



**A Model for Enhancing Physical Education Teachers'
Self-Efficacy through DeepSeek on Pedagogy Design
in Public Universities in Guangxi, China**

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 Guangxi, China

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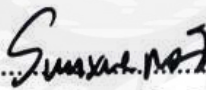
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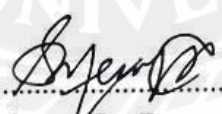
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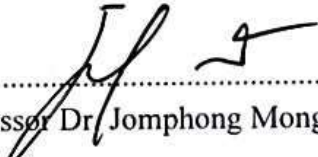
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Abstract

Title A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China

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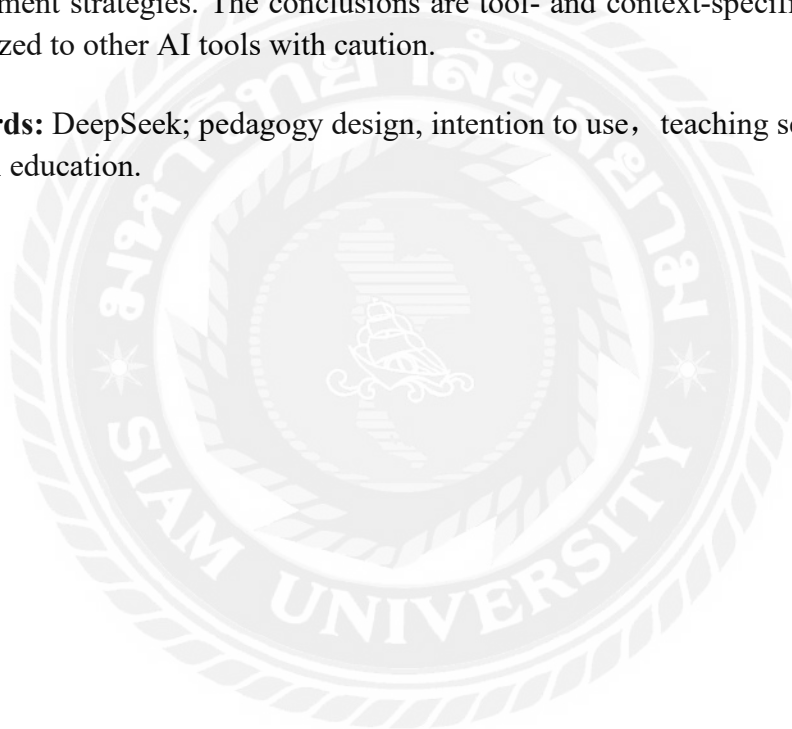
Artificial Intelligence (AI) is increasingly recognized as a transformative force in higher education; however, its integration into practice-based disciplines such as physical education (PE) remains underexplored. This study developed and validated the DeepSeek-Integrated PE Pedagogy Design Model to explain how DeepSeek adoption—with DeepSeek treated as the focal AI tool in this research—shapes PE teachers' intention to use DeepSeek in pedagogy design and strengthens their Teaching Self-Efficacy (TSE). Grounded in the Technology Acceptance Model (TAM), the Social Cognitive Theory (SCT), and the Motivation–Opportunity–Ability (MOA) framework, the model specifies that Perceived Usefulness (PU) and Facilitating Conditions (FC) increase teachers' Intention to Use DeepSeek on Pedagogy Design (ITU), whereas AI Anxiety (AIA) decreases ITU; ITU subsequently enhances TSE, and Perceived Ease of Use (PEOU) moderates these pathways by amplifying positive effects and buffering negative emotional influences.

A sequential mixed-methods approach was employed. Quantitatively, data from 402 PE teachers across 28 public universities in Guangxi were analyzed using Structural Equation Modeling (SmartPLS 4). The constructs demonstrated strong reliability and validity (Cronbach's $\alpha > .85$, CR $> .90$, AVE $> .60$). The structural results supported the hypothesized relationships: PU and FC significantly increased ITU, AIA exerted a negative influence on ITU, and ITU positively predicted TSE, which served as the model's central psychological outcome. Four AI-enabled instructional benefits—enhanced task clarity, greater instructional control, stronger classroom confidence, and improved outcome certainty—emerged as key mechanisms through which DeepSeek-supported pedagogy design contributes to strengthened TSE.

Qualitatively, semi-structured interviews with ten experts from Guangxi universities provided contextual validation and interpretation. Thematic analysis (MAXQDA 2020) indicated perceived benefits for lesson planning efficiency, differentiated instruction, data-informed assessment, and reflective practice, while also highlighting concerns about AI-related anxiety and insufficient institutional support.

The study contributes theoretically by extending TAM and SCT into a three-layer framework—Intervention (DeepSeek integration and facilitating conditions), Application (cognitive–affective adoption mechanisms), and Outcomes (AI-enabled instructional benefits leading to TSE). Practically, the findings offer actionable guidance for improving facilitating conditions, enhancing usability, reducing AI anxiety, and embedding DeepSeek-supported pedagogy design into institutional development strategies. The conclusions are tool- and context-specific and should be generalized to other AI tools with caution.

Keywords: DeepSeek; pedagogy design, intention to use, teaching self-efficacy, physical education.



