

PAPER

Research on University Teachers' Intention to Adopt Interactive Mobile Teaching Tools and the Barriers Based on the TAM Model

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ABSTRACT

With the deep integration of mobile technology and higher education, interactive mobile teaching tools have gradually occupied an important position in teaching activities in colleges and universities. However, university teachers, as core users of new teaching technologies, still face many obstacles in their willingness to use mobile teaching tools. Based on the technology acceptance model (TAM), combined with the results of data collection through questionnaires, this study uses structural equation modeling (SEM) to explore university teachers' intention to apply (IU), interactive mobile teaching tools and the barrier factors they encounter. The study findings show that perceived ease of use (PEOU) affects perceived usefulness; PEOU affects attitude towards use; perceived usefulness (PU), affects IU; technical barriers (TB) and management barriers (MB) affect PU, TB affect PEOU, and IU depends on previous mobile teaching experience (TE). The conclusions of this study suggest that colleges and universities should improve the adoption rate and the depth of teaching integration of interactive teaching tools among university teachers by optimizing the school management and support system, promoting the adaptation of tool design to teaching needs, building an experience transfer and community support network, and carrying out phased pilots and effect iterations.

KEYWORDS

technology acceptance model (TAM), university teachers, interactive mobile teaching tools, usage intention, empirical research

1 INTRODUCTION

With the rapid iteration of new technologies represented by AI and cloud computing, interactive mobile teaching tools have also achieved leapfrog development. This technology integrates multimodal interactions, such as utilizing advanced

Yue, G. X.-G., Imanova, M., Hadjiphanis, L., Mao, P., Chen, X. (2026). Research on University Teachers' Intention to Adopt Interactive Mobile Teaching Tools and the Barriers Based on the TAM Model. *International Journal of Interactive Mobile Technologies (ijim)*, 20(2), pp. 12–25. <https://doi.org/10.3991/ijim.v20i02.60087>

Article submitted 2025-08-10. Revision uploaded 2025-12-03. Final acceptance 2025-12-08.

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technologies like multi-touch, voice recognition, intelligent response, and 3D from devices including mobile phones, tablets, and VR/AR to empower university teachers' teaching activities. It transforms traditional classrooms into immersive teaching methods, providing new momentum for the informatization transformation of higher education teaching [1]. However, in practical application, there are significant differences in university teachers' acceptance and usage effects of interactive mobile teaching tools. On one hand, some university teachers actively embrace new technologies, integrating mobile teaching tools into daily teaching and achieving good results; on the other hand, a considerable number of university teachers still hold a wait-and-see or resistant attitude towards mobile teaching tools, with problems such as low application willingness and insufficient application capabilities [2].

Nevertheless, previous academic research has reached a consensus that interactive tools significantly improve teaching quality, but there remains a gap in studies on the adoption factors of interactive tools among university teachers. Therefore, based on the technology acceptance model (TAM) theory, as shown in Figure 1, this paper conducts an empirical analysis using structural equation modeling (SEM) to study university teachers' intention to apply (IU) interactive mobile teaching tools and the barrier factors. It is hoped that the study results will provide a theoretical model and practical framework for constructing a precise university teacher development system and optimizing educational technology governance [3].

