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An Extended Technology Model (ETAM) Framework for Understanding the Adaptation of Smart Teaching in Chinese Higher Education

Weiyin Xing

Doctor of Education Major in Educational Management, National University, M.F. Jhocson St., Sampaloc, Manila, Philippines

Abstract

Despite China's extensive investment in "Smart Education" infrastructure, classroom adoption remains inconsistent. This study applies an Extended Technology Acceptance Model (ETAM) to examine how students and teachers in a public university perceive and adapt smart teaching technologies. A mixed-methods design was employed, involving 539 students and 53 faculty members. Data were collected through structured questionnaires measuring 9 ETAM constructs and semi-structured interviews with 15 participants. Quantitative analysis utilized descriptive statistics, correlations, and regression, while qualitative insights were derived from thematic coding. Findings highlight Perceived Usefulness (PU) as the strongest predictor of adoption. Students reported higher consensus on academic benefits (M = 4.20) compared to teachers (M = 3.91). Both groups expressed neutral views on technological and pedagogical challenges, though qualitative data revealed persistent issues such as unstable internet connectivity and limited IT support. Students emphasized user experience and ease of use, while teachers were more influenced by institutional support and social influence. The results underscore a digital divide between infrastructure availability and effective classroom integration. While smart tools enhance productivity and real-time feedback, gaps in institutional support and training hinder deeper pedagogical transformation. The proposed ETAM framework demonstrates that successful adoption requires aligning technological investment with stakeholder-specific motivations. University leaders should prioritize holistic strategies that integrate infrastructure, training, and institutional policies to ensure sustainable smart teaching practices.

Keywords: Extended Technology Acceptance Model (ETAM), Smart Education, smart teaching adoption, institutional support, user experience, Chinese Higher Education

INTRODUCTION

Despite China's massive investment in "Smart Education" infrastructure, a notable disconnect persists between the availability of AI-driven tools and their actual pedagogical application. While the Ministry of Education (2022) indicates high levels of smart classroom access, interactive technology is utilized in fewer than half of all courses, often due to a research focus on top-down implementation that neglects the lived experiences of students and teachers. Traditional studies frequently rely on the Technology Acceptance Model (TAM) without considering the nuanced policy environments, institutional support, and individual attitudes that fundamentally dictate how digital transformation unfolds in practice.

To bridge this gap, this study employed the Extended Technology Acceptance Model (ETAM) to empirically test technology adoption within a Chinese public university. By evaluating variables such as Perceived Usefulness, Compatibility, and Technical Support from the perspectives of both educators and learners, the research seeks to move beyond theoretical analysis toward evidence-based practice. The goal is to provide university leaders and policymakers with actionable guidelines ranging from infrastructure refinements to specialized training that ensure technological investments translate into measurable improvements in student learning outcomes.

More specifically, this study is guided by the following research questions:

1. How do students and teachers perceive the usefulness of smart teaching in enhancing learning outcomes?

2. What technological and pedagogical challenges do students and teachers face in implementing smart teaching?

3. What are the students' and teachers' attitudes toward smart teaching?

4. What institutional policies and supports that can enhance the use of smart teaching?

5. Based on the findings, what framework may be proposed for the adoption of smart teaching?

This study utilizes the Extended Technology Acceptance Model (ETAM) to examine the complex user-acceptance processes involved in adopting innovative teaching tools among Chinese higher education students and teachers. While maintaining the core TAM relationship—where Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) drive Attitude (ATT) and Behavioral Intention (BI)—this research incorporates context-specific constructs such as Social Influence (SI), Compatibility (COM), User Experience (UX), and Perceived Risk (PR). Crucially, the framework distinguishes between user groups, noting that students are primarily driven by experience and ease of use, whereas teachers are influenced by Institutional and Training Support. By integrating these facilitating conditions and social dynamics, the model provides a more comprehensive explanation of technology adoption in environments where external pressures and systemic support are vital for long-term integration.

LITERATURE REVIEW

Smart Education and Smart Teaching: Concepts and Global Trends. Smart Education evolves beyond e-learning by integrating AI, big data, and IoT to provide personalized, data-driven feedback (Yang et al., 2025; Tan et al., 2025). This ecosystem facilitates Smart Teaching through sensors and formative analytics (Zhang et al., 2025), while gamified spaces enhance engagement (Hwang et al., 2025). Successful adoption, seen in Singapore and Finland, relies on PU and PEOU. However, barriers like infrastructure deficits and privacy concerns persist (Efstratopoulou et al., 2025). Ultimately, adoption requires intuitive design and institutional readiness to ensure tools act as relevant cognitive partners (Ullah et al., 2025).

Smart Teaching Adoption (ETAM Constructs). The ETAM framework bridges original TAM variables with specific educational contexts, allowing for a construct-by-construct discussion supported by recent empirical evidence that identifies literature gaps and proposes advancements for research in Chinese higher education.

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). These remain fundamental determinants of technology adoption, where PU reflects the belief that a system enhances performance and PEOU denotes the user's perceived effort. In smart classrooms, PU predicts teaching effectiveness and pedagogical innovation, with recent findings suggesting that adaptive systems and AI-infused platforms drive long-term engagement and behavioral intention (Alghazi et al., 2025). However, PEOU significantly moderates this utility; poor system integration or unintuitive interfaces can diminish perceived benefits (Ullah et al., 2021). Consequently, the longitudinal development of these perceptions varies by role, as students prioritize navigational ease while teachers must reconcile perceived utility with the potential increase in workload (Mailizar et al., 2023).

Social Influence (SI). This reflects the perceived pressure from significant others or institutions to adopt a system. In Chinese higher education, this often manifests as a top-down mandate that can accelerate initial acceptance but may lead to perfunctory use rather than deep pedagogical integration (Nie et al., 2023; Yang, 2023). Conversely, informal peer networks that promote cooperative learning tend to foster more genuine, long-term participation among both students and faculty. This highlights a critical tension between compliance-driven and desire-driven adoption, suggesting that while policy-driven SI ensures presence, high-quality engagement requires the influence to be balanced with supportive institutional frameworks rather than purely directive pressure.

Institutional Support (IS). This encompasses the policies, funding, and administrative structures essential for the successful absorption of intelligent teaching tools. Research indicates that IS acts as a critical intermediary between high-level policy and actual classroom practice; for instance, dependable infrastructure and faculty rewards significantly bolster technology acceptance (Nie et al., 2023). Conversely, inadequate support can stifle usage even when behavioral intentions are high. While some debate persists regarding whether IS serves as a direct predictor or a moderator for Perceived Usefulness and Perceived Ease of Use, it is increasingly viewed as a dynamic enabler that must adapt to individual and environmental contexts to ensure sustained integration.

Compatibility (C). This refers to how well an innovation aligns with the established beliefs, experiences, and practices of its users. In smart education, this involves the synergy between technology and existing curricula, assessment methods, and institutional culture. For educators, adoption is higher when tools augment rather than replace current pedagogical processes, while student acceptance depends on how well platforms match their learning styles (Rahayu & Widodo, 2025). Although technological disruptions can foster creativity, they often face resistance, even in exam-oriented cultures, if they require excessive pedagogical shifts (Yang, 2023). Thus, successful implementation requires a strategy that respects the specific contextual environment to minimize pushback.