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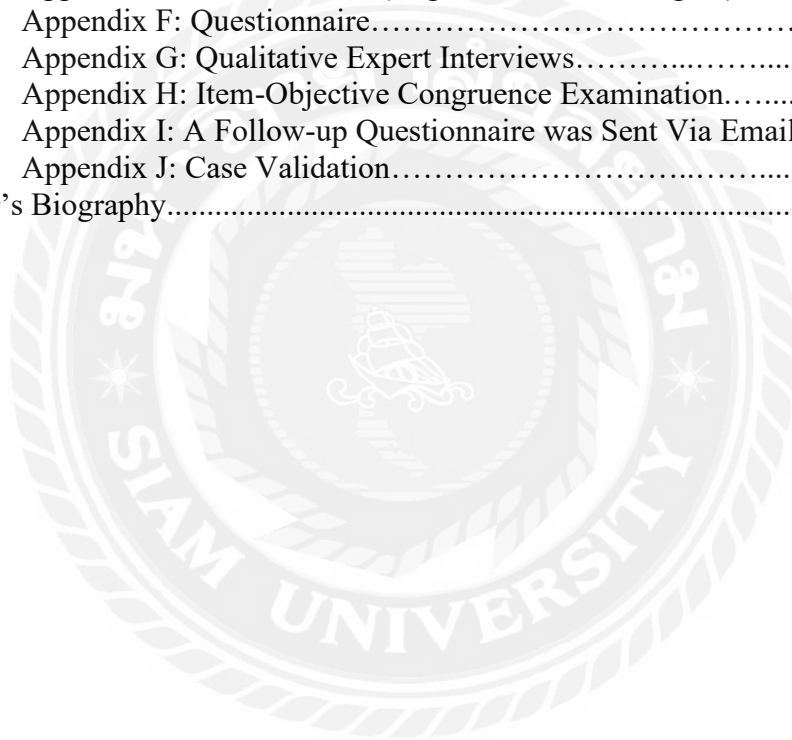
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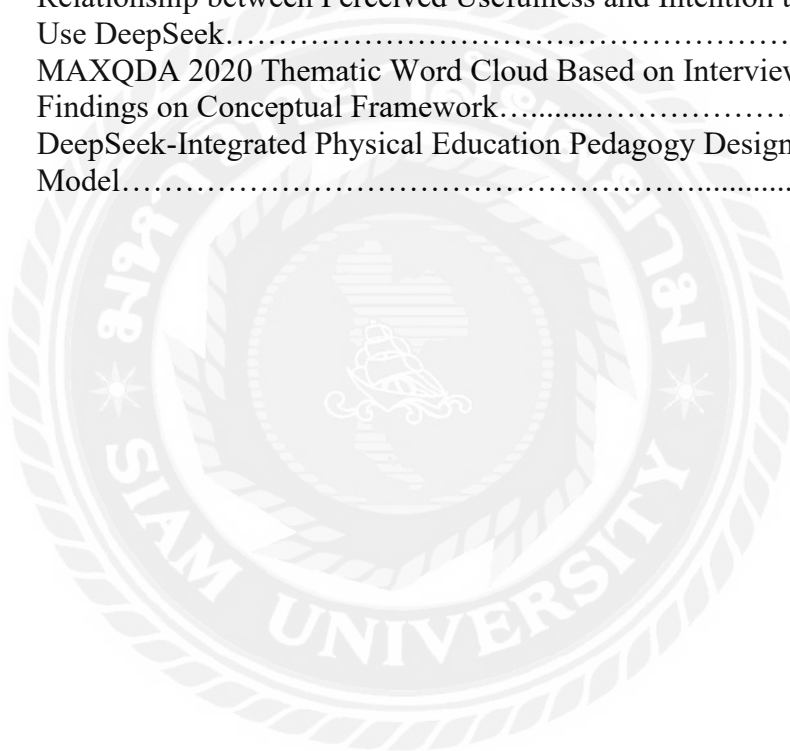
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List of Abbreviations

Abbreviation	Full Name
PE	Physical Education
LLM	Large Language Model
TSE	Physical Education Teacher's Self-Efficacy
ITU	Intention to use DeepSeek
AIA	AI Anxiety
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
FC	Facilitating Conditions
TAM	Technology Acceptance Model
MOT	Motivation–Opportunity–Ability Model
SCT	Social Cognitive Theory
IOC	Item-Objective Congruence
WJX	Wen Juan Xing Online Survey Platform
CFI	Comparative Fit Index
iFlytek	Information Fly technology AI Analysis Software

Remark: Created by Researcher

CHAPTER 1

INTRODUCTION

1.1 Background

1.1.1 Global and National Context of AI in Education

Artificial Intelligence (AI) has become a transformative force in higher education globally, reshaping teaching, learning, and curriculum design (Southworth et al., 2023). Large language models (LLMs) such as DeepSeek are increasingly recognized for their potential to enhance instructional innovation, facilitate personalized learning, and promote evidence-based pedagogical practices (Walter, 2024; Wang, 2025). At the international level, organizations such as UNESCO and OECD emphasize AI's impact on equity, ethical governance, and the cultivation of 21st-century skills (Zawacki-Richter et al., 2019). Countries including the United States, South Korea, and Singapore have already integrated AI into adaptive learning, automated assessment, and predictive analytics (Holmes et al., 2022).

China has positioned AI as a strategic national priority. The Next Generation Artificial Intelligence Development Plan (State Council, 2017) established the foundation, while the Ministry of Education's 2018 AI Innovation Action Plan highlighted curriculum reform and teacher training. In 2024, Guangxi was designated as China's "AI strategic highland" for ASEAN cooperation, underscoring the importance of integrating AI reform into higher education (Li & Wu, 2023; Zhai, 2025).

1.1.2 Guangxi as a Strategic Case for AI and Education

Guangxi holds a distinctive role as China's gateway to ASEAN, serving as a key platform for cross-border trade, the digital economy, and educational cooperation. Initiatives such as the China-ASEAN Information Harbor in Nanning exemplify the region's ambition for digital transformation (Li & Wu, 2023). In higher education, Guangxi's 28 public universities have invested heavily in digital infrastructure and teaching resources, particularly in applied disciplines.