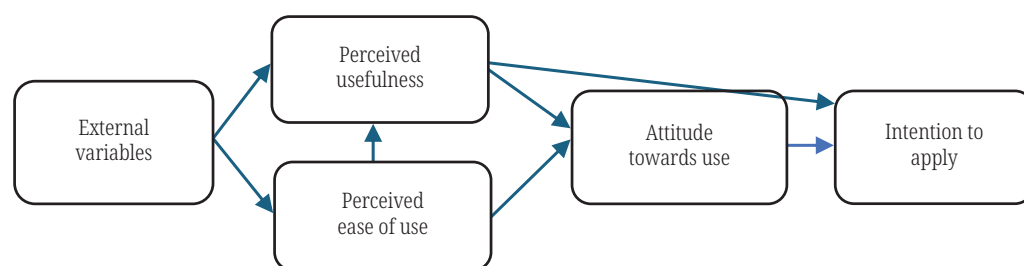


Fig. 1. The technology acceptance model

2 REFERENCES AND RESEARCH HYPOTHESES

2.1 Technology acceptance model

In the field of educational technology, perceived usefulness (PU) not only influences whether teachers are willing to accept instructional technologies but also directly relates to the extent to which these technologies can improve teaching quality. Teachers' evaluation of the PU of interactive mobile teaching tools is often closely associated with whether such tools can help meet instructional needs, such as enabling personalized teaching and providing real-time feedback on students' learning status [4]. When teachers believe that mobile teaching tools can significantly enhance in-class interaction efficiency and reduce the cost of delivering teaching resources, their willingness to adopt these tools increases markedly [5].

However, with the popularization of mobile technology, the connotation of PU has gradually expanded to include "the convenience of technology operation,

the friendliness of interfaces, and the level of costs for learning and use” [6]. Since teachers generally face heavy teaching workloads and limited time for technology learning, the ease of use of interactive mobile teaching tools directly determines whether they are willing to invest effort in trying these tools. If a tool has operational barriers, teachers’ willingness to adopt it will decrease significantly, even if the tool has powerful functions [7].

In studies related to the adoption of educational technology, the mediating effect of attitude towards use has been extensively verified: On one hand, PU influences attitude towards use through “recognition of tool value”—when teachers believe a tool can meet their teaching needs, they will form a positive attitude towards using it; on the other hand, perceived ease of use (PEOU) influences attitude towards use through “satisfaction with user experience”—tools that are easy to operate can reduce teachers’ negative emotions, thereby strengthening their positive attitude [8] [9].

Therefore, this paper proposes the following hypotheses:

- H1: Perceived ease of use has a significant positive impact on perceived usefulness.
- H2: Perceived ease of use has a significant positive impact on attitude towards use.
- H3: Perceived usefulness has a significant positive impact on attitude towards use.
- H4: Perceived usefulness has a significant positive impact on intention to apply.
- H5: Attitude towards use has a significant positive impact on intention to apply.

2.2 Research progress on barriers to university teachers’ application of interactive mobile teaching tools

Technical barriers (TB) are the most direct obstacles for teachers to use interactive mobile teaching tools. In terms of technical stability, tool lagging or crashing directly reduces teachers’ PU and PEOU. This is because technical failures disrupt the teaching rhythm, increase teachers’ teaching risks, and further lead to a negative attitude towards use [10]. In terms of data security risks, there is a risk of leakage of students’ personal information and learning data during tool use. This causes teachers to have “responsibility concerns” and use mobile teaching tools cautiously, which directly affects their attitude towards use [11].

Management barriers (MB) mainly stem from the imperfection of school-level management mechanisms. In terms of uneven resource allocation, problems in the school’s tool distribution make teachers believe that “the school does not attach importance to tool application,” thereby reducing PEOU and ultimately suppressing PU. In terms of unreasonable evaluation systems, if the school fails to incorporate tool application into a scientific teaching evaluation system, teachers will lack “motivation for application” and feel that “tool use cannot bring professional benefits,” which in turn reduces PU and leads to a negative attitude that “it does not matter whether to apply the tool or not” [12].

The barrier of imbalance between workload and benefits exerts a significant negative impact on both teachers’ cognitive and attitude variables. In terms of increased lesson preparation time, teachers need to spend extra time designing interactive sessions and creating teaching resources (such as short videos and online quizzes) suitable for mobile terminals, which significantly increases their workload. If this “additional input” is not compensated accordingly, teachers

will consider the tool “not cost-effective,” thereby reducing PU [13]. In terms of increased difficulty in student management, the interactive functions of mobile teaching tools may cause classroom disorder (e.g., students chatting or browsing irrelevant content using the tool). Teachers then need to spend more effort maintaining classroom discipline, which reduces PEOU and weakens PU [14]. In terms of unclear professional benefits, the teaching effects achieved by teachers through tool application (such as improved student engagement) are not incorporated into professional development systems such as professional title evaluation and performance assessment, resulting in “disproportionate input and return.” This “ambiguity of benefits” directly reduces teachers’ motivation to apply the tool, makes them question the tool’s PU, and leads to a negative attitude that “it is not worth investing in the tool” [15].