User Experience (UX). This encompasses the cognitive and affective responses elicited during technology interaction, focusing on aesthetics, responsiveness, and personal relevance (Alghazi et al., 2025). Positive UX significantly bolsters Perceived Usefulness (PU) and Perceived Ease of Use (PEOU); for instance, intuitive interfaces enhance student satisfaction and continued usage intentions, while poor design can lead teachers to abandon even theoretically advantageous tools (Ullah et al., 2021; Mailizar et al., 2023). Although often reduced to basic usability, contemporary research advocates for a broader definition of UX that includes emotional engagement and cognitive load (Efstratopoulou et al., 2024). Integrating this expanded view into acceptance frameworks is vital for balancing the distinct design expectations of both students and educators.

Perceived Risk (PR). This involves the potential negative consequences of technology use, such as data privacy concerns, system unreliability, and pedagogical disruptions (Featherman & Pavlou, 2023). In the context of smart teaching, these risks are amplified by learning analytics and AI assessments, raising critical questions regarding algorithmic accountability (Efstratopoulou et al., 2024). Educators often perceive higher risk than students due to their responsibility for learner privacy and instructional quality, whereas students focus more on technical failures that could impact academic achievement (Nie et al., 2023). While some evidence suggests that robust institutional support and superior user experience can mitigate these concerns, a lack of user involvement in system governance often sustains underlying trust issues despite existing technical safeguards.

Training and Technical Support (TS). This is vital for equipping users with the knowledge and confidence required to utilize systems effectively. Research highlights that sustained professional development and troubleshooting assistance are critical for fostering creative technology use and reducing faculty attrition. Despite its importance, TS is often marginalized during the planning phase, creating a gap between infrastructure availability and actual efficiency. Current debates focus on whether support should be centralized or department-specific, with emerging hybrid models suggesting that institutionally directed infrastructure is most effective when paired with discipline-specific guidance (Nie et al., 2023).

Empirical Applications of ETAM. Research confirms that while PU and PEOU remain foundational to TAM, an Extended TAM (ETAM) is necessary to address modern digital complexities. Adoption of AI and VR depends on system quality and interactivity (Al-Adwan et al., 2023), with a divide between student focus on usability and faculty focus on Compatibility (C). Consequently, Institutional Support (IS) and readiness are critical predictors (Mailizar et al., 2023). Mitigating Perceived Risks (PR) through robust policies is essential for fostering trust and ensuring long-term engagement.

METHODS

Research Design. This study adopted a convergent parallel mixed-methods design, which integrates quantitative and qualitative approaches to provide a comprehensive understanding of smart teaching adoption in Chinese higher education. In this design, both strands of data were collected simultaneously and analyzed independently before being merged for interpretation. The quantitative component involved administering standardized survey instruments to measure the constructs of the Extended Technology Acceptance Model (ETAM), such as Perceived Usefulness, Ease of Use, Social Influence, and Institutional Support. This allowed for statistical examination of adoption determinants across a large sample of students and faculty. In parallel, the qualitative component consisted of semi-structured interviews that captured participants lived experiences, perceptions, and challenges in using smart teaching tools. These narratives provided contextual depth and highlighted issues not easily quantifiable, such as cultural expectations and institutional dynamics. By applying the convergent parallel strategy, the study ensured that numerical trends were complemented by rich descriptive insights. The integration of findings from both strands offered a fuller, more grounded account of how smart teaching technologies are perceived and adopted, thereby strengthening the validity and applicability of the proposed ETAM framework.

Population and Sampling. This study utilized purposive sampling to recruit 539 students and 53 faculty members from diverse disciplines, ensuring all participants had practical experience with smart teaching. The student cohort (primarily aged 18–22) was 68.1% female and 24.3% male; faculty respondents included a mix of junior and senior professors (60.4% female, 34.0% male). Recruitment via institutional social media (QQ) targeted active users to enhance ecological and content validity. While this non-random approach introduces potential bias, it was intentionally selected to maximize construct relevance by focusing on individuals navigating ETAM components within a real-world environment.

Instrumentation. To operationalize nine ETAM constructs, this study utilized a structured questionnaire featuring parallel Likert-scale items and open-ended qualitative prompts. The instrument adapted validated psychometric scales for the Chinese higher education context, measuring Perceived Usefulness, Ease of Use, Social Influence, and Perceived Risk. Specific items assessed learning effectiveness, social interaction, and data security (Efstratopoulou et al., 2024). Additionally, Compatibility and Institutional Support were evaluated based on alignment with habits and university resources. This mixed-methods approach balances contextual richness with the reliability of traditional TAM methodologies.

Data Gathering Procedure. This study followed a two-phase, mixed-methods schedule in 2025 during the spring semester to ensure participants had sufficient experience with smart tools before exams. In Phase 1, quantitative and qualitative data were gathered via Wenjuanxing from 539 students and 53 teachers, using WeChat and QQ for recruitment to ensure engagement. Phase 2 involved semi-structured, 30-to-45-minute interviews in May 2025 with 10 students and 5 lecturers to triangulate findings and elucidate emotional insights into institutional support gaps. Throughout, strict ethical protocols ensured anonymity and voluntary participation. Integrating Likert-scale ratings and interview transcriptions allowed for robust thematic analysis, capturing a comprehensive view of how ETAM constructs manifest within the university's digital transformation.

Data Analysis. This study utilized a convergent mixed-methods approach, integrating quantitative data from Jamovi with qualitative themes from NVivo for a rigorous profile of smart teaching adoption. Quantitative rigor was established through descriptive statistics, Pearson correlations, and multiple regression, with scale reliability confirmed via Cronbach's alpha (a > 0.80) and exploratory factor analysis. These measures identified key predictors of Behavioral Intention (BI), such as the indirect effect of PEOU through PU, which were elucidated by Braun and Clarke's thematic analysis. Qualitative insights—validated through member checking—complemented independent t-tests by linking student adoption to exam preparation and faculty resistance to technical support concerns. By merging these datasets, the research triangulated ETAM relationships with situational meanings, creating a site-specific adoption model.

RESULTS

Perceived usefulness of smart teaching in enhancing learning outcomes. Table 1 shows the teachers' perceptions of the usefulness of smart teaching for improving learning outcomes. Teachers exhibit a generally positive perception of the instructional value of smart technologies (M = 3.91). High ratings for real-time feedback and teaching effectiveness suggest that educators prioritize tools facilitating data-driven decision-making and efficiency (Alghazi et al., 2025). This aligns with Perceived Usefulness (PU) as a primary adoption driver for optimizing time management (Nie et al., 2023; Yang, 2023). However, lower scores for student engagement and differentiated instruction reveal a gap between theoretical potential and actual classroom implementation (Rahayu & Widodo, 2025; Ullah et al., 2021). While practical benefits are recognized, leveraging tools for transformative, learner-centered pedagogy remains a barrier to deep integration (Rahayu & Widodo, 2023).

