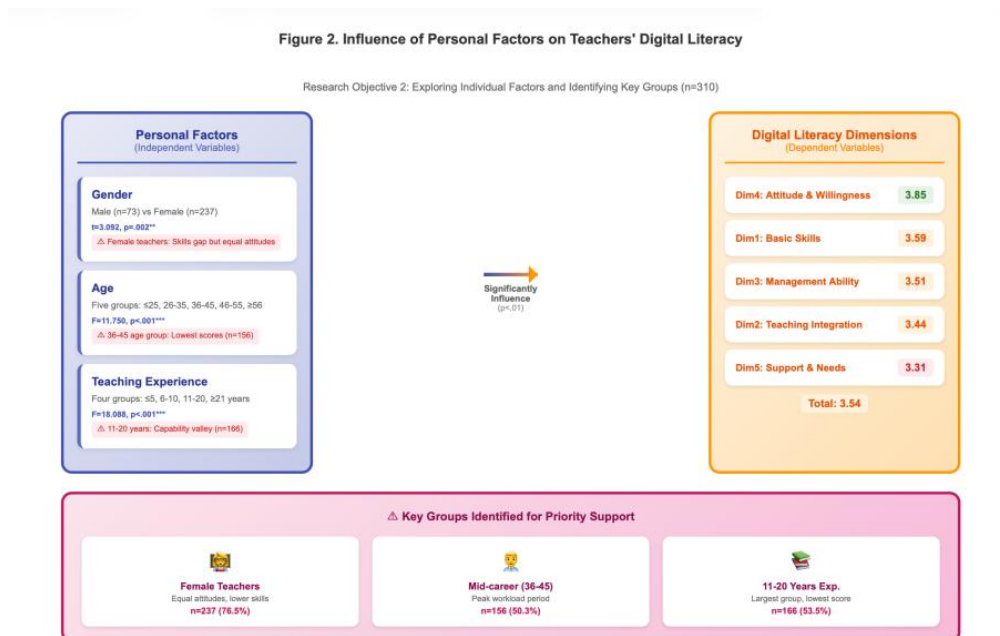


Figure 2 Influence of Personal Factors on Teachers' Digital Literacy



CONCLUSIONS AND RECOMMENDATIONS

5.1 Research Conclusions

This study validates the theoretical framework of management transformation as a driver, capability development as a response, and mechanism optimization as a feedback loop. The main conclusions are as follows:

First, teachers' digital literacy exhibits a structural imbalance characterized by high motivation, moderate competency, and low support. The primary factor constraining improvement is not lack of motivation but deficiencies in management mechanisms that block the pathway from intent to capability.

Second, the four elements of management transformation impact teacher competency development through distinct pathways. While hardware support is adequate, software conditions—including network stability, technical support responsiveness, and training quality—remain suboptimal.

Third, gender, age, and years of teaching experience significantly influence teachers' digital literacy, with middle-aged teachers aged 36-45 or those with 11-20 years of experience facing the most pronounced challenges. These group disparities stem from career development pressures and necessitate resolution through optimized management mechanisms.

5.2 Policy Recommendations

At the policy level: Regional education authorities should develop multi-year action plans for enhancing teachers' digital literacy, establish tiered competency standards across disciplines, and integrate digital literacy into the overall framework of teacher professional development.

At the training system level: Differentiated training strategies should be implemented, with a focus on covering the middle-aged teacher cohort aged 36-45. Training content must closely align with subject teaching needs, employing contextualized and hands-on training methods with flexible formats including microlearning resources.

At the support and assurance level: Priority should be given to integrating management platforms to reduce workload from duplicate data entry. A rapid-response technical support mechanism should be established, and teachers' working hours should be reasonably allocated to create conditions conducive to learning.

At the school management level: Digital literacy metrics should be integrated into teacher performance evaluations. A peer support mechanism should be established to leverage young faculty's technological expertise and senior teachers' pedagogical experience, fostering complementary strengths across generations.

At the individual teacher level: Support should be provided for educators to develop personal digital growth plans, encouraging participation in peer collaboration communities and inter-school exchange activities. Help teachers recognize that digital literacy is learnable and improvable, thereby enhancing their self-efficacy.

5.3 Research Contributions and Limitations

The theoretical contribution of this study lies in transcending the limitation of viewing digital literacy solely as an individual competency issue. It constructs an analytical framework driven by management transformation, responding through competency development, and optimized by mechanism feedback. The practical contribution provides empirical guidance for county-level high schools in underdeveloped ethnic regions. Research Limitations: This study employs a cross-sectional design. Subsequent research should adopt a longitudinal design to trace competency development trajectories and extend comparative analysis to more schools in similar regions.

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