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Teacher readiness and blended learning implementation in Chinese vocational colleges: a quantitative survey study

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ABSTRACT

Teacher readiness remains a key constraint on blended learning adoption in vocational education, yet limited research has examined how multiple readiness dimensions jointly shape implementation among vocational economics educators in China. This study investigated how technological literacy (TL), attitudes toward technology (AT), educational service quality (ES), and knowledge to create content (KC) predict teacher readiness for blended learning (RL), and how readiness influences actual practice among 390 economics teachers in vocational colleges in Hunan Province, China. A quantitative cross-sectional survey design was employed. Path analysis showed that all four antecedent variables significantly predicted readiness (R^2=37.0%), while readiness significantly predicted blended learning practice (β=0.322, $p<0.001$). Bootstrapped mediation analysis confirmed partial mediation across all four pathways, indicating that implementation occurs through both direct competency-enabled and readiness-mediated routes. Demographic characteristics showed no significant effect on readiness, suggesting that institutional conditions are more influential than teacher profiles. The study extends technology acceptance theory by demonstrating that integrated, multi-dimensional readiness modelling better explains blended learning implementation in subject-specific vocational contexts. The findings imply that institutional support, professional development, and content creation capacity are essential for scaling blended learning in comparable vocational education systems.

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1. INTRODUCTION

The COVID-19 pandemic fundamentally disrupted conventional instructional delivery and accelerated the adoption of blended learning across education systems globally. By integrating face-to-face instruction with online learning components, blended learning combines the relational strengths of direct teacher-student interaction with the accessibility and flexibility of digital platforms [1]. Governments and educational institutions have increasingly positioned blended learning as a strategic mechanism for improving instructional quality, widening access, and aligning educational outputs with labor market demands. In China, this shift has been formalized through successive national education informatization policies, driving large-scale deployment of learning management systems and digital content platforms across higher education and vocational institutions.

Vocational education occupies a strategic position within China's education system, serving as a bridge between academic learning and industry-oriented skills development. As vocational programs

emphasize applied knowledge and practical competence, blended learning is widely regarded as a suitable pedagogical approach that supports flexible learning pathways, experiential learning, and real-world application [2]. Figure 1 illustrates blended learning as the integration of teacher-led learning (in class or virtually) and digital learning (self-guided or assigned), combining the strengths of both pedagogical approaches [3].

Within vocational economics education specifically, spanning subjects such as accounting, finance, marketing, and international trade, blended learning is especially compatible with pedagogical demands, given the field's reliance on data analysis, simulation-based reasoning, and digital tools that mirror contemporary economic practice [4]. Hunan Province, located in south-central China, provides a representative and analytically productive context in which to examine these dynamics. The province has actively aligned itself with national educational modernization strategies through investments in digital infrastructure, online learning platforms, and institutional teacher training initiatives. However, significant disparities persist between urban and rural vocational colleges in terms of technological resources, institutional support structures, and teacher preparedness [5]. Figure 2 illustrates the blended learning model as implemented in Hunan's vocational colleges [6]. These intra-provincial disparities mean that national policy mandates encounter highly uneven implementation conditions, making Hunan a site where the relationship between institutional context and teacher readiness is particularly visible and consequential.

At the institutional level, the central challenge to blended learning implementation is teacher readiness. Teachers design learning activities, integrate technology into pedagogy, and sustain blended practices over time. Readiness in this context is not reducible to technical proficiency alone. It encompasses technological literacy (TL), positive and constructive attitudes toward technology (AT) use in education, access to reliable institutional support and service quality, and the capacity to design and produce digital learning content. When any one of these dimensions is underdeveloped, implementation tends to be inconsistent or unsustained, even where infrastructure exists.

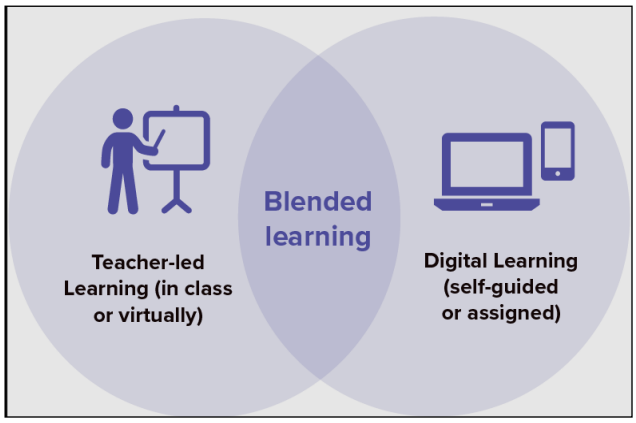

Figure 1. Concept of blended learning [3]

