Confidence Assessment in Implementing Personalized Learning Strategies among Primary School Teachers in Hangzhou, Zhejiang Province

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ABSTRACT

The objectives of this study were to: 1) Assess the overall level of primary school teachers' confidence in implementing personalized learning strategies in Hangzhou, Zhejiang Province; 2) Examine the relationship between teachers' digital literacy and implementation confidence; 3) Determine whether teachers' confidence differed according to selected teacher characteristics; and 4) Propose practical recommendations for policy and school improvement. A mixed-methods design was employed. Quantitative data were collected from 286 valid questionnaires distributed to teachers in 10 public and private primary schools, and qualitative data were gathered through semi-structured interviews with 15 teachers representing high, medium, and low confidence groups. The questionnaire included demographic items, 15 digital-literacy items, and 25 implementation-confidence items. Reliability and validity indicators were satisfactory (Cronbach's $\alpha = 0.945$; KMO = 0.913, $p < .001$). Quantitative data were analyzed using descriptive statistics, repeated-measures ANOVA, multiple linear regression, independent-samples t-tests, and one-way ANOVA using SPSS 26.0, while interview data were coded thematically using NVivo 12.

The findings indicated that: 1) Teachers' overall implementation confidence was at an upper-medium level (M = 3.72, S.D. = 0.58), with students' needs assessment showed the highest confidence (M = 3.85) and learning evaluation personalization showed the lowest (M = 3.58); 2) Digital literacy was significantly and positively associated with implementation confidence, and digital teaching design emerged as the strongest predictor; 3) Significant differences were found by age, teaching experience, educational background, and school nature respectively. Interview findings further showed that confidence was strengthened by peer observation, practical support, and digital pedagogical design, but constrained by assessment pressure, resource integration difficulty, and uneven organizational support; and 4) The study proposed that improving teachers' design-oriented digital competence and aligning assessment reform with personalized learning were essential for deeper implementation of personalized learning in primary schools.

Keywords: personalized learning strategies, implementation confidence, digital literacy, primary school teachers, Hangzhou

1. Introduction

High quality educational development and educational equity have become central concerns of contemporary schooling, and personalized learning has increasingly been regarded as an important strategy to respond to students' diverse readiness, interests, pace, and support needs. Unlike one-size-fits-all instruction, personalized learning emphasizes that teaching should be adjusted according to learner differences, while maintaining common curricular goals. In recent years, this orientation has been strengthened by the digital transformation of education, which has expanded access to learning data, digital platforms, and rich instructional resources.

However, the growth of digital infrastructure has not automatically led to high-quality personalized teaching. Technology can expand teachers' options, but it can also increase the complexity of lesson design, resource selection, data interpretation, and assessment. In practice, many schools are able to adopt the language of personalization faster than they are able to stabilize the daily routines required to implement it effectively. Teachers therefore occupy a pivotal position in reform by translating policy aspirations into classroom action. At the primary school level, the issue is particularly important. Younger learners need structured guidance, close feedback, and developmentally appropriate support. Personalized learning in primary schools therefore depends heavily on teachers' capacity to diagnose student needs, adapt teaching content, select suitable methods, use digital resources, and personalize evaluation. These tasks require not only professional competence, but also confidence that such work is feasible and worthwhile in real classrooms.

From the perspective of self-efficacy theory, implementation confidence functions as a task-specific judgment of capability. Teachers with stronger confidence are more likely to invest effort, persist under difficulty, and continue refining innovative practice, whereas teachers with weaker confidence may retreat to familiar whole-class methods when pressure increases. This makes implementation confidence a critical bridge between reform design and classroom enactment.

Hangzhou provides a relevant research context because it has actively promoted smart-education reform and digital transformation in basic education. Yet, even in digitally active environments, teachers may still face pressure related to assessment alignment, workload, and uneven access to support. Against this background, the present study investigated the confidence of primary school teachers in Hangzhou to implement personalized learning strategies, with particular attention to the role of digital literacy and the influence of teacher characteristics.