The Guangxi Department of Education has taken the lead in promoting the integration of artificial intelligence technologies such as DeepSeek into teaching, prioritizing their adoption in well-resourced public undergraduate universities. Several institutions, including Guangxi Normal University, have conducted professional training programs focused on AI-assisted pedagogy design using DeepSeek.

However, physical education (PE) teachers in Guangxi still face notable challenges, including limited AI literacy, insufficient institutional support, and

uncertainty in integrating AI into practice-based pedagogy (Cui et al., 2025; Wang & Wang, 2024). These realities make Guangxi a compelling and representative context for examining the adoption of AI tools such as DeepSeek in higher education.

1.1.3 DeepSeek as an Emerging AI Tool for Pedagogy Design

While global AI platforms such as ChatGPT and Gemini dominate public discourse, China's homegrown LLMs are gaining traction. DeepSeek, as a bilingual, transparent, open-source model, is positioned as a cost-effective and culturally adaptive alternative for Chinese universities (Poo, 2025). In this study, DeepSeek is conceptualized not as a replacement for teachers but as an AI-assisted pedagogical design tool. As a co-design partner, it supports teachers in planning, implementing, and reflecting on their lessons. Such pedagogical design is particularly challenging in physical education, where teaching must balance cognitive learning, kinesthetic practice, and interpersonal engagement (Zhou et al., 2023). Accordingly, this study treats DeepSeek as the focal AI system throughout the conceptual model and measurement design. All constructs and measurement items are explicitly anchored to DeepSeek-enabled pedagogical design rather than generic AI or technology use. Therefore, the findings primarily explain adoption mechanisms in the DeepSeek-supported teaching-design setting for physical education in Guangxi public universities. Caution is required when extending these conclusions to other AI tools or institutional contexts.

1.1.4 Physical Education and the Need for Pedagogical Innovation

AI presents unique opportunities to address these long-standing issues. DeepSeek and similar tools can facilitate adaptive learning pathways, generate individualized exercise plans, support gamified assessments, and extend learning beyond the classroom. These affordances align with the national agenda to shift PE from “skill-drill” instruction to “quality-oriented education” that integrates physical literacy, health cognition, and affective development (Wang et al., 2024).

However, traditional PE teaching in Chinese universities remains constrained by several systemic limitations:

1. Uniform teaching approaches that ignore individual differences.
2. Overemphasis on technical drills with insufficient attention to health literacy.
3. Assessment systems that prioritize performance results over learning processes.
4. Outdated course content disconnected from students' interests.
5. Underutilization of PE's broader educational functions, such as teamwork and character building.
6. Limited extracurricular support for sustained physical activity.

These issues create a mismatch between standardized teaching and the diverse needs of learners, weakening teachers' motivation and professional confidence (Li & Zhao, 2020; Sun et al., 2021).

Thus, the core of PE reform lies not merely in digitalizing teaching content but in redefining pedagogy design itself. Pedagogy design refers to the systematic and adaptive process through which teachers organize, implement, and evaluate learning experiences to promote holistic student development (Vahdani et al., 2021). Integrating AI tools like DeepSeek into this process enables teachers to co-create personalized, data-informed, and student-centered teaching strategies—transforming PE pedagogy from skill-based delivery to intelligent, reflective practice.

1.1.5 Potential of AI-Assisted Pedagogy Design (DeepSeek) to Enhance Teacher Self-Efficacy

Teacher self-efficacy refers to educators' belief in their ability to organize and execute teaching tasks effectively, thereby influencing student outcomes (Bandura, 1997). In physical education, this confidence is critical due to the complexity of managing both cognitive and kinesthetic learning, classroom dynamics, and motivational engagement (Friedman & Kass, 2002). Teachers with high self-efficacy demonstrate greater persistence, adaptability, and openness to pedagogical innovation (Alibakhshi et al., 2020).

AI-assisted pedagogy design—supported by tools like DeepSeek—offers scaffolding that can enhance teachers' self-efficacy by providing planning assistance, activity variation, and real-time feedback. Such support can reduce preparation stress, improve perceived instructional control, and foster a sense of *partnership between AI and the teacher* in lesson design. Consequently, DeepSeek integration not only enriches instructional design but also strengthens teachers' professional identity, confidence, and reflective capacity.

1.1.6 Research Gaps and Contributions

Despite growing interest in AI for higher education, several gaps persist:

1. Regional gap: Most studies focus on developed regions such as Beijing, Shanghai, and Guangdong; Guangxi—designated as China's "AI Highland" for ASEAN collaboration—remains underexplored (Li & Wu, 2023).

2. Technological gap: Systematic empirical evidence comparing China's open-source DeepSeek to global LLMs remains scarce (Al-Ahmad et al., 2026); the limited comparative work available nevertheless indicates residual performance differentials in reasoning-intensive benchmarks (Awan et al., 2026).

3. Disciplinary gap: AI adoption in PE pedagogy is limited, given its practice-based and interactive characteristics (Zhou et al., 2023).

4. Pedagogical gap: Existing research often equates “AI in education” with content or syllabus design, overlooking pedagogy design that encompasses philosophy, strategies, and holistic experiences (Wang et al., 2024).

To address these gaps, this study focuses on Guangxi’s 28 public universities, aligning with national AI and educational modernization strategies. It provides early empirical evidence on DeepSeek’s application in PE pedagogy design, extending AI adoption research into practice-based domains. The study also highlights AI’s potential to enhance teachers’ self-efficacy and reimagine pedagogy design as an interactive, AI-supported, and student-centered process.

Table 1.1 Research Gaps and Contributions of this Study summarize these gaps and the corresponding contributions in a concise format, complementing the narrative discussion above.