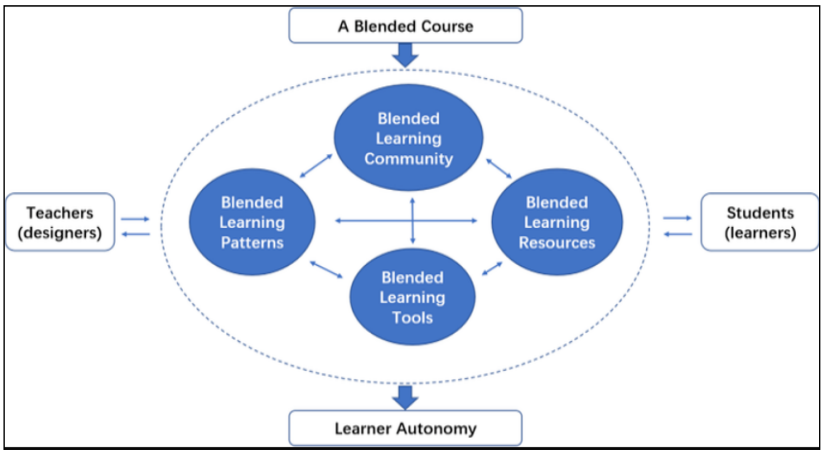

Figure 2. Blended learning model in vocational college, Hunan [6]

Despite growing research interest, three specific gaps remain in the literature. First, prior studies in China have predominantly examined blended learning in general higher education contexts or from the student perspective, with limited attention to vocational colleges and virtually none to subject-specific economic education [7]. Second, existing studies tend to examine adoption factors in isolation, attitudes, or infrastructure, but not their integrated effects, rather than modelling how multiple readiness dimensions jointly shape practice. Third, limited studies have systematically examined whether demographic characteristics moderate readiness specifically within vocational economic education in a regional Chinese context.

This study addresses these gaps by investigating how TL, AT use, educational service quality (ES), and knowledge to create digital content jointly influence teacher readiness for blended learning (RL), and how readiness in turn shapes actual practice among economics educators in Hunan's vocational colleges. The research questions guiding the study are:

- Do vocational economics teachers differ significantly in RL according to demographic characteristics? (RQ1)
- To what extent do TL, AT, ES, and knowledge to create content (KC) predict teacher RL? (RQ2)
- Does teacher RL significantly influence the practice of blended learning (PB)? (RQ3)
- Does teacher readiness mediate the relationships between the four antecedent variables and blended learning practice? (RQ4)

The novelty of this study lies in its integrated, multi-dimensional examination of readiness within a subject-specific vocational context, its use of path and mediation analysis to model both direct and readiness-mediated implementation pathways, and its empirical contribution to technology acceptance theory in a non-Western, regionally distinctive educational setting.

2. LITERATURE REVIEW

Blended learning is broadly defined as an instructional approach that strategically combines face-to-face teaching with online learning activities to enhance flexibility, engagement, and learning outcomes [1]. Meta-analytic evidence supports its general efficacy: Yu *et al.* [8] found significant positive effects on student learning performance across higher education and vocational contexts, while Prifti [9] reported associations between blended learning participation and improved student self-efficacy. Song and Lai [10] similarly confirmed that blended learning enhances student engagement and skill acquisition in vocational education contexts.

Teacher RL is generally understood as the extent to which teachers possess the skills, confidence, resources, and motivation necessary for effective implementation [11]. The construct has, however, been operationalized inconsistently across studies where sometimes as a psychological state of preparedness, and at other times as a behavioral disposition or a composite of competencies [12]. This ambiguity has produced findings that are difficult to compare. A further conceptual limitation is the tendency to treat readiness as a stable precondition rather than as a developing process shaped by implementation experience. The present study acknowledges this limitation in its cross-sectional design and treats readiness as a structural predictor, while recognizing that longitudinal work is needed to examine its developmental trajectory.

TL is consistently identified as a foundational readiness component, encompassing proficiency in learning management systems, digital communication tools, and online instructional resources [13]. In vocational education, disparities in TL have been associated with age, prior technology exposure, and unequal access to professional development [14], [15]. Importantly, Habibi *et al.* [14] found that digital technology access was a significant but not sufficient predictor of adoption, suggesting that literacy operates within a broader set of enabling conditions rather than independently driving implementation. This raises a theoretically important question about whether TL primarily builds teacher confidence or enables practice more directly. The present study's mediation framework provides a means of empirically addressing this question.

Beyond technical competence, teachers' AT use in education play a critical role in shaping their readiness. Positive attitudes, such as beliefs about the usefulness, ease of use, and pedagogical value of technology, are strongly associated with teachers' intentions to adopt blended learning and their persistence in using digital tools [16], [17]. Stack and Wallace [18] demonstrated that attitude formation is particularly sensitive to early implementation experiences and peer modelling. What the literature less frequently acknowledges is the potential bidirectionality of this relationship: attitudes may be as much an outcome of implementation experience as an antecedent to it [19]. Cross-sectional designs, including the present one, cannot resolve this directionality. Consistent with TAM, attitudes are treated here as antecedents, while recognizing that recursive relationships may operate over time.