2. Literature Review and Research Related

2.1 Implementation Confidence and Self-Efficacy

Bandura's self-efficacy theory provides the most direct theoretical foundation for understanding teachers' implementation confidence. Self-efficacy refers to an individual's belief in the ability to organize and execute the actions required to achieve desired outcomes (Bandura, 1977, 1997). In educational contexts, teacher efficacy shapes effort, persistence, resilience, and willingness to adopt innovative practice. Personalized learning requires multiple interrelated teaching actions, including diagnosis, adaptation, design, and assessment. Confidence in these tasks can therefore be understood as a specific form of teacher self-efficacy rather than a general positive attitude.

The theory is particularly useful because it identifies four major sources of efficacy beliefs: mastery experiences, vicarious experiences, verbal persuasion, and physiological or affective states. In the digital era, mastery experiences may come from successful technology-supported differentiation, while vicarious experiences may arise through peer observation or shared lesson cases. At the same time, time pressure, technical uncertainty, and assessment demands may weaken efficacy beliefs, even when teachers support the goals of personalized learning in principle.

2.2 Personalized Learning in Digitalized Primary Education

Personalized learning has been conceptualized as an approach that aligns goals, pathways, resources, feedback, and support with learner differences (OECD, 2006; Patrick et al., 2013). It is not limited to assigning students different worksheets or digital tasks. Rather, it involves a coherent process in which teachers diagnose needs, adapt instruction, provide differentiated resources, and evaluate learning progress in a responsive manner. In primary education, this process remains strongly teacher-mediated because students are still developing self-regulation, meta-cognitive strategies, and independent learning routines.

Recent studies also emphasize that personalized learning contains internal tensions. Although digital tools can support flexible learning pathways, they can also produce information overload, superficial individualization, and increased demands on teacher judgment. Assessment remains a particularly challenging dimension because individualized feedback and evidence collection are often difficult to reconcile with standardized accountability systems. This tension is one reason why personalized learning reforms often advance more quickly in instructional design than in evaluation practice (Black & Wiliam, 1998, 2009; Hattie & Timperley, 2007).

2.3 Digital Literacy and the Feasibility of Personalized Learning

Teacher digital literacy has evolved from a narrow technical concept into a broader notion of professional digital competence. The TPACK framework and DigCompEdu both suggest that meaningful digital literacy includes pedagogical integration, resource curation, assessment, and reflective professional use of technology rather than isolated operational skill (Mishra & Koehler, 2006; Redecker, 2017). In personalized learning contexts, this distinction is crucial. Teachers may know how to operate a platform and still feel uncertain about how to use it to support different learners effectively.

The present study operationalized digital literacy into three dimensions: digital tool application ability, digital resource integration ability, and digital teaching design ability. This operationalization recognizes that the most meaningful use of digital technology occurs when teachers can connect tools and resources to a coherent pedagogical plan. Recent research likewise shows that design-oriented competence often explains innovation outcomes more strongly than simple tool familiarity (Ning et al., 2022; Peng et al., 2024).

2.4 Research Framework and Hypotheses

Based on the literature, the conceptual framework of this study positioned digital literacy as the main independent variable, implementation confidence as the dependent variable, and age, teaching experience, educational background, and school nature as control variables. The framework assumed that stronger digital literacy would be associated with stronger implementation confidence because competence enhances teachers' sense of control over complex instructional tasks.

Two hypotheses guided the quantitative part of the study. Hypothesis 1 proposed that digital literacy would positively predict implementation confidence. Hypothesis 2 proposed

that implementation confidence would differ according to selected teacher characteristics. In addition, the qualitative phase was designed to explain why confidence was stronger in some dimensions than in others, and how school conditions shaped teachers' perceptions of feasibility.