Table 1
Teachers' Perceptions of the Usefulness of Smart Teaching for Improving Learning Outcomes

Indicators	Mean	SD	VI
Smart learning tools help me improve my overall teaching effectiveness.	3.97	0.87	A
They contribute positively to student learning outcomes.	3.82	0.89	A
They help increase my teaching productivity and efficiency.	3.97	0.86	A
Smart tools provide valuable teaching content and resources.	3.91	0.89	A
They enable me to implement more effective teaching strategies.	3.86	0.90	A
Smart teaching tools help me identify students' learning needs more effectively.	3.97	0.87	A
Smart teaching tools support differentiated instruction based on student performance or learning styles.	3.82	0.89	A
Using smart tools enables real-time feedback and assessment, improving student understanding.	3.97	0.86	A
Smart technologies help maintain student attention and engagement during lessons.	3.91	0.89	A
They make it easier to track student progress and adjust instruction accordingly.	3.86	0.90	A
Smart teaching tools contribute to deeper student learning and knowledge retention.	3.97	0.87	A
They encourage active student participation and interaction in class.	3.82	0.89	A
I can better monitor and support student learning outcomes using smart technologies.	3.97	0.86	A
The data provided by smart tools helps inform my teaching decisions.	3.91	0.89	A
Overall, I believe smart teaching enhances the quality of education I deliver.	3.86	0.90	A
General Weighted Mean	**3.91**		**A**

Table 2 reveals the students' perceptions of the usefulness of smart teaching for improving learning outcomes. Tertiary students exhibit a strong consensus on the academic benefits of smart tools, yielding a weighted mean of 4.20 ("Strongly Agree"). High scores for learning speed and real-time feedback (M = 4.30) underscore that students value self-paced learning and instantaneous assessment, which are critical for efficacy. This reinforces the role of technology in personalized academic support (Yang et al., 2025). However, lower agreement regarding deep engagement (M = 4.11) suggests caution concerning authentic participation (Rahayu & Widodo, 2025). While Perceived Usefulness (PU) dominates adoption, interaction quality depends heavily on classroom design and individual learning styles (Ullah et al., 2025).

Table 2
Students' Perceptions of the Usefulness of Smart Teaching for Improving Learning Outcomes

Indicators	MEAN	SD	VI
Smart learning tools help me improve my overall learning experience.	4.23	0.79	SA
Smart teaching tools contribute positively to my learning outcomes.	4.11	0.72	A
Smart learning tools help increase my productivity and efficiency in learning.	4.30	0.72	SA
Smart tools provide valuable learning content and resources.	4.13	0.80	A
Smart learning tools enable me to engage in more effective learning strategies.	4.25	0.70	S
Smart teaching tools help me identify my learning needs more effectively.	4.23	0.79	SA
Smart teaching tools support my learning based on my performance or learning style.	4.11	0.72	A
Using smart tools enables real-time feedback and assessment, improving my understanding.	4.30	0.72	SA
Smart technologies help maintain my attention and engagement during lessons.	4.13	0.80	A
Smart learning tools make it easier to track my progress and adjust my learning approach accordingly.	4.25	0.70	SA
Smart teaching tools contribute to deeper learning and better knowledge retention.	4.23	0.79	SA
Smart tools encourage my active participation and interaction in class.	4.11	0.72	A
I can better monitor my learning progress using smart technologies.	4.30	0.72	SA
The data provided by smart tools helps inform my learning decisions.	4.13	0.80	A
Overall, I believe smart teaching enhances the quality of my education.	4.25	0.70	SA
General Weighted Mean	**4.20**		**SA**

Technological and pedagogical challenges faced in the implementation of smart teaching. Table 3 exhibits the technological challenges faced by teachers in implementing smart teaching. Teachers perceive technological challenges as moderate rather than critical (M = 2.58). While issues like insufficient IT support and budget constraints exist (M = 2.60), these Institutional Support (IS) factors do not consistently prevent smart tool usage (Yang, 2023; Nie et al., 2023). Lower ratings for hardware and interface complexity suggest that in resource-rich environments with adequate training, technical obstacles become secondary. Per the ETAM, instructional benefits (PU) and ease of use (PEOU) often outweigh technical hurdles (Ullah et al., 2021; Yang et al., 2025). Ultimately, integration is driven more by social influence and perceived utility than by technical limitations.

Table 3
Technological Challenges Faced by Teachers in Implementing Smart Teaching

Indicators	Mean	SD	VI
I often experience unreliable internet connectivity in my teaching environment.	2.57	0.94	D
The available hardware (e.g., computers, projectors, smart boards) is outdated or insufficient.	2.59	0.95	D
Technical issues frequently disrupt my use of smart teaching tools during lessons.	2.58	0.92	D
I have no access to the essential digital tools or platforms required to implement smart teaching effectively.	2.53	0.95	D
There is a lack of IT support when technical problems occur.	2.60	0.95	N
Smart teaching tools are incompatible with the devices or systems I currently use.	2.57	0.94	D
I find it difficult to troubleshoot technical issues on my own.	2.59	0.95	D
There are not enough digital resources (e.g., software, apps) aligned with my curriculum.	2.58	0.92	D
The user interfaces of smart teaching tools are too complex or unintuitive.	2.53	0.95	D
Security and privacy concerns make me hesitant to use certain smart technologies.	2.60	0.95	N
The school or institution does not provide regular updates or maintenance for digital tools.	2.57	0.94	D
I face challenges by integrating multiple technologies into a cohesive teaching experience.	2.59	0.95	D
Smart teaching tools often lag, crash, or perform unreliably in class.	2.58	0.92	D
There is insufficient bandwidth to support multiple users accessing smart tools simultaneously.	2.53	0.95	D
The smart teaching tools I need are too expensive or not budgeted for by the institution.	2.60	0.95	N
General Weighted Mean	**2.58**		**N**

Table 4 presents the pedagogical challenges teachers face when applying smart teaching strategies. Teachers maintain a neutral perspective (M = 2.64) regarding pedagogical challenges, suggesting integration issues are not critical barriers. Low scores for stylistic misalignment (M = 2.60) and collaborative difficulties (M = 2.55) indicate that smart tools generally fit existing methodologies, a key predictor of adoption (Rahayu & Widodo, 2025; Yang, 2023). While moderate concerns exist regarding curriculum adaptation and training time (M = 2.60–2.66), these structural hurdles typically do not hinder use when supported institutionally (Nie et al., 2023). Ultimately, this neutrality reflects a workforce that views these technologies as flexible and adaptable, though full integration requires ongoing development to address retention, equity, and sustained institutional support.

Table 4
Pedagogical Challenges Faced by Teachers in Implementing Smart Teaching

Indicators	Mean	SD	VI
Smart teaching tools often do not align with my teaching style or pedagogical approach.	2.60	0.91	D
I find it difficult to adapt my lessons to effectively incorporate smart technologies.	2.65	0.91	N
Students are often distracted by technology during lessons, affecting their engagement.	2.66	0.92	N
Smart teaching tools do not fully support the interactive learning methods I prefer to use.	2.62	0.93	N
I struggle to assess student progress or comprehension using smart teaching tools.	2.66	0.93	N
There is a lack of resources or content that aligns with my subject area when using smart teaching tools.	2.60	0.91	D
It is difficult to integrate technology into group activities or collaborative learning.	2.65	0.91	N
Students find it challenging to engage with smart tools or require more guidance than expected.	2.66	0.92	N
I have concerns about the equity of access to technology for all students in my classroom.	2.62	0.93	N
I find it difficult to measure the effectiveness of smart tools on student learning outcomes.	2.66	0.93	N
There is insufficient time to train students on how to use smart tools effectively.	2.60	0.91	D
Students with varying levels of digital literacy create challenges when using smart teaching tools.	2.65	0.91	N
The use of smart teaching tools requires too much preparation or planning time.	2.66	0.92	N
I am uncertain about the impact of smart teaching tools on students' long-term retention of knowledge.	2.62	0.93	N
I face difficulty maintaining a balance between traditional and smart teaching methods in my curriculum.	2.66	0.93	N
General Weighted Mean	**2.64**		**N**

Table 5 presented the technological challenges students encounter with smart teaching implementation. Students maintain a neutral stance toward technological challenges (M = 2.96), acknowledging frequent disruptions like system crashes and lag (M = 3.06) without viewing them as insurmountable barriers (Yang et al., 2025). However, persistent stability issues can diminish Perceived Usefulness (PU) and satisfaction, requiring infrastructure improvements to prevent frustration (Alghazi et al., 2025; Nie et al., 2023). Concerns regarding outdated hardware and data privacy (M = 2.96) underscore that usability and trust are pivotal to the ETAM; students may disengage from platforms perceived as insecure (Efstratopoulou et al., 2024). Ultimately, while students are adaptable, successful transformation requires clear data protection to ensure a reliable learning environment.