Table 1.1 Research Gaps and Contributions of This Study

Dimension	Research Gap	Contribution of This Study
Why Guangxi	Existing research has emphasized developed regions; however, Guangxi remains underexplored.	Focuses on Guangxi’s 28 universities, aligning with national AI strategies and ASEAN role.
Why DeepSeek	Most studies examine global LLMs; empirical evidence on DeepSeek is scarce.	Provides early empirical insights into China’s emerging open-source LLM in PE pedagogy.
Why Physical Education	AI adoption in PE pedagogy is underexplored due to its practice-based nature.	Addresses this gap by examining AI’s potential in PE lesson planning, assessment, and teaching.
Pedagogy Design	Research often limits AI to syllabus/content design.	Expands to pedagogy design, encompassing philosophy, strategies, assessment, and experience.

Note. This table was developed by the researcher based on a synthesis of relevant literature.

1.2 Preliminary Interview Research

1.2.1 Interview with Experts

Semi-structured interviews were conducted with ten experts from five universities in Guangxi—five senior PE scholars and five administrators (Appendix A). The aim was to identify key factors influencing teachers' intention to adopt DeepSeek in pedagogy design and how such adoption relates to their teaching self-efficacy.

Table 1.2 Expert and Administrator Interview Keywords Mapped to Theoretical Constructs

Keyword (Macro-Level Focus)	Frequency	Mapped Construct	Interpretation
School Policy / Leadership Support	21	Facilitating Conditions (FC)	Institutional policies and leadership support provide the structural foundation for adoption.
Training Programs / Workshops	20	Facilitating Conditions (FC)	Continuous professional training strengthens teachers' readiness for AI adoption.
Resource Conditions (Hardware, Network)	25	Facilitating Conditions (FC)	Adequate infrastructure and reliable resources are prerequisites for sustainable use.
Perceived Usefulness for PE Teaching	25	Perceived Usefulness (PU)	Experts stressed DeepSeek's potential to enrich content, planning, and outcomes.
Ease of Use / Teacher Adaptability	20	Perceived Ease of Use (PEOU)	The usability of DeepSeek moderates the willingness to adopt and reduces resistance.
Teacher Recognition / Acceptance	17	Teacher Self-Efficacy (TSE)	Teachers' recognition and confidence directly influence sustained adoption.
Curriculum Innovation & Reform	10	PU / Intention to Use (ITU)	DeepSeek was viewed as a catalyst for innovative pedagogy and curriculum reform.
Teacher Development & Confidence	21	Teacher Self-Efficacy (TSE)	Professional confidence is critical for overcoming hesitation and ensuring use.

Keyword (Macro-Level Focus)	Frequency	Mapped Construct	Interpretation
Barriers: Time, Cost, Tech Anxiety	10	AI Anxiety (AIA)	Concerns about workload, costs, and technological stress hinder adoption.
Willingness to Try / Curiosity	8	Intention to Use (ITU)	Intrinsic motivation encourages early experimentation with AI tools.

Note. Keywords were derived from expert and administrator interviews and mapped to theoretical constructs by the researcher.

The interviews highlighted several dominant themes that align with the proposed theoretical constructs. As shown in Table 1.2, keywords such as "Resource Conditions" (frequency = 25) and "Perceived Usefulness" (frequency = 25) emerged with the highest salience, underscoring that adequate infrastructure and the practical pedagogical value of DeepSeek are viewed as the most critical enablers for adoption. Experts emphasized that without reliable hardware, networks, and institutional policy support, teachers' adoption of AI tools would remain unsustainable. Similarly, DeepSeek's ability to enrich PE content, improve lesson planning, and enhance outcomes was consistently recognized as central to teachers' willingness to adopt the system.

Concerns related to AI Anxiety were also evident, particularly around workload, time cost, and potential technological stress (frequency = 10). Experts noted that these anxieties could undermine teachers' readiness and confidence, highlighting the need for professional development and supportive system design. Closely related, Perceived Ease of Use (PEOU) was identified as a moderating factor. If DeepSeek is intuitive and easy to operate, it can amplify the positive impact of usefulness while mitigating anxiety-related barriers.

Psychological readiness was captured through references to Teacher Recognition/Acceptance (frequency = 17) and Teacher Development & Confidence (frequency = 21), both of which were mapped to Teacher Self-Efficacy (TSE). Experts stressed that recognition of DeepSeek's value and confidence in one's ability to use AI are equally critical to sustained adoption, confirming that technological integration is not solely dependent on institutional resources but also on teachers' self-belief. Intention to Use (ITU) was identified as the motivational bridge linking contextual supports and psychological perceptions. Although less frequently mentioned in absolute terms (e.g., Willingness to Try/Curiosity, frequency = 8), ITU was repeatedly interpreted as the mechanism through which institutional support and personal attitudes translate into meaningful professional practice.

1.2.2 Interview with PE Teachers

Interviews with 25 PE teachers across five universities further validated the model constructs (Appendix B). Teachers emphasized DeepSeek's usefulness in saving preparation time, improving material quality, and providing personalized teaching ideas (PU). They also highlighted the importance of ease of use (PEOU) and institutional support (FC), while expressing concerns about AI Anxiety (AIA) related to technical stress and loss of autonomy. Younger teachers showed higher digital confidence (TSE) and stronger intention to use (ITU), confirming that psychological readiness and institutional conditions jointly influence adoption. *(Key contents of the interviews are documented in Appendix table B1).*