Institutional and educational service support constitutes another key dimension of teacher readiness. ES includes access to reliable technological infrastructure, availability of technical assistance, professional development programs, and supportive institutional policies [20], [21]. Anthony [22] found that institutional support was among the strongest predictors of sustained blended learning implementation, frequently exceeding individual-level predictors in explanatory contribution. Wangdi *et al.* [23] similarly found that facilitating conditions bridged the gap between intention and actual practice. In Hunan's vocational sector, where urban-rural resource disparities are well-documented [5], this distinction carries direct practical significance: attributing uneven implementation to individual teacher deficiencies, rather than to structural inequities in institutional provision, would both misdiagnose the problem and misdirect intervention.

The capacity to design and produce digital learning materials distinguishes teachers at different stages of blended learning readiness. Effective implementation requires not only platform proficiency but also the pedagogical design competence to produce interactive materials, assessments, and multimedia resources that extend face-to-face instruction [24]. In economics education, where abstract concepts require contextualization and real-time data integration is pedagogically valuable, content creation capability is particularly consequential. Recent advances in artificial intelligence and learning analytics have expanded content creation possibilities while simultaneously introducing new competency demands [25]. Buluma and Walimbwa [26] found that many vocational teachers lack formal training in instructional design, constraining their capacity to exploit these possibilities. KC functions not merely as a technical skill but as a source of pedagogical agency where teachers who design their own materials are more likely to perceive blended learning as genuinely enhancing their practice.

The relationships between demographic characteristics and blended learning readiness are empirically inconsistent. Tweed [27] found that younger, less experienced teachers exhibited higher technological confidence, while Willis *et al.* [28] demonstrated that structured professional development could equalize confidence across age cohorts. Abedi [29] found tensions between information and communication technology (ICT) policy expectations and individual teacher practice across experience levels rather than concentrated among specific groups. These inconsistencies suggest that demographic variables function as proxies for differential access to professional development and institutional support, rather than as independent determinants of readiness.

Cultural dimensions of technology adoption in education have gained increasing scholarly attention, particularly in non-Western contexts where educational technology models developed in Western settings may require significant adaptation [30], [31]. In Chinese vocational education specifically, research suggests that blended learning implementation involves negotiating between traditional pedagogical values emphasizing teacher authority and systematic knowledge transmission, and contemporary approaches emphasizing student-centered learning and digital literacy [32]. Understanding these cultural dynamics is essential for developing effective implementation strategies that respect local educational traditions while fostering innovation.

2.1. Theoretical framework and hypotheses

This study is grounded in the technology acceptance model (TAM) [16] and the unified theory of acceptance and use of technology (UTAUT) [17]. TAM posits that perceived usefulness and ease of use determine AT and subsequent adoption behavior. UTAUT extends this by incorporating social and organizational dimensions: performance expectancy, effort expectancy, social influence, and facilitating conditions, that are particularly relevant in vocational institutional settings where adoption is shaped by peer expectations and resource availability alongside individual beliefs. Empirical studies confirm the applicability of UTAUT in blended learning adoption research, with facilitating conditions consistently bridging intention and use [23].

Drawing on these theoretical foundations, this study conceptualizes teacher RL as a function of four key factors: TL corresponds to effort expectancy and perceived ease of use; attitude reflects evaluative judgements about pedagogical value; ES aligns with facilitating conditions; and KC corresponds to perceived usefulness, as design capability increases the perceived benefit of blended learning to instructional practice. Teacher readiness mediates these antecedent conditions and actual practice, capturing the transition from preparedness to implementation. The conceptual framework is illustrated in Figure 3. Based on this framework, the following hypotheses are proposed:

- Teacher RL differs significantly according to gender, age, and teaching experience (H1)
- TL, AT, ES, and KC significantly influence teacher RL (H2)
- Teacher RL significantly influences the PB (H3)