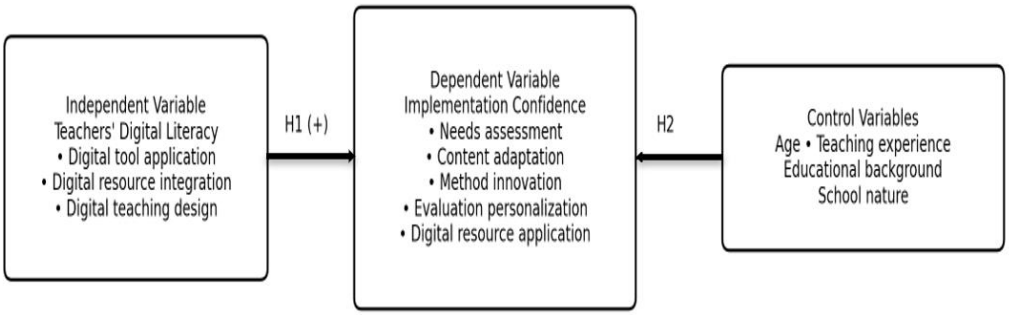

Figure 1.1. Conceptual framework of the study

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3. Research Methodology

This study employed a mixed-methods design because the research problem required both measurable patterns and explanatory interpretation. The quantitative strand was used to assess overall confidence levels, dimensional differences, predictive relationships, and group differences. The qualitative strand was used to explain how teachers understood their confidence and why certain dimensions were easier or more difficult to implement in practice.

The research population consisted of full-time primary school teachers in Hangzhou, Zhejiang Province. The final quantitative sample included 286 valid respondents from 10 primary schools, while the qualitative sample consisted of 15 teachers purposively selected from high-, medium-, and low-confidence groups. This sampling design allowed the study to combine breadth with interpretive depth.

The research instrument included three parts. Part I collected demographic information, including gender, age, teaching experience, educational background, and school nature. Part II measured digital literacy through 15 items across three dimensions: digital tool application, digital resource integration, and digital teaching design. Part III measured implementation confidence through 25 items across five dimensions: student needs assessment, teaching content adaptation, teaching method innovation, learning evaluation personalization, and digital resource application. All scale items used a five-point Likert response format.

The instrument demonstrated satisfactory psychometric quality. The overall Cronbach's α coefficient was 0.945, and the dimensional coefficients ranged from 0.876 to 0.915. The KMO value for the total scale was 0.913, and Bartlett's test of sphericity was

significant ($p < .001$), indicating good construct validity. These indices suggested that the questionnaire was suitable for the formal investigation.

Questionnaire data were analyzed in SPSS 26.0 through descriptive statistics, repeated-measures ANOVA, multiple linear regression, independent-samples t tests, and one-way ANOVA. Interview data were transcribed and coded in NVivo 12 through thematic analysis. The combination of these methods made it possible to connect statistical results with teachers' lived interpretations of reform.

Table 1. Sample Characteristics of Respondents (N = 286)

Variable	Category	N	Percentage (%)
Gender	Male	102	35.66
	Female	184	64.34
Age	18–25 years	68	23.78
	26–35 years	125	43.71
	36–45 years	73	25.52
	46+ years	20	6.99
Teaching Experience	<5 years	85	29.72
	5–10 years	118	41.26
	>10 years	83	29.02
Educational Background	Junior College	32	11.19
	Undergraduate	215	74.83
	Master's+	39	13.64
School Nature	Public School	156	54.55
	Private School	130	45.45

4. Research Results and Discussion

The sample was dominated by female teachers (64.34%), teachers aged 26–35 (43.71%), and teachers with 5–10 years of experience (41.26%). Most respondents held an undergraduate degree (74.83%), and the distribution across public and private schools was relatively balanced. These characteristics provided a useful basis for exploring group differences in implementation confidence.

4.1 Overall Confidence and Dimensional Differences

The overall implementation confidence of Hangzhou primary school teachers was at an upper-medium level ($M = 3.72$, $SD = 0.58$). This result suggested that teachers had already moved beyond simple policy awareness and had developed a workable basis for personalized learning implementation. At the same time, the score did not indicate full stabilization. Confidence remained developmental and uneven across different stages of teaching.

Among the five dimensions, student needs assessment showed the highest mean score (M = 3.85), while learning evaluation personalization showed the lowest (M = 3.58). This pattern is theoretically meaningful. Needs assessment is relatively close to teachers' familiar professional practice because teachers already observe classroom performance, identify learner differences, and monitor progress in daily teaching. Personalized evaluation, by contrast, requires differentiated criteria, ongoing documentation, and individualized feedback, all of which become more difficult under time pressure and standardized examination demands.

The repeated-measures ANOVA reported in the thesis showed significant differences across the five confidence dimensions ($p < .001$). This result implies that implementation confidence should not be interpreted as a single summary score only. A school may appear ready for personalization when the average score is considered, yet still have important weaknesses in the specific dimension of assessment reform.