Therefore, this paper proposes the following hypotheses:

- H6: Technical barriers have a significant negative impact on perceived usefulness.
- H7: Technical barriers have a significant negative impact on perceived ease of use.
- H8: Technical barriers have a significant negative impact on attitude towards use.
- H9: Management barriers have a significant negative impact on perceived usefulness.
- H10: Management barriers have a significant negative impact on perceived ease of use.
- H11: Management barriers have a significant negative impact on attitude towards use.
- H12: The barrier of imbalance between workload and benefits has a significant negative impact on perceived usefulness.
- H13: The barrier of imbalance between workload and benefits has a significant negative impact on perceived ease of use.
- H14: The barrier of imbalance between workload and benefits has a significant negative impact on attitude towards use.

3 RESEARCH METHODS

3.1 Research objects and sampling method

The research objects of this study are teachers from various types of colleges and universities across the country, including undergraduate institutions, higher vocational colleges, public institutions, and private institutions. The sample also covers teachers from different disciplines, such as liberal arts, science, and engineering, as well as teacher groups of different ages and teaching seniority.

This study adopts a simple random sampling method. There are 27 observed variables in this study, and the sample size is generally 5–10 times the number of observed variables, i.e., 135–270. Therefore, a sample of approximately 200 meets the requirements [16].

3.2 Questionnaire design

This study intends to adopt a 5-point Likert scale. The specific design of the questionnaire is presented in Table 1.

Table 1. Questionnaire design

Variable	Latent Variable	Observed Variable
Dependent Variable	Intention to Apply (IU)	I intend to use this tool frequently. (IU1)
		I plan to continue using this tool in future semesters. (IU2)
		I am willing to try using this tool in various teaching scenarios. (IU3)
		I will recommend this tool to my colleagues. (IU4)
Independent Variable	Perceived Usefulness (PU) (+)	I believe that using this tool can effectively improve students' classroom participation. (PU1)
		I believe that using this tool can help me improve teaching efficiency. (PU2)
		I believe that using this tool can make my teaching process more interesting and interactive. (PU3)
	Perceived Ease of Use (PEOU) (+)	It is easy for me to learn to operate this tool. (PEOU1)
		I think the interface of this tool is clear and user-friendly. (PEOU2)
		I can easily and proficiently master all functions of this tool. (PEOU3)
		I can easily solve common problems encountered during use. (PEOU4)
	Attitude towards Use (AU) (+)	I think using this tool in teaching is a good idea. (AU1)
		I think it is wise to use this tool for teaching. (AU2)
		Using this tool is consistent with my teaching philosophy. (AU3)
External Variable	Technical Barriers (TB) (-)	The school has insufficient hardware facilities and lacks necessary teaching tools. (TB1)
		I am worried about compatibility issues such as lagging or crashing when using the tool. (TB2)
		I am worried that the tool's functions are incomplete and lack necessary features. (TB3)
		I am concerned about data security issues (e.g., leakage of students' information). (TB4)
	Management Barriers (MB) (-)	The school lacks sufficient technical support and training services. (MB1)
		The school has no effective incentive policies such as performance appraisal. (MB2)
		The school lacks a policy environment that encourages teaching innovation. (MB3)
	Workload-Benefit Imbalance Barriers (WB) (-)	Learning and using new tools requires me to invest a lot of extra time and energy. (WB1)
		Redesigning courseware to adapt to tool-based teaching will increase my workload. (WB2)
		The existing teaching evaluation system does not effectively motivate me to innovate in teaching tools. (WB3)
Control Variables	Age (AG)	<31
		31–40
		41–50
		>50
	Teaching Seniority (TS)	5 years or less (novice teachers)
		6–15 years (mid-career teachers)
		16 years or more (senior teachers)
	Previous Mobile Teaching Experience (TE)	No experience
		Occasional use (1–2 times per semester)
		Frequent use (≥3 times per semester)

Open-Ended Question: Regarding the intention of university teachers to apply interactive mobile teaching tools and the barrier factors, what other aspects do you think need to be supplemented?