Table 1.3 PE Teacher Interview Keywords Mapped to Theoretical Constructs

Keyword (Teacher Perspective)	Frequency	Mapped Construct	Interpretation
Save Time / Improve Efficiency	30	Perceived Usefulness (PU)	Efficiency gains are perceived as the most valuable contribution of DeepSeek.
Richer Content / Better Quality	24	Perceived Usefulness (PU)	Teachers expect higher-quality and diversified lesson materials.
Easy to Use / Quick to Learn	14	Perceived Ease of Use (PEOU)	Usability determines willingness to adopt and reduces resistance to change.
Need Training / Technical Support	21	Facilitating Conditions (FC)	Institutional training and technical support are essential for sustained adoption.
Tech Anxiety / Lack of Experience	13	AI Anxiety (AIA)	Lack of digital competence generates resistance and stress.
School Policy / Funding Support	22	Facilitating Conditions (FC)	Adoption depends on clear policies, resources, and institutional incentives.
Willing to Try / Curiosity	8	Intention to Use (ITU)	Curiosity-driven teachers are more open to experimenting with AI.
Traditional Habit	20	AIA / Low TSE	Reliance on traditional methods reflects resistance and weak digital confidence.
Cost Issues / Lack of Time	9	AIA / FC	Workload and financial constraints reduce the feasibility of adoption.

Keyword (Teacher Perspective)	Frequency	Mapped Construct	Interpretation
Age / Tech Skills	10	Teacher Self-Efficacy (TSE)	Younger/digitally skilled teachers show higher confidence and readiness.
Syllabus Alignment / Fit	16	PU / ITU	Teachers evaluate whether DeepSeek outputs align with pedagogy goals.
Assessment & Evaluation Needs	9	Perceived Usefulness (PU)	Teachers value the role of AI in formative and summative assessment.
Motivation	18	Intention to Use (ITU)	Teachers' intrinsic motivation drives willingness to adopt DeepSeek.
Student Individual Differences / Needs	12	Perceived Usefulness (PU)	DeepSeek's capacity for personalization is a major driver of interest.
Health & Performance Improvement	10	Perceived Usefulness (PU)	Teachers link AI integration with promoting student health outcomes.

Note. Keywords were derived from PE teachers' interviews and mapped to theoretical constructs by the researcher.

Table 1.3 presents the priorities and concerns of PE teachers regarding DeepSeek. The strongest drivers are Perceived Usefulness—teachers value efficiency, richer content, and alignment with pedagogy. Ease of Use is critical for reducing barriers, though many expressed AI Anxiety tied to limited digital competence. Facilitating Conditions, such as training and funding, were emphasized as prerequisites for adoption. Both curiosity and motivation shape teachers' Intention to use, while Self-Efficacy is reflected in their ability to overcome traditional habits and adapt to new digital practices.

1.2.3 Preliminary Exploration of Key Variables

The combined insights from experts and teachers strongly validate the inclusion of the following variables in this study:

Perceived Usefulness (PU): Teachers' belief that DeepSeek can enhance pedagogy design, improve teaching performance, and enrich student engagement.

AI Anxiety (AIA): Psychological concerns that hinder teachers' willingness to adopt AI, including fears of error, dependence, and ethical risks.

Facilitating Conditions (FC): Institutional and technical resources (hardware, software, training, policy) that enable or constrain adoption.

Perceived Ease of Use (PEOU): The degree of effort required to operate DeepSeek effectively, acting as a moderator in shaping intention.

Intention to Use DeepSeek in Pedagogy Design (ITU): Teachers' readiness and motivational drive to apply DeepSeek in pedagogy design, mediating the link between perceptions and outcomes.

PE Teachers' Self-Efficacy (TSE): PE teachers' belief in their ability to successfully integrate DeepSeek into pedagogy design and teaching delivery.

1.3 Research Problem

Despite the strong institutional promotion of AI-assisted teaching in Guangxi's public universities, preliminary evidence suggests that physical education (PE) teachers exhibit limited intention to adopt DeepSeek in pedagogy design, accompanied by relatively low teaching self-efficacy. Traditional teacher-centered instructional models continue to dominate, and the integration of AI tools into PE pedagogy remains at an early stage.

This situation raises critical questions regarding the underlying causes of the gap between policy encouragement and teachers' actual adoption behavior. Specifically, what cognitive, institutional, and emotional factors shape PE teachers' intention to use DeepSeek, and how does such intention influence their teaching self-efficacy? Addressing these questions is essential to understanding how DeepSeek-integrated pedagogy can serve as a mechanism for enhancing teachers' confidence and innovation capacity.

Gap: Traditional models such as TAM and UTAUT rarely consider teaching self-efficacy as an educational outcome. Moreover, there is a lack of localized empirical models and practical cases for AI integration in PE pedagogy.

1.4 Research Questions

Based on the research problem, this study sought to answer the following research questions:

1. What is the status of Guangxi public university PE teachers' Perceived Usefulness (PU), Facilitating Conditions (FC), AI Anxiety (AIA), Perceived Ease of Use (PEOU), Intention to Use DeepSeek (ITU), and PE Teachers' self-efficacy (TSE)?
2. How do PU, FC, and AIA directly and indirectly influence teachers' Intention to use DeepSeek (ITU), and to what extent does PEOU moderate these relationships?

3. How does DeepSeek-supported pedagogy design enhance PE teachers' teaching self-efficacy (TSE) by strengthening their intention to use DeepSeek (ITU), particularly under different levels of perceived usefulness, facilitating conditions, AI anxiety, and perceived ease of use?

4. What institutional and pedagogical strategies can effectively enhance PE teachers' Intention to use DeepSeek (ITU) and improve their Self-Efficacy (TSE)?

1.5 Research Objectives

This study aimed to construct and empirically validate a model that explains the determinants of Guangxi public university PE teachers' intention to use DeepSeek in pedagogy design and how such intention influences their teaching self-efficacy. The specific objectives are:

1. To assess the status of PE teachers' Perceived Usefulness (PU), Facilitating Conditions (FC), AI Anxiety (AIA), Perceived Ease of Use (PEOU), Intention to Use DeepSeek (ITU), and PE Teachers' Self-Efficacy (TSE) in Guangxi's public universities.