Table 5
Technological Challenges Faced by Students in the Implementation of Smart Teaching

Indicators	Mean	SD	VI
I often experience an unreliable internet connection that disrupts my use of smart learning tools.	2.81	0.83	N
The available hardware (e.g., computers, projectors, smart boards) in my classroom is outdated or insufficient for effective learning.	2.96	0.75	N
Technical issues frequently disrupt my access to or use of smart learning tools during lessons.	3.06	0.74	N
I do not have access to the essential digital tools or platforms needed to fully participate in smart learning activities.	2.96	0.73	N
There is a lack of technical support available when I encounter problems with smart learning tools.	3.00	0.78	N
Smart learning tools are incompatible with the devices or systems I currently use for studying.	2.81	0.83	N
I find it difficult to resolve technical issues with smart tools on my own without assistance.	2.96	0.75	N
There are not enough digital resources (e.g., software, apps) that align with the curriculum for my courses.	3.06	0.74	N
The user interfaces of smart learning tools are too complex or unintuitive for me to use effectively.	2.96	0.73	N
I have security and privacy concerns that make me hesitant to use certain smart technologies for learning.	3.00	0.78	N
The school or institution does not provide regular updates or maintenance for the digital tools I need for learning.	2.81	0.83	N
I face challenges using multiple technologies in a coordinated way during my learning activities.	2.96	0.75	N
Smart learning tools often lag, crash, or perform unreliably, disrupting my learning experience.	3.06	0.74	N
There is insufficient bandwidth to support multiple users accessing smart tools at the same time.	2.96	0.73	N
The smart learning tools I need are too expensive or are not provided by the institution.	3.00	0.78	N
General Weighted Mean	**2.96**		**N**

Students' and teachers' attitudes toward smart teaching. Table 6 shows the perceptions of teachers regarding smart teaching as measured under Perceived Usefulness (PU).

Table 6
Teachers' Attitudes towards Smart Teaching in Terms of Perceived Usefulness

Indicators	Mean	SD	VI
Smart teaching tools enhance my ability to teach effectively.	3.89	0.77	A
I believe using smart tools helps improve student learning outcomes.	3.89	0.74	A
Smart tools make my teaching more productive and efficient.	3.91	0.87	A
I find smart tools valuable for meeting the diverse needs of my students.	3.87	0.78	A
Smart teaching tools improve the quality of lessons I can provide.	3.83	0.91	A
General Weighted Mean	**3.88**		**A**

Teachers strongly value the instructional utility of smart tools (M = 3.88), particularly for enhancing lesson quality (M = 3.93) and operational productivity (M = 3.91). These technologies are viewed as essential assistants for optimizing delivery (Ullah et al., 2021). While high Perceived Usefulness (PU) indicates receptivity toward efficiency, lower ratings for meeting diverse student needs (M = 3.87) highlight challenges in personalization (Alghazi et al., 2021). Curriculum integration limits often hinder optimal use in heterogeneous classrooms (Rahayu & Widodo, 2025; Yang, 2023; Mailizar et al., 2023). Ultimately, improving perceived value requires better customization and targeted training to support learning.

Table 7
Teachers' Attitudes towards Smart Teaching in Terms of Ease of Use

Indicators	Mean	SD	VI
Smart teaching tools enhance my ability to teach effectively.	3.89	0.77	A
I believe using smart tools helps improve student learning outcomes.	3.89	0.74	A
Smart tools make my teaching more productive and efficient.	3.91	0.87	A
I find smart tools valuable for meeting the diverse needs of my students.	3.87	0.78	A
Smart teaching tools improve the quality of lessons I can provide.	3.83	0.91	A
General Weighted Mean	**3.88**		**A**

Table 7 presents the teachers' attitudes toward smart teaching tools. Teachers perceive smart teaching tools as accessible and user-friendly (M = 3.88), reinforcing the critical role of Perceived Ease of Use (PEOU) in technology acceptance. High ratings for productivity (M = 3.91) suggest that intuitive interfaces encourage instructors to view technology as a valuable asset for reducing administrative burdens (Mailizar et al., 2023). However, a lower rating for impact on lesson quality (M = 3.83) reveals a gap between technical ease and pedagogical mastery (Yang, 2023). While usability is a prerequisite for adoption, teachers require targeted professional development to integrate tools into complex instructional designs (Ullah et al., 2021; Alghazi et al., 2025). Ultimately, PEOU drives initial trust, but ongoing support is vital for transformative practice.

Table 8
Teachers' Attitudes towards Smart Teaching in Terms of Behavioral Intentions

Indicators	Mean	SD	VI
I plan to continue using smart teaching tools in my future lessons.	4.02	0.74	A
I would recommend using smart teaching tools to my colleagues.	3.92	0.84	A
I am likely to incorporate more smart tools into my teaching in the future.	4.00	0.70	A
I would use smart teaching tools regularly if I had more access to them.	4.00	0.80	A
I feel that using smart teaching tools aligns with my teaching goals.	4.04	0.73	A
General Weighted Mean	**4.00**		**A**

Table 8 shows the teachers' intentions to continuously use smart teaching tools. Teachers exhibit a strong proactive commitment to sustaining smart technology use, evidenced by a high Behavioral Intention (BI) mean of 4.00 ("Agree"). The highest-rated item (M = 4.04) underscores significant alignment between tools and instructional goals, confirming that pedagogical harmony drives readiness (Rahayu & Widodo, 2025). High future intent (M = 4.02) and willingness to increase usage (M = 4.00) validate that positive PU and PEOU translate into long-term dedication (Nie et al., 2023). However, lower peer recommendation scores (M = 3.92) suggest caution, necessitating institutional "push effects" and professional development to move from individual adoption to institution-wide diffusion (Yang, 2023).

Table 9 presents faculty perspectives on how social factors influence their adoption of smart teaching tools. Teachers perceive a strong social push toward technology integration (M = 3.92), confirming Social Influence (SI) as a vital ETAM construct. Primary motivators include exposure to tech-capable colleagues (M = 4.06) and university leadership priorities (M = 3.98) (Nie et al., 2023). While institutional culture drives adoption, lower ratings for direct peer encouragement (M = 3.81) suggest advocacy varies by digital fluency (Yang, 2023). Ultimately, when smart teaching becomes a community standard backed by administration, educators internalize these social cues as professional responsibilities (Rahayu & Widodo, 2023).