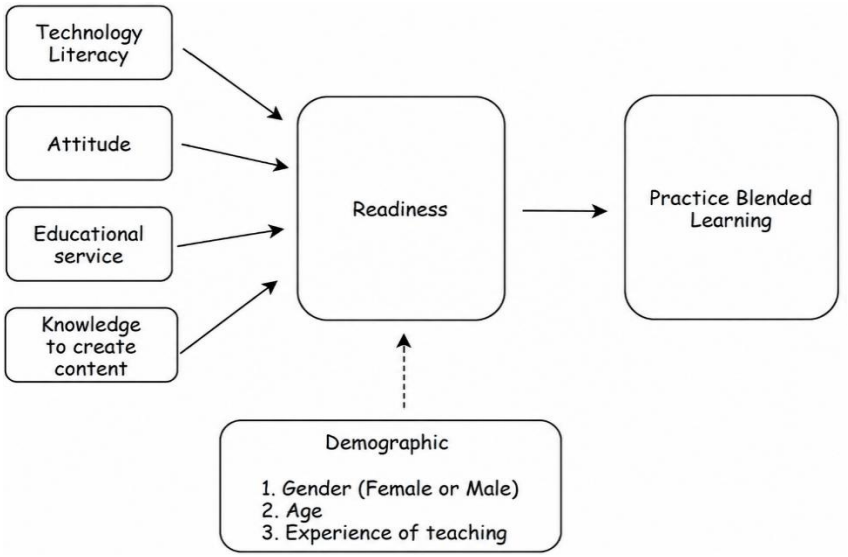

Figure 3. Conceptual framework

3. METHOD

3.1. Research design and context

This study adopted a quantitative, cross-sectional survey design to examine the determinants of blended learning readiness and practice among vocational economics teachers. A quantitative approach was deemed appropriate due to the study's objective of testing theoretically grounded relationships among latent constructs using statistical modeling. The research was conducted in vocational colleges across Hunan Province, China, a regional context characterized by active digital infrastructure investment alongside documented urban-rural disparities in institutional resources [5], making it a productive setting for examining how individual readiness and institutional conditions jointly shape implementation. The geographical location of the study area is illustrated in Figure 4, which situates Hunan Province within the broader national context of China.

Figure 4. Hunan Province, China

3.2. Population and sampling

A purposive sampling strategy was employed to ensure all respondents possessed direct, active experience teaching economics-related subjects at the vocational college level. This was appropriate to the

study's subject-specific focus: a purely probabilistic sample of all vocational teachers irrespective of disciplinary context would have introduced construct-irrelevant variance in the readiness and practice measures. Institutions were selected to represent geographic sub-regional diversity across Hunan, including urban centers such as Changsha and more rural inland areas, thereby capturing variation in institutional resource levels and infrastructure access. The final sample comprised 390 economics teachers. Participation was voluntary and all respondents were informed of the research purpose prior to completion. No incomplete responses were recorded, yielding a 100% valid response rate.

The sample was diverse across all key demographic variables, as presented in Table 1. Female teachers constituted 53.59% (n=209) and male teachers 46.41% (n=181). The largest age group was 35–44 years (31.28%), followed by 25–34 years (29.49%). Regarding educational background, 51.79% held a master's degree, 28.21% a bachelor's degree, and 20.00% a doctorate. Teaching experience was distributed across all career stages, with the largest group reporting 4 to 6 years of experience (24.62%).

Table 1. Demographic characteristics of respondents (N=390)

Demographic characteristics	Items	Frequency	Percentage (%)
Gender	Female	209	53.59
	Male	181	46.41
Age	25–34	115	29.49
	35–44	122	31.28
	45–54	43	11.03
	55 and above	32	8.21
	Under 25	78	20.00
Educational background	Bachelor's degree	110	28.21
	Doctorate	78	20.00
	Master's degree	202	51.79
Years of experience in the teaching	1–3 years	83	21.28
	4–6 years	96	24.62
	7–10 years	77	19.74
	Less than 1 year	83	21.28
	More than 10 years	51	13.08
Teaching level	Vocational college	390	100.00
Primary area of economics teaching	Financial economics	102	26.15
	International economic	100	25.64
	Macroeconomic	92	23.59
	Microeconomics	92	23.59
	No teaching economic subject	4	1.03
Have you received any formal training in blended learning?	Maybe	156	40.00
	No	78	20.00
	Yes	156	40.00
How often do you currently use blended learning approaches in your teaching	Always	90	23.08
	Never	32	8.21
	Often	78	20.00
	Rarely	73	18.72
	Sometimes	117	30.00
Total		390	100.0

3.3. Research instrument

Data were collected via a structured self-administered questionnaire comprising seven sections: one covering demographic characteristics and six measuring the study constructs: TL, AT, ES, KC, RL, and PB. TL, AT, ES, and KC each comprised ten items; RL and PB each comprised eight items. All items used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items were adapted from established instruments in the technology acceptance literature and subjected to expert content review prior to administration to confirm construct relevance and item clarity.

3.4. Normality assessment

Prior to inferential analysis, data normality was assessed using skewness and kurtosis values, supplemented by Kolmogorov-Smirnov and Shapiro-Wilk tests. As shown in Table 2, skewness values ranged from -0.470 to -0.289 and kurtosis values from -0.646 to -0.331, all within acceptable parametric thresholds. Although formal significance tests indicated departures from normality for some constructs, this outcome is expected given the large sample size (n=390) and does not preclude parametric analysis [33]. No data transformation was required.