This objective establishes a comprehensive baseline for understanding teachers' technological adoption and confidence levels.

2. To examine the direct and indirect effects of PU, FC, and AIA on teachers' ITU, and the moderating role of PEOU in the relationship among these variables.

This objective clarifies how cognitive and contextual factors interact to shape teachers' behavioral intention to adopt AI-assisted pedagogy.

3. To develop and validate a DeepSeek-based pedagogical enhancement model that explains how AI integration in teaching design improves PE Teachers' Self-Efficacy through Intention to Use DeepSeek (ITU).

This objective synthesizes quantitative and qualitative evidence to propose a theoretically grounded and practically applicable model for AI-driven pedagogy in PE.

4. To provide institutional and pedagogical recommendations for promoting teachers' DeepSeek adoption and strengthening professional self-efficacy in the context of Guangxi's higher education digital transformation.

This objective translates research findings into actionable strategies for policymakers, administrators, and teacher-training programs.

1.6 Research Significance

Theoretical Significance

This study advances AI adoption theory by positioning DeepSeek—a domestically developed large language model (LLM)—within the underexplored domain of physical education (PE) pedagogy design. It synthesizes the Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), and the Motivation–Opportunity–Ability

(MOA) framework into an integrated explanatory model. The model captures how cognitive perceptions (PU, PEOU), contextual supports (FC), and emotional barriers (AIA) interact to influence teachers' Intention to Use DeepSeek (ITU) and subsequently their Teaching Self-Efficacy (TSE). By establishing ITU as a mediating mechanism and TSE as a core educational outcome, the study extends TAM beyond the behavioral adoption of technology toward a deeper understanding of AI-assisted pedagogical transformation. Moreover, by embedding SCT at a macro-theoretical level, it elucidates how personal beliefs, environmental factors, and behavioral engagement jointly shape professional growth outcomes, including leadership, motivation, engagement, and achievement. Thus, the research contributes to bridging technology adoption theory and educational psychology through a holistic, context-sensitive framework.

Practical Significance

Practically, this study offers evidence-based insights for policymakers, university administrators, and teacher-training institutions seeking to foster AI adoption in higher education. It identifies major barriers—such as AI anxiety, limited digital competence, and uneven institutional support—while highlighting key enabling factors, including facilitating conditions and system usability. The proposed DeepSeek-Integrated PE Pedagogy Design Model serves as a strategic roadmap for developing AI-supported, teacher-centered professional development ecosystems in Guangxi and comparable regions. It provides actionable guidance for designing professional training programs, improving infrastructure, and promoting reflective teaching practices through DeepSeek. In doing so, the study contributes to China's national vision of building an intelligent, inclusive, and sustainable education system aligned with the Healthy China 2030 and AI Innovation Action Plan (2018) initiatives.

This study pioneers the integration of DeepSeek into every stage of university PE pedagogy design, proposing targeted strategies for each step of the process. Such comprehensive application marks the first of its kind in the field, representing a significant innovation for PE teaching methodology in Chinese higher education. Grounded in the research problem of how DeepSeek-enhanced pedagogy design influences teachers' self-efficacy and intention to adopt AI, this study not only fills a theoretical gap in AI-assisted instructional design but also provides a practical framework for developing intelligent, data-driven, and teacher-centered PE education models in China's universities.

1.7 Scope of the Study

The study focused on public universities in Guangxi that offer undergraduate degree programs, including application-oriented universities and a limited number of “vocational and technical universities” that are authorized to award bachelor's degrees. Private universities, junior colleges, and institutions outside Guangxi were excluded.

The target population was full-time PE teachers who teach undergraduate, credit-bearing PE courses (lecturer and above). The following individuals were excluded: part-time instructors, external coaches who do not receive credit for their teaching, administrators with no current teaching responsibilities, and graduate teaching assistants. The survey aimed to collect at least 400 valid teacher questionnaires, drawn from the 28 participating universities. The qualitative component included expert/administrator interviews (≈ 10) to inform instrument refinement and interpretation.

Fieldwork was conducted over one academic year (2024–2025). The evidence, therefore, reflects a cross-sectional snapshot of teachers' perceptions during this period; it does not track change over time.

In terms of content boundaries, this study was tool-specific and centered on DeepSeek as the focal AI system for pedagogy design. All constructs and measurement items were explicitly anchored to DeepSeek-enabled pedagogy design. Additionally, the study did not evaluate student-level learning outcomes (e.g., achievement, satisfaction, physical fitness gains) or institutional performance indicators. Its primary outcome is Teachers' Self-Efficacy associated with designing and implementing PE instruction with DeepSeek support.

1.8 Definition of Terms

In this research, some terms need to be defined, and the researcher has listed them in the following table:

Table 1.4 Definition of Terms

Term	Definition
Perceived Usefulness (PU)	Refers to the degree to which a PE teacher believes that using DeepSeek for Pedagogy design will enhance their teaching effectiveness and improve instructional outcomes.
AI Anxiety (AIA)	Refers to the negative emotional response accompanying the adoption of AI tools (e.g., DeepSeek) by PE teachers for Pedagogy design.
Facilitating Conditions (FC)	Refers to the degree to which a PE teacher believes that organizational and technical infrastructures are in place to support the use of DeepSeek.
Intention to Use DeepSeek on PE Pedagogy Design (ITU)	Refers to the degree to which a PE teacher is willing and plans to use DeepSeek for Pedagogy design, reflecting their subjective readiness to adopt and integrate the system into their instructional practices.
PE Teachers'	Refers to a PE teacher's belief in their capability to effectively

Term	Definition
Self-efficacy (TSE)	design and deliver physical education instruction, including their confidence in integrating AI tools such as DeepSeek to achieve specific teaching goals.
Perceived Ease of Use (PEOU)	Indicates the extent to which a PE teacher perceives DeepSeek as easy to use.