Table 9
Teachers' Attitudes towards Smart Teaching in Terms of Social Influence

Indicators	Mean	SD	VI
I am encouraged by my colleagues to use smart teaching tools in my lessons.	3.81	0.91	A
I believe that using smart teaching tools is considered important by my school administration.	3.98	0.88	A
The use of smart teaching tools is becoming a norm in my teaching community.	3.85	0.90	A
I feel social pressure to use digital tools for teaching from my peers.	3.89	0.77	A
I am motivated to use smart tools because others in my professional network use them.	4.06	0.86	A
General Weighted Mean	**3.92**		**A**

Table 10
Teachers' Attitudes towards Smart Teaching in Terms of Social Influence

Indicators	Mean	SD	VI
Smart tools are compatible with the way I typically conduct my lessons.	3.91	0.85	A
The use of smart teaching tools aligns with my teaching philosophy.	3.87	0.85	A
I can easily integrate smart tools into my existing curriculum.	3.83	0.93	A
I feel that using smart teaching tools fits well with my teaching style.	3.85	0.88	A
The tools allow me to implement the strategies I value in my teaching.	3.85	0.96	A
General Weighted Mean	**3.86**		**A**

Table 10 reveals the teachers' perceptions regarding the alignment of smart tools with their individual teaching styles, philosophies, and instructional methods. Teachers perceive smart teaching tools as highly compatible with professional practice (M = 3.86). The highest-rated indicator (M = 3.91) suggests these tools function as seamless extensions of standard teaching behaviors, validating the Compatibility (C) construct of the ETAM (Yang, 2023). While educators report a strong pedagogical match with their instructional philosophies (M = 3.87), the lower rating for curriculum integration (M = 3.83) highlights structural hurdles in diverse course settings (Nie et al., 2023). Ultimately, successful embedding depends on both technological flexibility and the adaptability of existing instructional frameworks to ensure a seamless flow across curricula.

Table 11
Teachers' Attitudes towards Smart Teaching in Terms of User Experience

Indicators	Mean	SD	VI
I am satisfied with the overall performance of the smart teaching tools I use.	3.28	0.90	N
The user interface of smart teaching tools is intuitive and easy to use.	3.23	0.88	N
I enjoy using smart tools in my classroom.	3.36	0.87	N
I feel that my experience with smart tools enhances my teaching practice.	3.38	0.96	N
I feel that using smart tools is a positive experience for both me and my students.	3.38	0.87	N
General Weighted Mean	**3.32**		**N**

Table 11 displays the teachers' feedback on their experiences with smart teaching tools. Teachers maintain a cautiously positive view of the User Experience (UX) for smart tools (M = 3.32). While educators believe technology enriches professional practice and classroom engagement (M = 3.38), satisfaction is tempered by performance and usability concerns (Ullah et al., 2021; Nie et al., 2023). The user interface was rated lowest (M = 3.23), confirming that design complexity remains a significant barrier to pedagogical integration (Rahayu & Widodo, 2023). Although tools provide benefits like real-time feedback (Alghazi et al., 2025), moderate scores suggest they are not yet fully transformative. Adoption hinges on improving intuitive design and technical support within the ETAM framework.

Table 12
Teachers' Attitudes towards Smart Teaching in Terms of Perceived Usefulness

Indicators	Mean	SD	VI
Smart teaching tools enhance my ability to teach effectively.	3.64	0.97	A
I believe using smart tools helps improve student learning outcomes.	3.74	0.85	A
Smart tools make my teaching more productive and efficient.	3.94	0.79	A
I find smart tools valuable for meeting the diverse needs of my students.	3.66	0.82	A
Smart teaching tools improve the quality of lessons I can provide.	3.83	0.84	A
General Weighted Mean	**3.76**		**A**

Table 12 features the teachers' responses for the usefulness of smart teaching tools. Teachers express a generally positive view of how smart tools enhance teaching (M = 3.76). The highest-rated indicator (M = 3.94) emphasizes that educators primarily value these technologies for increasing productivity and efficiency. This validates the Perceived Usefulness (PU) construct of the TAM and identifies time-saving as a primary adoption driver (Alghazi et al., 2025; Ullah et al., 2021). However, lower ratings for teaching effectiveness (M = 3.64) and addressing diverse student needs (M = 3.66) suggest instructional impact is less clear when tools lack pedagogical alignment (Mailizar et al., 2023). Thus, logistical advantages currently outweigh transformative pedagogical impact (Rahayu & Widodo, 2023).

Table 13
Teachers' Attitudes towards Smart Teaching in Terms of Institutional Satisfaction

Indicators	Mean	SD	VI
I am satisfied with the overall performance of the smart teaching tools I use.	3.81	0.85	A
The user interface of smart teaching tools is intuitive and easy to use.	3.77	0.84	A
I enjoy using smart tools in my classroom.	3.77	0.86	A
I feel that my experience with smart tools enhances my teaching practice.	3.70	0.81	A
I feel that using smart tools is a positive experience for both me and my students.	3.89	0.82	A
General Average	**3.79**		**A**

Table 13 shows the teachers' satisfaction with the school and the use of smart teaching tools. They report a positive user experience with smart tools (M = 3.79), reflecting high satisfaction with classroom engagement and usability. The highest-rated indicator (M = 3.89) underscores that educators view these technologies as meaningful for improving interaction and fostering dynamic environments (Alghazi et al., 2025). While interfaces are considered intuitive and enjoyable (M = 3.77), the lower rating for long-term pedagogical advancement (M = 3.70) suggests that professional impact is not always immediately apparent (Rahayu & Widodo, 2023). Consequently, reaching full instructional potential requires robust development to move beyond basic efficiency into innovative teaching.

Table 14
Teachers' Attitudes towards Smart Teaching in Terms of Perceived Risks

Indicators	Mean	SD	VI
I worry about the security of student data when using smart teaching tools.	3.81	0.85	A
I am concerned about the privacy risks of using smart tools in my classroom.	3.77	0.84	A
I fear that using smart teaching tools might lead to technical issues that disrupt my lessons.	3.77	0.86	A
I am concerned that students might misuse smart tools or access inappropriate content.	3.70	0.81	A
I am unsure about the long-term sustainability of smart tools due to potential risks.	3.89	0.82	A
General Weighted Mean	**3.79**		**A**

Table 14 presents the teachers' perceived risks of using smart teaching tools. Teachers exhibit high risk awareness (M = 3.79) regarding smart tool integration. Their primary concern is long-term sustainability and institutional support (M = 3.89), reflecting doubts about financial longevity and rapid technical evolution (Alshammari et al., 2025). Educators also express significant apprehension regarding data security (M = 3.81) and privacy (M = 3.77). While student misuse is a lower concern (M = 3.70), it remains a factor mitigated by explicit policies (Ullah et al., 2021). Ultimately, Perceived Risk (PR), particularly concerning unauthorized information access and monitoring safeguards, heavily influences continued adoption (Featherman & Pavlou, 2023).

Table 15
Teachers' Attitudes towards Smart Teaching in Terms of Training Support

Indicators	Mean	SD	VI
Smart teaching tools enhance my ability to teach effectively.	3.64	0.97	A
I believe using smart tools helps improve student learning outcomes.	3.74	0.85	A
Smart tools make my teaching more productive and efficient.	3.94	0.79	A
I find smart tools valuable for meeting the diverse needs of my students.	3.66	0.82	A
Smart teaching tools improve the quality of lessons I can provide.	3.83	0.84	A
General Weighted Mean	**3.76**		**A**

Table 15 reveals the teachers' perception regarding the training support provided for effective smart teaching tool implementation.

They report positive Training Support (TS) with a weighted mean of 3.76 ("Agree"). Training significantly empowers productivity and efficiency (M = 3.94), validating TAM by elevating PU and PEOU. This alignment with professional development mirrors findings by Alghazi et al. (2025). However, lower ratings for addressing diverse student needs (M = 3.66) and general effectiveness (M = 3.64) reveal challenges in complex, differentiated instruction (Rahayu & Widodo, 2023; Ullah et al., 2021). While training facilitates task management, specialized development is essential to bridge the gap toward sophisticated, personalized pedagogy.