Table 2. Normality test results (N=390)

Item	Skewness	Kurtosis	Kolmogorov-Smirnov		Shapiro-Wilk	
			Statistic	p-value	Statistic	p-value
TL	-0.330	-0.331	0.097	0.022*	0.967	0.014*
AT	-0.318	-0.593	0.080	0.117	0.960	0.004**
ES	-0.470	-0.477	0.114	0.003**	0.948	0.001**
KC	-0.429	-0.570	0.111	0.004**	0.942	0.000**
RL	-0.289	-0.586	0.068	0.298	0.965	0.010**
PB	-0.328	-0.646	0.088	0.052	0.952	0.001**

*p<0.05, **p<0.01

3.5. Reliability and validity

Cronbach's alpha values ranged from 0.941 to 0.959 across all constructs, as shown in Table 3, exceeding the recommended threshold of 0.70. These values indicate strong internal consistency. It is, however, acknowledged that uniformly high alpha values may partly reflect item similarity rather than pure reliability. Item-total correlation and inter-item correlation matrices were examined to confirm that all items contributed meaningfully to their respective constructs without excessive overlap. Future studies should examine whether more parsimonious scale structures preserve psychometric quality while reducing potential redundancy.

Construct validity was assessed through multiple procedures. Kaiser-Meyer-Olkin (KMO) (0.868) and Bartlett's test (χ^2=32,158.973, p<0.001) confirmed sampling adequacy and sufficient inter-item correlations, as shown in Table 4. Convergent validity was supported by average variance extracted (AVE) values exceeding 0.50 and CR values exceeding 0.90 across all constructs, as shown in Table 5. Discriminant validity was confirmed by HTMT ratios below 0.85 throughout, as shown in Table 6. It should be noted that HTMT below 0.85 confirms statistical discriminant validity but does not fully resolve the conceptual proximity among TL, KC, and RL, a limitation acknowledged here and flagged for future scale development.

Table 3. Reliability statistics

Construct	Number of items	Cronbach's alpha
TL	10	0.959
AT	10	0.957
ES	10	0.957
KC	10	0.959
RL	8	0.941
PB	8	0.953

Table 4. KMO and Bartlett's test

Test	Value
KMO measure	0.868
Bartlett's χ^2	32,158.973
Df	1540
p-value	<0.001

Table 5. AVE and composite reliability

Construct	AVE	CR
TL	0.697	0.958
AT	0.690	0.957
ES	0.702	0.959
KC	0.668	0.941
RL	0.684	0.945
PB	0.684	0.945

Table 6. HTMT ratio matrix

Construct	TL	AT	ES	KC	RL	PB
TL	-					
AT	0.482	-				
ES	0.565	0.477	-			
KC	0.477	0.469	0.437	-		
RL	0.532	0.475	0.500	0.469	-	
PB	0.560	0.498	0.522	0.504	0.629	-

3.6. Data analysis

Analysis proceeded in sequential inferential layers, each addressing a distinct research question. Descriptive statistics established the distributional profile of all constructs. Independent samples t-tests and one-way ANOVA examined demographic differences in readiness (H1). Pearson correlation established the bivariate association structure as a preliminary structural check prior to multivariate modelling. Hierarchical regression then tested the incremental predictive contribution of readiness above the four antecedent variables. Path analysis estimated the full structural model simultaneously, quantifying direct effects for H2 and H3. Bootstrapped mediation analysis formally tested whether readiness mediated each antecedent-practice relationship. While these analyses draw on overlapping data, each addresses a non-redundant

inferential question: together they map the structural complexity of the conceptual model more fully than any single analytical approach could achieve. All analyses were conducted using IBM SPSS Statistics. Path relationships were estimated through multiple regression-based path analysis, while mediation effects were tested using bootstrapping with 5,000 resamples to generate bias corrected 95% confidence intervals. Mediation was considered significant when the confidence interval for the indirect effect did not include zero.

3.7. Ethical considerations

The ethical principles were strictly observed. Participation in the study was voluntary, and respondents were informed of the research purpose prior to completing the questionnaire. Anonymity and confidentiality were maintained, and the data were used solely for academic research purposes.

4. RESULTS AND DISCUSSION

4.1. Descriptive statistics of key variables

Mean scores across all six constructs ranged narrowly from 3.139 to 3.199 on a five-point scale, as shown in Table 7, indicating uniformly moderate levels across TL, AT, ES, KC, RL, and PB. Readiness recorded the highest mean (M=3.199, SD=1.076) and attitude the lowest (M=3.139, SD=1.187). The narrow inter-construct range is substantively meaningful. Rather than showing differentiated profiles where some dimensions are well-developed and others lagging, teachers in this sample exhibited synchronized development across all readiness dimensions. This pattern is consistent with Anthony [22] characterization of blended learning readiness as a systemic rather than modular phenomenon, where professional development programs addressing multiple dimensions simultaneously tend to produce parallel rather than uneven growth across competency areas. The moderate level of readiness, that scores clustering slightly above the scale midpoint indicates a system in active transition: teachers have moved beyond initial resistance but have not yet achieved confident, sustained implementation [12]. The 2020–2023 period covered by this study encompasses both the forced technology adoption of COVID-19 lockdowns and the subsequent return to in-person instruction, a sequence likely to have accelerated the transition without necessarily consolidating it into mature practice [8].