Note. PU = Perceived Usefulness; AIA = AI Anxiety; FC = Facilitating Conditions; ITU = Intention to Use DeepSeek for PE pedagogy design; TSE = PE Teachers' Self-Efficacy; PEOU = Perceived Ease of Use. Definitions were developed by the researcher for this study.

Overall, Chapter I establishes the conceptual, contextual, and theoretical foundations of the study, setting the stage for the development and empirical validation of the DeepSeek-based pedagogical enhancement model presented in subsequent chapters.

CHAPTER 2

LITERATURE REVIEW

2.1 Literature Review

2.1.1 Perceived Usefulness (PU)

Definition of Perceived Usefulness

Perceived Usefulness (PU), proposed by Davis (1989) in the Technology Acceptance Model (TAM), refers to "the degree to which an individual believes that using a particular system would enhance job performance." PU is widely used to assess motivation to adopt new technologies. In AI-related education research, PU reliably predicts adoption intentions.

PU is typically measured with Likert-type items (1 = Strongly disagree, 5 = Strongly agree). Canonical items include: "Using the system improves my work efficiency," "The system helps me accomplish tasks," and "The system makes it easier to achieve my goals." Recent studies (e.g., Park & Kim, 2023; Romero-Rodríguez et al., 2023; Alshammari & Babu, 2025) have reported satisfactory reliability and validity.

Related Literature of Perceived Usefulness

Across higher education and AI-supported contexts, PU consistently shows a significant positive effect on intention to use, including with LLM-enabled tools used for planning and feedback.

Romero-Rodríguez et al. (2023) identified PU as a decisive factor in students' adoption of ChatGPT, particularly in organizing information and stimulating creativity. Park and Kim (2023) highlighted PU's role in meeting users' emotional support, information access, and entertainment needs, strengthening engagement. Alshammari and Babu (2025) revealed that PU has a dual-path effect, directly influencing behavioral intention and indirectly enhancing sustained use through satisfaction.

2.1.2 AI Anxiety (AIA)

Definition of AI Anxiety

AI anxiety refers to the apprehension, fear, or unease experienced by individuals in response to the development and application of AI technologies (Wang & Wang, 2022). This anxiety stems from concerns about job displacement, loss of control, ethical implications, and potential misuse of AI (Nahass et al., 2025). Unlike general anxiety, AI anxiety is triggered explicitly by the perceived threats and uncertainties associated with AI advancements. It encompasses a range of emotions, from mild unease to severe

panic, and can significantly impact individuals' attitudes and behaviors towards AI technologies.

Artificial Intelligence Anxiety Scale (AIAS): Developed by Wang and Wang (2022), the AIAS is a 21-item scale that measures four dimensions of AI anxiety: Learning Anxiety, Job Replacement Anxiety, Sociotechnical Blindness, and AI Configuration Anxiety. The scale uses a seven-point Likert-type rating system and has demonstrated high internal consistency and reliability (Cronbach's $\alpha > 0.90$ for all subscales). **General Attitudes toward Artificial Intelligence Scale (GAAIS):** Although not exclusively a measurement tool for AI anxiety, the GAAIS developed by Schepman and Rodway (2020, 2023) includes items that capture negative attitudes toward AI, which can be indicative of AI anxiety. The GAAIS has been adapted into Turkish and validated, showing good psychometric properties (Kaya et al., 2024).

Related Literature of AI Anxiety

AI Anxiety Questionnaire: Developed by Wang & Wang (2022), this questionnaire specifically targets AI anxiety in the context of predicting motivated learning behavior. It encompasses items related to fears of AI replacing human jobs, concerns about the loss of control over AI systems, and worries about the ethical implications of AI.

The Artificial Intelligence Anxiety Scale (AIAS), developed by Wang and Wang (2022), has garnered significant recognition among scholars for its comprehensive assessment of AI anxiety. This scale's robust design and validated structure make it a preferred tool for measuring AI anxiety in various research contexts. Consequently, the AIAS serves as the primary reference for the AI anxiety measurement instrument employed in this study.

Research has shown that AI anxiety is prevalent among various demographic groups, including students, teachers, and the public (Kaya et al., 2024). AI anxiety can negatively affect individuals' attitudes toward AI, reducing their willingness to adopt and use AI technologies (Fan et al., 2025; Zhou et al., 2025). In the educational context, AI anxiety among teachers can hinder the integration of AI into teaching practices, thereby affecting students' learning experiences.

2.1.3 Facilitating Conditions (FC)

Definition of Facilitating Conditions

Facilitating conditions originate from theories of technology adoption and use (such as TAM and UTAUT). They refer to the external factors—such as perceived availability of resources, knowledge, and organizational support—that support an individual's execution of a specific behavior when using a new technology (Venkatesh et al., 2003). In AI adoption research, it typically refers to the availability of hardware infrastructure, technical training, and collaborative support when using AI systems (Cheng et al., 2022). For example, in educational contexts, whether physical education

teachers have access to and can use AI tools (such as DeepSeek or ChatGPT), whether they have received relevant training, and whether they can receive peer assistance all fall under the scope of facilitating conditions (Wangdi et al., 2023).