3.3 Data collection

Data collection was conducted through the distribution of online questionnaires. The questionnaires were randomly distributed to colleges and universities across the country from October 9 to 11, 2025. A total of 270 questionnaires were distributed. After collection and careful screening—where invalid questionnaires (such as those with short response times or incorrect answers) were excluded—a total of 257 valid questionnaires were obtained, with a validity rate of 95.2%.

4 RESEARCH RESULTS

4.1 SEM

The core of the SEM is a model that simultaneously handles measured variables and latent variables and analyzes the causal relationships between variables.

The core components of SEM are the “measurement model” and the “structural model.”

The measurement model is used to test whether “latent variables” can be accurately represented by “measured variables.” The structural model is used to analyze the causal or correlational relationships between different latent variables, thereby testing presupposed theoretical hypotheses.

The formula is:

$$\eta = \beta\eta + \Gamma\xi + \zeta \tag{1}$$

Where:

η : Vector of endogenous latent variables.

β : Matrix of path coefficients between endogenous latent variables.

Γ : Matrix of path coefficients from exogenous latent variables to endogenous latent variables.

ξ : Vector of exogenous latent variables.

ζ : Residual vector of the structural equation.

4.2 Structural equation modeling

The results of the descriptive analysis are presented in Table 2.

Table 2. Results of descriptive analysis

Latent Variable	Observed Variable	Frequency	Percentage
Age	<31	24	9.3%
	31–40	114	44.4%
	41–50	92	35.8%
	>50	27	10.5%

(Continued)

Table 2. Results of descriptive analysis (*Continued*)

Latent Variable	Observed Variable	Frequency	Percentage
Teaching seniority	5 years or less (novice teachers)	80	31.1%
	6–15 years (mid-career teachers)	108	42.1%
	16 years or more (senior teachers)	69	26.8%
Previous mobile teaching experience	No experience	60	23.3%
	Occasional use (1–2 times per semester)	104	40.5%
	Frequent use (≥ 3 times per semester)	93	36.2%

According to the data collection results, the age distribution of teachers shows a “high in the middle and low at both ends” characteristic. Teachers aged 31–50 account for more than 80% in total, indicating that middle-aged teachers with certain teaching experience (TE) form the majority.

The teaching seniority of teachers is somewhat correlated with their age distribution. Teachers with 6–15 years of teaching seniority account for the highest proportion, reaching 42.1%, which suggests that these teachers already possess the teaching methods to master new technologies and the ability to manage classrooms.

Among teachers’ mobile TE, those who use mobile teaching occasionally account for the highest proportion (40.5%), indicating that most teachers have had preliminary contact with mobile teaching but have not formed a usage habit. Although teachers without mobile TE are in the minority, they need to be focused on in subsequent efforts.

In the open-ended questions, most teachers believe that there are defects in the ease of use of the tools, with outdated functions and constraints from the environment and hardware. In addition, there are issues such as classroom management problems, insufficient student participation, and a mismatch between teaching costs and input. Furthermore, schools have a low recognition of interactive mobile teaching tools, and teachers need to go through an adaptation process, among other related problems.

4.3 Reliability analysis

According to the calculation results, as shown in Table 3, the overall Cronbach’s α coefficient of the questionnaire is 0.940, which is greater than 0.7, indicating that the scale has high internal consistency.

Table 3. Reliability analysis

Dimension	Number of Items	Cronbach’s α Coefficients
IU	4	0.962
PU	3	0.929
PEOU	4	0.938
AU	3	0.964
TB	4	0.886
MB	3	0.926
WB	3	0.870
Overall	24	0.940

4.4 Validity analysis

According to the calculation results, as shown in Table 4, indicating that there is a strong correlation between the observed variables.

Table 4. KMO test and Bartlett's test

Bartlett's test of sphericity	KMO value	0.874 (>0.7)
	Chi-square	3539.200
	Degrees of freedom	351
	P level	0.000 (<0.05)

4.5 Goodness-of-fit test

The indicator results are shown in Table 5:

Table 5. Fit indices

Common Indicators	CMID/DF	RMSEA	IFI	TLI	CFI
Judgment Criteria	<3	<0.08	>0.8	>0.8	>0.8
Value	2.708	0.116	0.850	0.828	0.848

The results of the goodness-of-fit analysis indicate that the overall goodness-of-fit of the model has not reached the ideal level. Some path relationships show significant impacts, and on the whole, the model adaptation needs to be optimized.