4.2. Differences in readiness for blended learning by demographic factors (H1)

The independent samples t-test revealed no significant difference in readiness between male (M=3.20, SD=1.09) and female teachers (M=3.20, SD=1.07), t(388)=-0.021, p=0.983, as shown in Table 8. One-way ANOVA found no significant differences across age groups, F(4, 385)=0.218, p=0.928, as shown in Table 9, or teaching experience categories, F(4, 385)=0.431, p=0.786, as shown in Table 10. H1 was therefore not supported.

Table 7. Descriptive statistics of study variables (N=390)

Variables	Mean	S.D.
TL	3.163	1.158
AT	3.139	1.187
ES	3.198	1.171
KC	3.158	1.196
RL	3.199	1.076
PB	3.167	1.159

Table 8. Independent t-test based on gender (N=390)

Item	Gender	*n*	Mean	S.D.	Mean difference	95% CI (difference)	*t*	*df*	p-value
RL	Female	209	3.20	1.07	-0.00	-0.217~0.213	-0.021	388.000	0.983
	Male	181	3.20	1.09					
	Total	390	3.20	1.08					

*p<0.05, **p<0.01

Table 9. One-way ANOVA based on age (N=390)

Item	Age	n	Mean	S.D.	F	p-value
RL	25-34	115	3.18	1.15	0.218	0.928
	35-44	122	3.23	1.05		
	45-54	43	3.24	1.07		
	55 and above	32	3.29	1.00		
	Under 25	78	3.11	1.06		
	Total	390	3.20	1.08		

*p<0.05, **p<0.01

Table 10. One-way ANOVA based teaching experience (N=390)

Item	Teaching experience	n	Mean	S.D.	F	p-value
RL	1-3 years	83	3.30	1.10	0.431	0.786
	4-6 years	96	3.13	1.00		
	7-10 years	77	3.19	1.16		
	Less than 1 year	83	3.14	1.06		
	More than 10 years	51	3.28	1.10		
	Total	390	3.20	1.08		

These findings diverge from Tweed [27], who reported that younger and less experienced teachers exhibited higher technological confidence, but align with Willis *et al.* [28] and Avolio and Benzaquen [30], who demonstrated that well-structured institutional support can equalize readiness across demographic groups. The most parsimonious interpretation is that demographic variables function as proxies for differential access to professional development and institutional support rather than as independent readiness determinants. Where institutional conditions are reasonably consistent, as Hunan's province-wide policy framework may help ensure, demographic stratification in readiness attenuates. For vocational education managers, this finding carries a direct implication: the demographic composition of a teaching workforce need not constrain blended learning adoption trajectories, provided institutional support is consistently and equitably delivered across staff groups.

4.3. Predictors of readiness and practice (H2 and H3)

Pearson correlation analysis confirmed positive and statistically significant associations among all six constructs (all $p<0.01$), as presented in Table 11. The strongest bivariate relationship was between readiness and PB ($r=0.593$). Among the antecedent variables, TL showed the strongest association with RL ($r=0.506$), followed by ES ($r=0.475$), AT ($r=0.451$), and KC ($r=0.446$).

Hierarchical regression results as shown in Table 12 provided further specification: the four antecedent variables alone explained 41.2% of variance in practice (Model 1), and the addition of readiness produced a significant incremental gain ($\Delta R^2=0.065$, $p<0.001$), with readiness emerging as the strongest individual predictor ($\beta=0.322$) in the full model explaining 47.8% of variance overall. Path analysis results as shown in Table 13 confirmed that all four antecedent variables significantly predicted readiness: TL ($\beta=0.241$, $p<0.001$), ES ($\beta=0.191$, $p<0.001$), KC ($\beta=0.178$, $p<0.001$), and AT ($\beta=0.172$, $p<0.001$), collectively explaining 37.0% of variance in readiness and supporting H2. RL significantly predicted practice ($\beta=0.322$, $p<0.001$), supporting H3.