Table 16
Teachers' Attitudes towards Smart Teaching in Terms of Institutional Support

Indicators	Mean	SD	VI
Smart tools are compatible with the way I typically conduct my lessons.	3.91	0.85	A
The use of smart teaching tools aligns with my teaching philosophy.	3.87	0.85	A
I can easily integrate smart tools into my existing curriculum.	3.83	0.93	A
I feel that using smart teaching tools fits well with my teaching style.	3.85	0.88	A
The tools allow me to implement the strategies I value in my teaching.	3.85	0.96	A
General Weighted Mean	**3.86**		**A**

Table 16 summarizes faculty reports on institutional support and the perceived compatibility of smart teaching tools with their professional values and pedagogical practices. They report high levels of Institutional Support (IS), with a weighted mean of 3.86 ("Agree"), indicating an environment where smart tools align with instructional values. The highest-rated indicator (M = 3.91) suggests these technologies are viewed as flexible extensions of teaching behaviors, reinforcing the role of pedagogical compatibility in adoption (Rahayu & Widodo, 2023; Mailizar et al., 2023). Despite strong alignment with personal philosophies (M = 3.85–3.87), a lower score for curriculum integration (M = 3.83) reveals hurdles in rigid academic frameworks (Yang, 2023). While institutional readiness bolsters adoption, achieving seamless integration requires greater curricular flexibility (Ullah et al., 2021).

Table 17
Students' Attitudes towards Smart Teaching in Terms of Perceived Usefulness

Indicators	Mean	SD	VI
Smart teaching tools help me improve my overall learning effectiveness.	3.78	0.88	A
They contribute positively to my learning outcomes.	3.72	0.89	A
They help increase my productivity and efficiency in learning.	3.74	0.88	A
Smart tools provide valuable learning content and resources.	3.75	0.90	A
They enable me to implement more effective learning strategies.	3.78	0.91	A
General Weighted Average	**3.75**		**A**

Table 17 presents the students' perceptions regarding the utility and effectiveness of smart teaching tools in enhancing their learning outcomes. They generally perceive smart teaching tools as useful, yielding a weighted mean of 3.75 ("Agree"). They particularly value technology for enhancing learning effectiveness and study strategies (M = 3.78), corroborating Alghazi et al. (2025). While ratings for productivity and resource access (M = 3.74–3.75) align with Ullah et al. (2021), the lower score for direct impact on learning outcomes (M = 3.72) suggests a nuanced stance. Perceived influence on grades varies by individual style. Ultimately, students view these tools as essential for efficiency rather than guaranteed drivers of transformative academic success.

Table 18
Students' Attitudes towards Smart Teaching in Terms of Perceived Ease of Use

Indicators	Mean	SD	VI
I find it easy to use smart teaching tools during my studies.	3.78	0.86	A
The tools are simple to navigate and use in my learning.	3.75	0.87	A
I do not need extensive training to use smart teaching tools effectively.	3.72	0.89	A
I find that using smart tools in my studies is intuitive and straightforward.	3.73	0.87	A
I feel confident using smart teaching tools without facing many technical difficulties.	3.71	0.88	A
General Weighted Average	**3.74**		**A**

Table 18 shows the students' feelings on the ease of using smart teaching tools in classes.

Students generally perceive smart teaching tools as user-friendly and intuitive, as reflected by an overall weighted mean of 3.74 ("Agree"). The highest-rated indicator (M = 3.78) confirms that students find these tools easy to integrate into their studies, a factor that directly drives continued adoption and student confidence. While students are comfortable navigating these digital interfaces (Lee & Hwang, 2020), slightly lower scores for self-sufficiency in training (M = 3.72) and technical troubleshooting (M = 3.71) suggest that minor obstacles remain (Ullah et al., 2021). Despite these small challenges, the positive scores indicate that technical issues are not a significant deterrent to engagement, supporting the idea that user-friendly design and low technical barriers are essential for classroom success (Alghazi et al., 2025).

Table 19
Students' Attitudes towards Smart Teaching in Terms of Behavioral Intentions

Indicators	Mean	SD	VI
I plan to continue using smart teaching tools in my future studies.	3.77	0.88	A
I would recommend using smart teaching tools to my classmates.	3.76	0.90	A
I am likely to use smart tools regularly in the future.	3.77	0.89	A
I would prefer learning through smart tools if I had more access to them.	3.78	0.89	A
I am excited to explore more smart tools in my learning process.	3.76	0.89	A
General Weighted Mean	**3.76**		**A**

Table 19 indicates the students' intended actions when using smart teaching tools in the future. Students maintain a strong commitment to future technology use, with a Behavioral Intention (BI) weighted mean of 3.76 ("Agree"). The highest-rated item (M = 3.78) identifies resource accessibility as the primary driver for increased adoption. Consistent scores for planned future use (M = 3.77) and peer recommendation (M = 3.76) confirm that students trust these technologies and perceive significant value in their continuity (Alghazi et al., 2025). These findings align with the TAM, demonstrating that positive PU and PEOU, alongside institutional support, effectively predict long-term engagement and wider adoption (Alshammari et al., 2025; Efstratopoulou et al., 2024; Yang, 2023).

Table 20
Students' Attitudes towards Smart Teaching in Terms of Social Influence

Indicators	Mean	SD	VI
My classmates encourage me to use smart teaching tools in my studies.	3.75	0.89	A
I believe that my teachers expect me to use smart teaching tools for better learning.	3.76	0.87	A
Using smart tools is becoming the norm in my learning environment.	3.79	0.88	A
I feel social pressure to use digital tools for learning from my peers.	3.72	0.87	A
I am motivated to use smart tools because others in my class use them.	3.77	0.89	A
General Weighted Mean	**3.76**		**A**

Table 20 shows the students' feelings about the social factors that affect their use of smart teaching tools. Students perceive a significant social impetus toward adopting smart technologies, evidenced by an overall weighted mean of 3.76 ("Agree"). The highest-rated indicator—that using smart tools is becoming the "norm" (M = 3.79)—suggests that academic culture and institutionalization are powerful drivers (Yang et al., 2025; Alshammari et al., 2025). Peer behavior (M = 3.77) and teacher expectations (M = 3.76) act as critical social cues, confirming that faculty leadership and peer modeling shape student approaches (Alghazi et al., 2025). These findings align with the Social Influence (SI) construct of the ETAM, showing that when peers and teachers endorse digital tools, it creates a normalized, enthusiastic environment that naturally boosts adoption (Efstratopoulou et al., 2024).

Table 21
Students' Attitudes towards Smart Teaching in Terms of Compatibility

Indicators	Mean	SD	VI
Smart teaching tools are compatible with the way I learn best.	3.79	0.88	A
I can easily integrate smart tools into my existing study habits.	3.74	0.88	A
The use of smart tools aligns with my preferred learning methods.	3.73	0.90	A
Smart tools help me learn in ways that suit my learning style.	3.76	0.86	A
Using smart teaching tools fits well with how I approach my studies.	3.79	0.88	A
General Weighted Average	**3.76**		**A**

Table 21 reveals the students' feelings about compatibility of smart teaching tools with their own learning styles and habits. Students demonstrate high compatibility between smart tools and personal study habits (M = 3.76). The highest-rated indicators (M = 3.79) suggest these technologies mirror successful study approaches, reinforcing that adoption is higher when tools align with existing practices (Alghazi et al., 2025). While integration carries a low cognitive load (M = 3.74–3.76), a slightly lower score for alignment with preferred learning methods (M = 3.73) highlights that perceptions of fit vary across learner types (Rahayu & Widodo, 2023; Yang et al., 2025; Alshammari et al., 2025; Efstratopoulou et al., 2024). Ultimately, the diversity of student styles means total alignment is challenging, requiring tools that cater to unique educational preferences (Rahayu & Widodo, 2025; Ullah et al., 2021).