4.6 Factor analysis

As shown in Table 6, a total of five factors were extracted, with eigenvalues all greater than 1. The cumulative variance explained rate of these five factors after rotation was 76.123%, which meets the passing standard of ≥60%. This indicates that these five latent factors can cover nearly 80% of the information of the 24 observed variables, showing a good factor extraction effect and a reliable basis for construct validity.

Table 6. Total variance explained in factor analysis

Component	Initial Eigenvalues			Squared Loadings after Rotation		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	10.905	40.390	40.390	9.401	34.817	34.817
2	5.393	19.975	60.365	5.971	22.113	56.930
3	1.736	6.430	66.795	1.845	6.834	63.764
4	1.304	4.830	71.625	1.688	6.252	70.016
5	1.215	4.498	76.123	1.649	6.108	76.123

Extraction method: Principal Component Analysis.

4.7 Correlation analysis

The results of the Pearson correlation analysis are shown in Table 7.

Table 7. Pearson correlation analysis (r-value)

	AG	TS	TE	IU	PU	PEOU	AU	TB	MB	WB
AG	1.000									
TS	0.606***	1.000								
TE	0.053	0.218***	1.000							
IU	0.054	0.002	0.262***	1.000						
PU	-0.019	-0.111	0.035	0.695***	1.000					
PEOU	0.024	-0.096	0.030	0.603***	0.776***	1.000				
AU	0.052	-0.124*	0.005	0.629***	0.787***	0.704***	1.000			
TB	0.176**	0.039	-0.147*	0.185**	0.330***	0.304***	0.273***	1.000		
MB	0.101	0.093	-0.088	0.182**	0.183**	0.247***	0.159*	0.737***	1.000	
WB	0.111	0.084	-0.156*	0.136*	0.192**	0.167**	0.195**	0.619***	0.613***	1.000

Note: *p < 0.05; **p < 0.01; ***p < 0.001.

On the whole, there is a strong positive correlation between variables such as IU, PU, PEOU, and AU. Meanwhile, a significant positive correlation is also observed between TB, MB, and WB. However, the correlations between each of these variables and AG, as well as between each of these variables and TE, are relatively weak.

4.8 Structural equation analysis

Based on the analysis conducted by data analysis software, the path coefficient estimates are shown in Table 8.

Table 8. Path coefficient estimates

Path	Standardized Path	Unstandardized Path	S.E.	C.R.	P	Significant or Not
TB → PEOU	0.222	0.286	0.086	3.326	***	Yes
MB → PEOU	0.122	0.117	0.062	1.886	0.059	No
WB → PEOU	-0.035	-0.040	0.076	-0.528	0.598	No
TB → PU	0.217	0.250	0.052	4.806	***	Yes
MB → PU	-0.182	-0.156	0.036	-4.341	***	Yes
WB → PU	0.037	0.038	0.043	0.885	0.376	No
PEOU → PU	0.763	0.684	0.044	15.411	***	Yes
PU → AU	0.738	0.829	0.095	8.719	***	Yes
PEOU → AU	0.128	0.129	0.077	1.678	0.093	No
TB → AU	-0.023	-0.030	0.058	-0.522	0.602	No
MB → AU	-0.030	-0.029	0.041	-0.694	0.488	No

(Continued)

Table 8. Path coefficient estimates (Continued)

Path	Standardized Path	Unstandardized Path	S.E.	C.R.	P	Significant or Not
WB → AU	0.074	0.085	0.047	1.809	0.071	No
AU → IU	0.149	0.162	0.101	1.610	0.108	No
PU → IU	0.604	0.741	0.117	6.314	***	Yes
IU → AG	0.050	0.045	0.057	0.788	0.431	No
IU → TS	0.000	0.000	0.054	0.001	0.999	No
IU → TE	0.260	0.221	0.053	4.196	***	Yes

The standardized estimates of the SEM are shown in Figure 2.