Table 2. Descriptive Statistics of Implementation Confidence

Dimension	Mean	SD	Rank
Student Needs Assessment	3.85	0.62	1
Teaching Content Adaptation	3.78	0.59	2
Teaching Method Innovation	3.67	0.71	4
Learning Evaluation Personalization	3.58	0.68	5
Digital Resource Application	3.71	0.74	3
Overall Implementation Confidence	3.72	0.58	-

4.2 Teachers' Digital Literacy and Predictive Effects

Teachers' overall digital literacy was also at an upper-medium level (M = 3.65, SD = 0.63). Digital tool application (M = 3.72) and digital teaching design (M = 3.68) scored slightly higher than digital resource integration (M = 3.58). This structure is notable because it suggests that teachers were more comfortable using tools than selecting, adapting, and integrating resources for specific learner groups.

The relatively weaker score for digital resource integration reflects a common challenge in digitalized schooling: abundance does not necessarily produce coherence. Teachers may have access to many resources, yet still struggle to decide which materials fit their objectives, which students need them, and how they can be combined within limited class time. This challenge is closely related to personalized learning because differentiation depends on careful curation rather than mere availability.

The multiple regression analysis showed that digital literacy significantly predicted implementation confidence. Among the three predictors, digital teaching design was the strongest standardized predictor ($\beta = 0.378$), followed by digital resource integration ($\beta = 0.236$) and digital tool application ($\beta = 0.168$). The model explained 40.2% of the variance in implementation confidence ($R^2 = 0.402$; Adjusted $R^2 = 0.395$). These findings indicate that teachers' confidence depends less on isolated technical operation than on their ability to transform technology into coherent pedagogical design.

Table 3. Descriptive Statistics of Teachers' Digital Literacy

Dimension	Mean	SD	Rank
Digital Tool Application	3.72	0.67	2
Digital Resource Integration	3.58	0.72	3
Digital Teaching Design	3.68	0.65	1
Overall Digital Literacy	3.65	0.63	-

Table 4. Multiple Regression Predicting Implementation Confidence

Predictor	B	SE	β	t	p
Digital Tool Application	0.152	0.058	0.168	2.62	.009
Digital Resource Integration	0.214	0.062	0.236	3.45	.001
Digital Teaching Design	0.342	0.057	0.378	6.00	.000
Model R^2 / Adj. R^2			0.402 / 0.395		

4.3 Group Differences in Implementation Confidence

Hypothesis 2 was supported by significant differences across age, teaching experience, educational background, and school nature. Teachers aged 26–35 years reported the highest confidence (M = 3.84), and teachers with 5–10 years of experience also reported the highest confidence (M = 3.89). This pattern suggests a mid-career advantage: teachers in this stage may possess enough classroom experience to feel professionally secure while still remaining adaptable to digital innovation.

Teachers with master's degrees or above reported higher confidence (M = 3.88) than those with junior college degrees (M = 3.54), and public school teachers reported higher confidence (M = 3.82) than private school teachers (M = 3.59). These results suggest that implementation confidence is shaped not only by personal capability but also by differential access to resources, formal study, organizational support, and professional development.

Table 5. Group Differences in Overall Implementation Confidence

Variable	Category	N	Mean	SD	F/t	p
Age	18–25 years	68	3.58	0.61	6.82	.001
	26–35 years	125	3.84	0.54		
	36–45 years	73	3.65	0.57		
	46+ years	20	3.51	0.63		
Teaching Experience	<5 years	85	3.60	0.62	8.14	.000
	5–10 years	118	3.89	0.53		

Variable	Category	N	Mean	SD	F/t	p
Educational Background	>10 years	83	3.59	0.59		
	Junior College	32	3.54	0.64	4.21	.016
	Undergraduate	215	3.71	0.57		
	Master's+	39	3.88	0.55		
School Nature	Public	156	3.82	0.56	3.52	.001
	Private	130	3.59	0.59		

4.4 Qualitative Explanations

The interview findings helped explain the statistical patterns and revealed four major themes. First, teachers described digital technology as a double-edged sword. It offered useful data and resources, but it also produced overload, fragmentation, and uncertainty about whether digital profiles accurately represented students' needs. One teacher explained, "The 'Learning in Binjiang' platform provides rich resources, but sometimes I feel overwhelmed. There's so much content that I spend more time searching than actually using it for teaching." This comment illustrates why digital resource integration remained the weakest dimension of digital literacy.