Table 22
Students' Attitudes towards Smart Teaching in Terms of User Experience

Indicators	Mean	SD	VI
I am satisfied with my overall experience using smart teaching tools.	3.47	0.89	A
I find smart teaching tools enjoyable to use in my studies.	3.40	0.88	N
The user interface of smart teaching tools is easy to understand.	3.43	0.87	A
My experience with smart tools has been positive so far.	3.39	0.86	N
I feel that smart tools make my learning process more engaging and interactive.	3.41	0.88	A
General Weighted Mean	**3.42**		**A**

Table 22 shows the students' feelings about the effects of using smart teaching technologies on their experience. Students maintain a cautiously positive User Experience (UX) regarding smart tools (M = 3.42). While reporting overall satisfaction (M = 3.47) and appreciating intuitive, interactive interfaces (M = 3.43), their scores for enjoyment and "vibrant" participation are lower (M = 3.39–3.40), suggesting limited engagement (Ullah et al., 2021). This moderate excitement aligns with research showing that complex designs or lack of personalization can hinder long-term passion (Alghazi et al., 2025; Nie et al., 2023). Ultimately, while functional UX supports basic adoption, sustained interest requires tools customized to meet specific learner needs and environmental contexts (Yang et al., 2025; Efstratopoulou et al., 2024).

Table 23
Students' Attitudes towards Smart Teaching in Terms of Training Support

Indicators	Mean	SD	VI
I feel that I received adequate training to use smart teaching tools effectively.	3.82	0.87	A
The training materials provided to use smart tools are clear and easy to follow.	3.76	0.87	A
I would benefit from more tutorials or guides on how to use smart tools.	3.76	0.90	A
I feel prepared to use smart teaching tools after receiving initial training.	3.76	0.89	A
The institution provides sufficient resources for me to learn how to use smart tools.	3.78	0.89	A
General Weighted Average	**3.77**		**A**

Table 23 exhibits the students' thoughts about the training and help they got from the school in using smart teaching technologies. Students express high confidence in Training Support (TS), reflected by a weighted mean of 3.77 ("Agree"). The highest-rated indicator—feeling adequately trained (M = 3.82)—suggests that initial programs successfully build self-efficacy. This readiness is bolstered by clear instructional materials and sufficient resources (M = 3.78), echoing findings by Nie et al. (2023) on the necessity of accessible support content. While students feel prepared, a persistent interest in additional tutorials (M = 3.76) highlights a desire for ongoing assistance over one-time orientation. Ultimately, robust institutional support and continuous guidance remain critical drivers for sustained technology adoption (Ullah et al., 2021).

Institutional policies and supports that can enhance the use of smart teaching. Both educators and students identify sociocultural dynamics as pivotal for adoption, with high mean scores (3.83–4.21). Teachers exhibit significantly higher susceptibility to social influence (M = 4.13–4.21) than students (M = 3.83–3.88), suggesting institutional hierarchies and departmental mandates exert greater pressure on faculty (Tarhini et al., 2025). While educators are motivated by leadership and peer networks, students view technology as a normative requirement primarily when a majority of instructors utilize it (Ullah et al., 2021).

Table 24
Descriptive Statistics of Social Influence (SI)

Indicator	Student Mean	Student SD	Teacher Mean	Teacher SD	Interpretation
SI-1	3.88	0.81	4.17	0.66	High
SI-2	3.85	0.83	4.18	0.63	High
SI-3	3.86	0.84	4.21	0.68	High
SI-4	3.84	0.85	4.13	0.66	High
SI-5	3.83	0.84	4.20	0.69	High

However, inconsistent advocacy can weaken these norms. Ultimately, organizational culture and peer networks are major catalysts, requiring both administrative incentives and strong peer examples for integration (Yang, 2023).

Table 25
Descriptive Statistics of Training Support (TS)

Indicator	Student Mean	Student SD	Teacher Mean	Teacher SD	Interpretation
TS-1	3.81	0.85	3.63	0.72	Moderate-High
TS-2	3.77	0.88	3.62	0.70	Moderate-High
TS-3	3.78	0.89	3.64	0.71	Moderate-High
TS-4	3.75	0.87	3.65	0.74	Moderate-High
TS-5	3.74	0.85	3.68	0.73	Moderate-High

Table 25 presents the Training Support (TS) that the school gives to students and staff in learning the use of smart teaching tools. Both students and teachers report "Moderate-High" training support, though a readiness discrepancy exists. Students express higher confidence, with their top-rated item—feeling adequately trained (M = 3.81)—suggesting orientations and tutorials are currently meeting their needs. Conversely, teachers report lower scores regarding their own adequacy (M = 3.63), highlighting systemic deficiencies in professional development that lack discipline-specific support. While both groups feel "somewhat" prepared, moving to daily implementation requires more continuous, personalized training (Nie et al., 2023). Ultimately, students are satisfied with basic support, but teachers face a "readiness gap" necessitating ongoing, specialized development to bridge technology access and pedagogical use.

Table 26
Descriptive Statistics of Institutional Support (IS)

Indicator	Student Mean	Student SD	Teacher Mean	Teacher SD	Interpretation
IS-1	3.92	0.76	3.95	0.69	High
IS-2	3.90	0.77	3.98	0.68	High
IS-3	3.86	0.78	3.93	0.70	High
IS-4	3.87	0.75	3.97	0.70	High
IS-5	3.86	0.78	4.01	0.69	High

Table 26 lists the Institutional Support (IS) that the school provides to help people use smart teaching technologies and adopt them. Both students and teachers report "High" levels of Institutional Support (IS), with teachers (M = 3.93–4.01) feeling slightly more supported than students (M = 3.86–3.95). Teachers lauded the sufficiency of IT help and resources (M = 4.01), suggesting targeted professional development is effectively reaching faculty. Students expressed confidence in the institution's provision of technical resources (M = 3.92), a critical determinant of performance (Yang, 2023). Technology adoption flourishes when infrastructure and administrative guidance align with user needs (Nie et al., 2023). However, the slight disparity suggests that while faculty are prioritized, ensuring equitable, long-lasting support for students remains a necessary institutional goal.

Qualitative evidence in Table 27 reveals that basic infrastructure functionality is hindered by a "digital divide" caused by unstable Wi-Fi, outdated equipment, and slow maintenance

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(Yang et al., 2025; Al-Ajlan, 2025). Ad hoc troubleshooting due to absent formal support erodes teacher confidence, risking tool abandonment (Rahayu & Widodo, 2023; Mailizar et al., 2021). This policy-reality disconnect is exacerbated by lack of incentives and peer modeling (Yang, 2023; Nie et al., 2023; Alghazi et al., 2021). Sustainability requires shifting toward proactive maintenance and discipline-specific guidance to bridge the gap between IT and faculty (Alghazi et al., 2025; Nie et al., 2023).