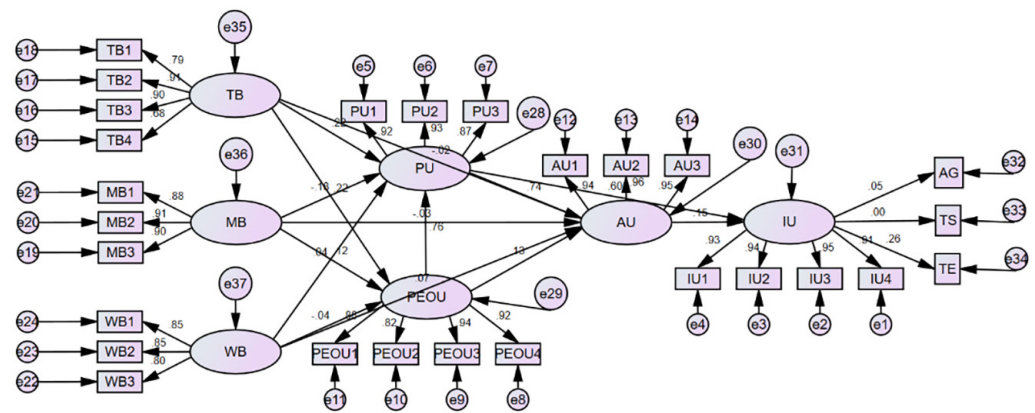


Fig. 2. Standardized estimates

5 CONCLUSIONS, DISCUSSIONS, AND RECOMMENDATIONS

5.1 Conclusions

Based on the previous analysis results, the following conclusions are drawn: The impact of PEOU on PU is valid; the impact of PEOU on attitude toward use (AU) is valid; the impact of PU on IU is valid; the impacts of TB and MB on PU are valid; the impact of TB on PEOU is valid; and IU depends on previous mobile TE. These conclusions are shown in Table 9.

Table 9. Hypothesis verification results

Hypothesis	Variable	Path	Variable	Direction	Results
H1	Perceived Ease of Use (PEOU)	→	Perceived Usefulness (PU)	+	Accepted
H2	Perceived Ease of Use (PEOU)	→	Attitude towards Use (AU)	+	Accepted
H3	Perceived Usefulness (PU)	→	Attitude towards Use (AU)	+	Rejected
H4	Perceived Usefulness (PU)	→	Intention to Apply (IU)	+	Accepted
H5	Attitude towards Use (AU)	→	Intention to Apply (IU)	+	Rejected
H6	Technical Barriers (TB)	→	Perceived Usefulness (PU)	-	Accepted
H7	Technical Barriers (TB)	→	Perceived Ease of Use (PEOU)	-	Accepted

(Continued)

Table 9. Hypothesis verification results (*Continued*)

Hypothesis	Variable	Path	Variable	Direction	Results
H8	Technical Barriers (TB)	->	Attitude towards Use (AU)	-	Rejected
H9	Management Barriers (MB)	->	Perceived Usefulness (PU)	-	Accepted
H10	Management Barriers (MB)	->	Perceived Ease of Use (PEOU)	-	Rejected
H11	Management Barriers (MB)	->	Attitude towards Use (AU)	-	Rejected
H12	Workload-Benefit Imbalance Barriers (WB)	->	Perceived Usefulness (PU)	-	Rejected
H13	Workload-Benefit Imbalance Barriers (WB)	->	Perceived Ease of Use (PEOU)	-	Rejected
H14	Workload-Benefit Imbalance Barriers (WB)	->	Attitude towards Use (AU)	-	Rejected

5.2 Discussion

Core research results and theoretical adaptability. This study verified that PEOU has a positive impact on PU, which is highly consistent with Davis's core view that "ease of use is an antecedent variable of usefulness" [3]. Meanwhile, the direct positive impact of PU on application intention was also verified, further confirming that the actual utility of tools is the core driving force behind teachers' usage, which conforms to the logic that usefulness directly drives usage intention.