Table 11. Pearson correlation matrix (N=390)

Construct	Mean	S.D.	TL	AT	ES	KC	RL	PB
TL	3.163	1.158	1					
AT	3.139	1.187	0.462**	1				
ES	3.198	1.171	0.542**	0.456**	1			
KC	3.158	1.196	0.458**	0.450**	0.419**	1		
RL	3.199	1.076	0.506**	0.451**	0.475**	0.446**	1	
PB	3.167	1.159	0.533**	0.474**	0.496**	0.480**	0.593**	1

**p<0.01

Table 12. Hierarchical regression results for PB (N=390)

Construct	Model 1					Model 2				
	B	Std. Error	t	p-value	β	B	Std. Error	t	p-value	β
Constant	0.587**	0.164	3.586	0.000	-	0.264	0.161	1.637	0.102	-
TL	0.254**	0.050	5.082	0.000	0.253	0.176**	0.048	3.632	0.000	0.176
AT	0.174**	0.046	3.754	0.000	0.178	0.120**	0.044	2.696	0.007	0.123
ES	0.197**	0.045	4.343	0.000	0.203	0.141**	0.043	3.244	0.001	0.145
KC	0.191**	0.049	3.936	0.000	0.193	0.130**	0.047	2.786	0.006	0.131
RL						0.347**	0.050	6.927	0.000	0.322
R-squared	0.412					0.478				
Adjust R-squared	0.406					0.471				
F Test	F (4, 385)=67.535, p=0.000					F (5, 384)=70.216, p=0.000				
△R-squared	0.412					0.065				
△F	F (4, 385)=67.535, p=0.000					F (1, 384)=47.978, p=0.000				

**p<0.01

Table 13. Path analysis results (N=390)

Path	Unstandardized B	SE	z	Standardized β	p	Result
TL→RL	0.224	0.048	4.702	0.241	0.000	Supported
AT→RL	0.156	0.044	3.529	0.172	0.000	Supported
ES→RL	0.176	0.046	3.800	0.191	0.000	Supported
KC→RL	0.160	0.043	3.704	0.178	0.000	Supported
TL→PB	0.176	0.048	3.661	0.176	0.000	Supported
AT→PB	0.120	0.044	2.718	0.123	0.007	Supported
ES→PB	0.130	0.046	2.807	0.131	0.005	Supported
KC→PB	0.141	0.043	3.265	0.145	0.001	Supported
RL→PB	0.347	0.050	6.980	0.322	0.000	Supported

Note: "→" indicates regression relationship

The incremental contribution of readiness in Model 2 (ΔR^2=0.065, p<0.001) confirms that readiness is not simply a compositional index of the four antecedent variables but captures a distinct psychological and behavioral state that independently facilitates implementation. TL was the strongest individual predictor of readiness, consistent with TAM's positioning of perceived ease of use as a primary adoption driver [16]. The comparatively stronger direct effect of TL on practice relative to its indirect effect through readiness suggests that technical skills operate through two mechanisms simultaneously: building the psychological confidence that constitutes readiness, and directly enabling the practical acts of blended implementation. ES, by contrast, showed a pattern where institutional support enables practice even when individual readiness is not fully developed, consistent with UTAUT's facilitating conditions construct [17] and with Anthony [22] finding that institutional provision can compensate for incomplete individual readiness by lowering implementation barriers. This distinction has practical significance for sequencing interventions: institutional infrastructure and support do not need to wait for readiness to be fully built before yielding implementation gains.

4.4. Mediation analysis

Bootstrapped mediation analysis confirmed that readiness partially mediated all four antecedent-practice relationships, as shown in Table 14. Indirect effects were statistically significant for TL (indirect effect=0.078, 95% CI [0.022, 0.142], p=0.011), ES (indirect effect=0.061, 95% CI [0.014, 0.126], p=0.032), KC (indirect effect=0.056, 95% CI [0.012, 0.117], p=0.039), and AT (indirect effect=0.054, 95% CI [0.012, 0.109], p=0.027). Direct effects remained significant in all cases, confirming partial rather than full mediation throughout.

Table 14. Mediation analysis results

Item	Symbol	Effect	Value	95% CI		Std. Error	z or t	p-value	Conclusion
				Lower limit	Upper limit				
TL→RL→PB	a * b	Indirect effect	0.078	0.022	0.142	0.030	2.551	0.011	Partial
TL→RL	a	X=>M	0.224	0.130	0.318	0.048	4.673	0.000	mediation
RL→PB	b	M=>Y	0.347	0.249	0.445	0.050	6.927	0.000	
TL→PB	c'	Direct effect	0.176	0.081	0.271	0.048	3.632	0.000	
TL→PB	c	Total effect	0.254	0.156	0.352	0.050	5.082	0.000	
AT→RL→PB	a * b	Indirect effect	0.054	0.012	0.109	0.025	2.204	0.027	Partial
AT→RL	a	X=>M	0.156	0.069	0.243	0.045	3.507	0.001	mediation
AT→PB	b	M=>Y	0.347	0.249	0.445	0.050	6.927	0.000	
AT→PB	c'	Direct effect	0.120	0.033	0.207	0.044	2.696	0.007	
ES→RL→PB	c	Total effect	0.174	0.083	0.265	0.046	3.754	0.000	
ES→RL	a * b	Indirect effect	0.061	0.014	0.126	0.028	2.147	0.032	Partial
ES→PB	a	X=>M	0.176	0.085	0.267	0.047	3.776	0.000	mediation
ES→PB	b	M=>Y	0.347	0.249	0.445	0.050	6.927	0.000	
KC→RL→PB	c'	Direct effect	0.130	0.039	0.221	0.047	2.786	0.006	
KC→RL	c	Total effect	0.191	0.096	0.286	0.049	3.936	0.000	
KC→PB	a * b	Indirect effect	0.056	0.012	0.117	0.027	2.062	0.039	Partial
KC→PB	a	X=>M	0.160	0.075	0.245	0.044	3.681	0.000	mediation
TL→RL→PB	b	M=>Y	0.347	0.249	0.445	0.050	6.927	0.000	
TL→RL	c'	Direct effect	0.141	0.056	0.226	0.043	3.244	0.001	
RL→PB	c	Total Effect	0.197	0.108	0.285	0.045	4.343	0.000	