Second, teachers emphasized the importance of vicarious experience. Observing successful peers reduced uncertainty and made abstract ideas concrete. One teacher stated, "Last semester, I observed a colleague's Chinese class where she used the platform to assign different reading materials based on students' levels. Seeing how engaged the students were, I thought, 'I can do this too.'" This theme strongly supports the logic of self-efficacy theory: confidence grows when successful practice becomes visible and relatable.

Third, the interviews confirmed that personalized assessment was the deepest bottleneck. Teachers reported that they could differentiate instruction more easily than they could redesign evaluation under standardized accountability pressures. Finally, support conditions mattered. Teachers from better-supported schools described regular training and technical help, while others relied mostly on self-study or informal collegial exchange. These qualitative results show that implementation confidence is shaped through the interaction of capability, visibility, feasibility, and institutional reinforcement.

Table 6. Major Qualitative Themes Explaining Implementation Confidence

Theme	Core Meaning	Illustrative Implication
Technology as a double-edged sword	Technology supports diagnosis and access, but also creates overload and uncertainty	Resource abundance does not automatically lead to pedagogical clarity
Seeing is believing	Peer observation and model lessons reduce uncertainty	Vicarious experience strengthens confidence

Theme	Core Meaning	Illustrative Implication
The assessment dilemma	Personalized evaluation is difficult under standardized accountability	Assessment reform is the "last mile" of personalization
Support matters	Training, time, and technical assistance shape confidence	Confidence is partly organizational, not only individual

4.5 Discussion

The findings suggest that implementation confidence in Hangzhou should be understood as developmental rather than fixed. Teachers appeared to have accepted the legitimacy of personalized learning and had begun to operationalize it, yet their confidence remained uneven across tasks. The high score for student needs assessment and the low score for personalized evaluation indicate that reform has advanced farther in diagnosis than in assessment. This "diagnosis-to-design gap" is consistent with literature showing that assessment reform often lags behind instructional innovation.

The study also clarifies the role of digital literacy. The strongest predictor was not simple tool application, but digital teaching design. This means that meaningful digital competence is pedagogical in nature. Teachers feel confident when they can connect digital possibilities to concrete classroom design—sequencing activities, differentiating tasks, and deciding how to use data and resources with different learners. Tool operation is necessary, but design competence is what makes technology educationally consequential.

Finally, the combination of statistical and qualitative evidence highlights the importance of contextual support. Confidence is not produced by competence alone. It grows when teachers can see successful practice, receive practical support, and work in organizational conditions that make personalization feasible. This explains why public school teachers reported stronger confidence on average and why interview participants repeatedly linked confidence to training, collaboration, and available technical help.

5. Conclusion and Recommendations

This article examined the implementation confidence of primary school teachers in Hangzhou, China, in relation to personalized learning strategies and digital literacy. The results showed that teachers' overall confidence was at an upper-medium level and varied significantly across five dimensions. Student needs assessment showed the strongest confidence, whereas learning evaluation personalization remained the weakest dimension. Teachers' digital literacy was also at an upper-medium level, and digital teaching design emerged as the strongest predictor of confidence. Significant differences were found across age, teaching experience, educational background, and school nature.

Taken together, the findings indicate that personalized learning in digitalized primary education is not limited by teacher willingness alone. The main challenge lies in converting digital resources and policy aspirations into manageable pedagogical routines, especially in assessment. Confidence grows when teachers experience successful examples, work within supportive school structures, and develop design-oriented digital competence.

Three practical recommendations follow. First, education administrative departments should align assessment reform with personalized-learning policy so that teachers are not encouraged to personalize instruction while being evaluated only through uniform performance logic. Second, schools should invest in collaborative lesson inquiry, peer observation, and protected planning time so that personalization becomes a shared professional practice rather than an individual burden. Third, teacher development programs should focus more strongly on digital pedagogical design and resource integration rather than on isolated technical training.

The study is limited by its regional focus and cross-sectional design. Future research should use longitudinal designs, include classroom observation and teaching artifacts, and examine additional contextual variables such as leadership support, collaborative culture, subject specialization, and workload. Even with these limitations, the present article provides evidence that teachers' confidence is a central condition for the sustainable implementation of personalized learning in primary schools.

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