Some hypotheses in this study failed to pass verification. For example, the impact of usage attitude on application intention is not significant, which differs from the conclusion of "attitude mediating effect" proposed by Park et al. [17]. Combined with the analysis of sample characteristics, teachers aged 31–50 account for more than 80%, and this group pays more attention to the actual utility of teaching tools rather than subjective attitude preferences, resulting in the weakening of the mediating role of attitude. In addition, the impact of PU on usage attitude is not significant, possibly because teachers' judgment of usefulness depends more on objective teaching effects rather than subjective attitude evaluation, leading to the weakening of the conversion path from tool value recognition to usage attitude. This is closely related to the result-oriented teaching evaluation atmosphere in domestic colleges and universities.

Practical mapping of barrier factors. Among the three types of barrier factors, TB and management barriers have the most significant negative impact on PU, and TB further extend to PEOU, forming a two-dimensional obstacle. However, the barrier of imbalance between workload and benefits has no significant impact on core variables, and this result is highly related to the deep logic of educational practice scenarios.

From the perspective of TB, concerns about data security make teachers use tools cautiously due to responsibility considerations, which is consistent with Kim et al.'s finding that technical stability directly affects teachers' technology adoption [18]. However, TB have no significant impact on usage attitude, possibly because 40.5% of teachers in the sample have preliminary mobile TE and have formed the cognition that technical failures can be solved through debugging, so they will not deny the overall value of tools due to occasional problems, weakening the negative impact on attitude.

The negative impact of MB on PU highlights the key role of school support systems. Feedback from open-ended questions in the questionnaire shows that 82% of

teachers mentioned the lack of technical training and incentive policies, which is related to the resource allocation tendency of “valuing scientific research over teaching technology innovation” in domestic colleges and universities.

The impact of the barrier of imbalance between workload and benefits did not meet expectations, which seems contradictory to teachers' feedback that lesson preparation time has increased. In fact, it reflects the existence of a utility compensation mechanism. Although some teachers believe that using tools will increase their workload, when tools can significantly improve the efficiency of classroom interaction, they will form the cognition that utility offsets the burden, weakening the negative impact of the imbalance barrier.

Potential value of control variables. Previous mobile TE has a significant positive impact on application intention. Data shows that teachers who frequently use mobile teaching tools have significantly higher application intention than those without experience, indicating that practical experience is an effective way to improve acceptance, which is consistent with Venkatesh et al.'s finding that technical experience positively moderates usage intention [2].

Age and teaching seniority have no significant impact on application intention, breaking the stereotype that older teachers resist new technologies, indicating that teachers' acceptance of tools depends more on technical practicality than age. The weak correlation between teaching seniority and application intention shows that both new and senior teachers' pay attention to whether tools can solve teaching pain points, rather than differences in technical adaptability brought by teaching seniority.

5.3 Recommendations

Optimize the School Management and Support System. Establish a “training-incentive-guarantee” trinity mechanism. To address MB, schools should organize hierarchical technical training for teachers. Regarding hardware and technical support, it is necessary to resolve issues such as insufficient hardware and data security in TB—for instance, equipping teachers with dedicated tool devices, developing exclusive data encryption systems, regularly collecting feedback on tool usage based on actual operation, and optimizing and upgrading tool software to reduce malfunctions such as lagging and crashes.

Promote the adaptation of tool design to teaching needs. It is recommended that tool developers simplify operation processes to reduce teachers' time costs for learning. In addition, they should enhance utility functions—such as automatically calculating indicators like classroom interaction rates and the extent of students' academic performance improvement—allowing teachers to intuitively perceive the usefulness of the tools and offset the negative perception of increased workload.

Build an experience transfer and community support network. Implement an experience-sharing program, organizing experienced teachers to conduct training seminars so that teachers without experience can recognize the practical value of the tools through training. Furthermore, establish teacher communication communities, create online forums or offline groups, and encourage teachers to share tool usage skills and teaching design plans, thereby fostering an atmosphere of mutual assistance and common progress.

Conduct phased pilots and effect iteration. Start with the group of teachers who use the tools occasionally. Since these teachers already have basic experience in using the tools and have relatively higher acceptance, replicable experience can be

quickly formed through pilots and then promoted to teachers without experience, reducing overall promotion resistance. Additionally, establish a dynamic feedback mechanism to regularly collect teachers' feedback on tools and support policies, adjust policies in a timely manner, ensure the implementation of recommendations, and continuously optimize the effectiveness.

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