The consistent pattern of partial mediation across all four relationships carries an important theoretical implication: it refutes a simple sequential model in which readiness functions as the sole gateway to implementation. The antecedent variables exert both a direct enabling effect on practice and an indirect effect mediated through readiness, indicating that implementation proceeds simultaneously through competency-enabled and readiness-mediated pathways. This finding advances beyond conventional linear TAM applications, which typically position attitudes or perceptions as complete mediators between external

variables and behavior, by demonstrating that in practice the pathways are more plural and overlapping. For program designers, this points toward iterative, practice-integrated professional development, where teachers engage in implementation while readiness continues to develop, rather than front-loaded readiness-building as a prerequisite stage that must be completed before implementation begins.

4.5. Contextual interpretation

The empirical pattern observed in this study is consistent with a vocational education system in which province-wide professional development policies have produced reasonably uniform baseline conditions across teacher cohorts, while implementation remains constrained by incomplete institutional consolidation of blended learning as a sustained instructional norm rather than an episodic practice [22], [23]. Existing scholarship suggests that Confucian educational values emphasizing teacher authority, systematic knowledge transmission, and structured learning may shape how educators in Chinese contexts approach pedagogical innovation [31], [32]. These cultural interpretations are theoretically plausible and may help explain the cautious, graduated nature of readiness development observed here. However, they should be treated as provisional rather than established conclusions. Cultural orientation is not directly measured in the present quantitative design, and inferring cultural effects from descriptive patterns risks overstating what the data can support. Longitudinal and qualitative evidence would be needed to establish whether cultural orientation independently drives readiness or whether institutional resource levels and professional development quality are the more proximate explanatory factors. The cultural interpretations offered here are therefore best understood as theoretically informed propositions for future investigation rather than empirical findings of the present study.

5. CONCLUSION

This study investigated teacher RL among vocational economics educators in Hunan Province, examining how TL, AT, ES, and KC jointly shape readiness and its subsequent influence on practice. Three findings are of primary significance. First, readiness levels were uniformly moderate across all dimensions, reflecting a system in active transition rather than at either end of the adoption spectrum. Second, demographic characteristics exerted no significant influence on readiness, pointing to institutional conditions as the decisive determinant of capacity development. Third, readiness partially mediated all four antecedent-practice relationships, confirming that implementation proceeds through both direct competency-enabled and readiness-mediated pathways. This finding advances beyond linear TAM by demonstrating that these pathways operate simultaneously rather than sequentially.

The study contributes to technology acceptance theory by demonstrating that readiness functions as a partial rather than complete mediator in blended learning implementation, and that this pattern holds consistently across multiple antecedent dimensions. For vocational education managers and policymakers, the practical implication is that integrated institutional support, encompassing infrastructure, technical assistance, and multi-dimensional professional development delivered equitably across staff groups, is a more evidence-consistent lever for scaling adoption than demographic-targeted or single-dimension interventions. The future implication of this study is that blended learning in vocational colleges should be developed as a system-wide institutional strategy rather than an individual teacher responsibility. Colleges should invest not only in digital infrastructure, but also in continuous teacher training, technical support, and digital content development. If these supports are strengthened, vocational teachers may become more confident and consistent in applying blended learning, which can improve teaching flexibility, student engagement, and long-term digital transformation in vocational education. Future research should pursue longitudinal designs to track how readiness evolves through sustained implementation experience, mixed-methods approaches incorporating classroom observation and learning analytics for more objective implementation quality measures, and comparative studies across Chinese provinces with differing resource profiles. Whether construct-level differences exist according to institutional type, specifically urban versus rural vocational colleges, remains an empirically open question warranting dedicated investigation.

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AUTHOR CONTRIBUTIONS STATEMENT

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
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Mohamad Zuber Abd Majid		✓				✓		✓	✓	✓	✓	✓		

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research related to human use has complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Universiti Kebangsaan Malaysia and has been approved by the authors' institutional review board or equivalent committee.

DATA AVAILABILITY

Derived data supporting the findings of this study are available from the corresponding author [MZAM] on request.

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