Table 27
Qualitative Findings on Institutional Support

Theme	Description	Sample Supporting Quotes
1. Adequacy of Facilities and Resources	Infrastructure is present but hindered by "dead zones," aging hardware, and slow repair cycles.	"Some classrooms have no internet, and broken devices are not repaired."
2. Accessibility of Technical Support	Lack of formal IT help desks forces a reliance on self-troubleshooting or peer assistance.	"Teachers explain how to use Learning Pass." "No dedicated technical support is available..."
3. Encouragement and Motivation from the Institution	Institutional encouragement is perceived as passive or lacks a clear system of rewards.	"I feel guided to use smart tools..." "...we don't use smart tools actively." "The school encourages digital teaching in principle, but there is no clear system of incentives."
4. Institutional Emphasis on Technology Integration	Top-down promotion exists without phased guidelines or hands-on implementation support.	"The school promotes smart teaching, and teachers now use tablets." "We are told to innovate, but training and implementation support are lacking."
5. Maintenance and Updating of Smart Teaching Tools	System reliability is inconsistent; software updates occur but crashes disrupt teaching.	"There are updates, and it doesn't lag much." "Sometimes the system crashes and affects class activities."
6. Policy Clarity and Stability (Teacher-specific)	Teachers require more stable, phased frameworks to navigate digital transitions.	"The school should gradually develop and implement clear, phased smart education policies."
7. Training Effectiveness (Teacher-specific)	Training is frequent but often lacks the practical, hands-on focus needed for mastery.	"The training is useful and well-organized." "There are too many meetings and not enough hands-on sessions."
8. Suggestions for Improvement (Teacher-specific)	Suggest peer-led sharing, structured feedback, and planned upgrade cycles.	"Encourage sharing of practical experiences among faculty." "Set up regular equipment upgrade cycles."

Proposed framework to adopt smart teaching. Figure 3 illustrates the proposed ETAM-based framework for implementing smart teaching at Mianyang Polytechnic. The model considers Behavioral Intention as the direct result of related factors: cognitive perceptions (perceived usefulness [PU], perceived ease of use [PEOU]), social influences (SI), and contextual enablers (user experience [UX], compatibility [C], training support [TS], institutional support [IS]). These dimensions interact to shape willingness to adopt and sustain the use of smart teaching tools in the university setting.

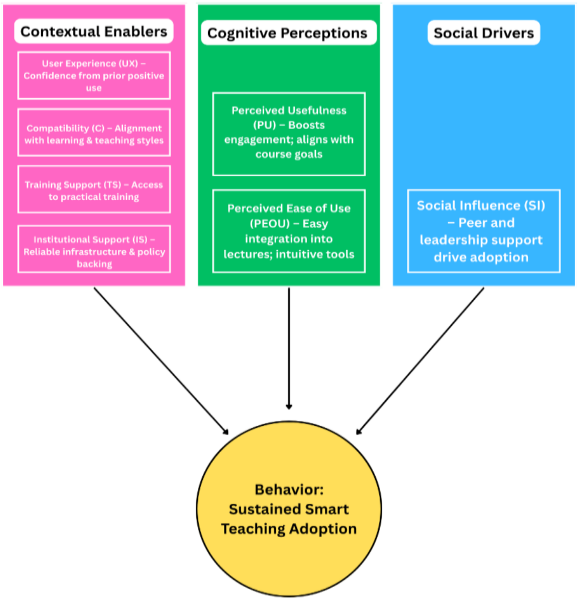

Figure 1
Framework for the Adoption of Smart Teaching

Regression analysis and qualitative evidence indicate that PU is the strongest determinant of teacher intention, with many noting its value for improving instructional efficiency (e.g., "The data dashboards help me intervene faster."). PEOU and UX are drivers for students facilitating intuitive interfaces, enjoying, and engagement interface. SI has equal and continuing effect on both groups via departmental culture, peer modeling, and administrative pressures. Although TS and IS themselves are not the main factors that induce users to adopt, they constitute essential infrastructural constructs – without them, even highly motivated users encounter obstacles.

The model also includes a feedback loop: successful experiences with uptake increase positive valuations, develop learners' sense of efficacy and habituate use in social networks (e.g., instructors advising colleagues; students creating cohorts around digital tools).

Differentiated Adoption Mechanisms. The model separates the behavior logics of teachers and students:

For teachers: Professional value, peer and administrative support, and performance-based incentives motivate adoption. Key quote: "This allows me to teach better, and our dean wants it."

For Students: Implementation is based on perceiving practicality, enjoyment, and apparent learning gains. Quote of note: "If it's interactive and fun, I'll use it — if it's just attendance, I won't." This indicates differentiated approach: teachers need formal preparation and incentives will induct outcomes, students move best by the quiet effect from digital learning that is seamless, engaging as much.

Implications for Stakeholders. The implications in Table 28 highlight the shared responsibility among stakeholders in embedding smart teaching into institutional practice.

Table 28
Stakeholder Roles and Recommended Actions for Smart Teaching Adoption

Stakeholder	Recommended Action
University Leaders	Align promotion criteria with smart teaching adoption; support infrastructure investment.
Faculty Developers	Offer differentiated training (hands-on for teachers, onboarding for students).
Instructors	Model adoption behaviors and share successful use cases across departments.
IT and Platform Designers	Improve usability, mobile compatibility, and responsiveness to feedback.

University leaders must align promotion criteria and invest in infrastructure to signal commitment. Faculty developers should provide tailored training that empowers instructors and students, fostering confidence and competence. Instructors play a pivotal role by modeling adoption behaviors and sharing successful practices, thereby normalizing innovation across departments. Meanwhile, IT and platform designers must ensure usability, mobile compatibility, and responsiveness to feedback, creating supportive environments. Together, these cultivate a culture where smart teaching becomes sustainable and integral.

In conclusion, the proposed framework emphasizes that the adoption of smart teaching is not a singular decision, but an ongoing process influenced by perceptions, social norms, and systemic supports. To progress from testing to long-term integration, we must combine positive cognitive appraisals (PU, PEOU), supportive environments (SI, IS), and adaptable implementation strategies. This framework gives stakeholders a strategic plan on how to make smart teaching a part of the institution's culture.

DISCUSSION

This study utilizes the ETAM framework, identifying Perceived Usefulness (PU) as the primary driver for smart teaching adoption. Students are significantly influenced by Perceived Ease of Use (PEOU) and Compatibility (C) with study habits, while teachers prioritize Training (TS) and Institutional Support (IS) due to Perceived Risks (PR) like technological failure (Nie et al., 2023). Social Influence (SI) remains crucial for both, as peer modeling defines innovation legitimacy (Alghazi et al., 2025; Ullah et al., 2021). Despite infrastructure, inconsistent technical help and vague policy frameworks hinder sustained implementation (Al-Ajlan, 2025).

Findings highlight a disconnect between top-down policies and classroom realities, necessitating personalized professional development over generic workshops. Students prioritize platform reliability to avoid academic burdens (Yang, 2023). Without rapid-response support and a culture rewarding digital creativity, adoption remains fragmented and dependent on individual motivation rather than institutional norms (Mailizar et al., 2021; Rahayu & Widodo, 2023).

Successful integration requires transitioning from mere infrastructure deployment to a holistic strategy balancing technological and human factors. Leaders must incentivize innovation through recognition and peer networks while addressing security and system stability. Despite its single-institution focus, this study provides a foundation for future longitudinal research to measure long-term educational outcomes. By aligning administrative objectives with nuanced stakeholder needs, universities can ensure digital tools drive genuine, lasting instructional transformation.

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