Facilitating conditions are often measured by adapting original scales from TAM or UTAUT models. Standard measurement dimensions and items include: Resource Accessibility (e.g., “I have the resources necessary to use a certain AI technology”); Knowledge and Skills (e.g., “I have basic knowledge of how to use this AI system”); Technical Support and Training (e.g., “I can receive technical support or training on AI from my school/organization”); Help and Collaboration (e.g., “If I encounter difficulties using the AI system, someone can help me”). Compatibility (e.g., “The AI tools are compatible with my existing work systems or processes”). Wang et al. (2017), in their study on teachers' use of cloud services, developed a Facilitating Conditions Scale comprising “training support,” “equipment resources,” and “collaborative environment,” demonstrating that facilitating conditions significantly predict teachers’ intention to continue using the technology. Similarly, Wangdi et al. (2023) employed an extended TAM model and constructed a questionnaire based on “TPACK + facilitating conditions.” This study’s measurement of facilitating conditions primarily references Wang et al.’s (2017) scale, while integrating challenges that higher education PE teachers face when designing lessons with DeepSeek.

Related Literature of Facilitating Conditions

A substantial body of research confirms the critical role of facilitating conditions in the adoption of technology. Some studies suggest that facilitating conditions indirectly influence intention to use. For instance, Wangdi et al. (2023) proposed that teachers’ TPACK knowledge and AI-related facilitating conditions do not directly influence adoption intention, but instead affect it indirectly through perceived usefulness and ease of use. In Cheng et al.’s (2022) study, facilitating conditions, along with performance expectancy and effort expectancy, indirectly foster AI adoption behavior through a "social influence–trust" pathway. Meanwhile, other research supports the direct positive influence of facilitating conditions on AI adoption behavior (or intention to use). For example, the “AI Adoption–Avoidance Model” (IAAAM) proposed by Cao et al. (2021) emphasizes that facilitating conditions are a core driving factor for managers to adopt AI systems within organizations—especially when clear training and resource support are in place, significantly strengthening behavioral intention. Hasan Emon et al. (2023), in their study of professionals adopting ChatGPT, found that facilitating conditions (such as technical support and resource availability) were significant predictors of behavioral intention.

2.1.4 Intention to Use DeepSeek on PE Pedagogy Design (ITU)

Definition of PE Pedagogy and Pedagogy Design

Pedagogy in physical education (PE) is more than the act of instruction; it represents a complex and systematic process of designing, implementing, and

evaluating learning experiences that promote students' physical, cognitive, emotional, and social development. In the educational context, pedagogy design refers to the deliberate planning and structuring of instructional elements—including objectives, content, learning environment, teaching methods, technological tools, and assessment strategies—to achieve holistic learning outcomes (Vahdani et al., 2021).

According to Vahdani et al. (2021), the pedagogical design of PE operates through two interdependent dimensions: *fixed elements*, such as objectives, learner characteristics, learning environment, and educational platforms, and *flexible elements*, which include teachers, content, teaching methods, materials, family engagement, and assessment. These components interact dynamically, forming a comprehensive system that enables PE teachers to adapt to learners' individual, social, and cultural contexts. Effective PE pedagogy design, therefore, requires teachers to integrate these factors coherently to ensure learning experiences are relevant, inclusive, and sustainable.

In the era of digital transformation and artificial intelligence (AI), pedagogy design extends beyond traditional teaching frameworks. Bearman and Ajjawi (2023) proposed that a pedagogy for an AI-mediated world involves learning to operate within opaque, complex, and uncertain environments, emphasizing the relational and sociotechnical dimensions of teaching. Pedagogy in this context must help learners develop evaluative judgment, ethical awareness, and the capacity to interact meaningfully with AI systems rather than merely focusing on technological proficiency.

Meanwhile, Weng et al. (2023) highlighted the role of design-based learning (DBL) in promoting students' *deep learning*—an approach characterized by critical thinking, knowledge integration, problem-solving, and reflective inquiry. In PE pedagogy, adopting DBL principles means engaging students in iterative cycles of design, reflection, and redesign, thereby cultivating both technical proficiency and creative thinking.

Furthermore, May et al. (2023) suggested that effective pedagogy design should be grounded in a sociotechnical–pedagogical framework, balancing technological, pedagogical, and social usability. This model views learning as a relational process embedded in social interaction, cultural context, and technological mediation. Such a framework aligns with contemporary PE education, which increasingly incorporates online laboratories, virtual training environments, and AI-assisted performance analysis.

In summary, PE pedagogy design can be defined as a systematic, adaptive, and contextually responsive process that integrates curricular goals, learner diversity, and sociotechnical environments to foster holistic physical education. It emphasizes learner-centered engagement, reflective practice, and digital fluency, aiming not only to improve students' physical skills but also to nurture higher-order competencies such as collaboration, critical thinking, and lifelong health literacy.

Definition of Intention to Use

Intention to use refers to an individual's psychological tendency or willingness to use a specific technology or system at some point in the future (Venkatesh et al., 2003). Within frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), intention to use is considered the most direct antecedent of actual usage behavior.

In research on AI adoption, Chatterjee et al. (2021) pointed out that employees' intention to use AI-integrated systems is influenced by multiple factors, including perceived usefulness, social influence, and facilitating conditions. An et al. (2023) explained that, in the context of education, teachers' intention to use AI tools stems not only from expected performance but also from their existing technological pedagogical knowledge and the compatibility of the tools with instructional tasks. In the context of PE teaching, the construct of Intention to use is particularly critical, as teachers must evaluate the suitability and convenience of AI tools (such as DeepSeek) in authentic and complex classroom environments to determine whether to incorporate them into their lesson design process.

Most studies use a 5-point Likert scale to measure Intention to use. Standard items include: "I intend to use this system in my teaching," "If conditions permit, I am willing to use this system," and "I may use this system in my future teaching practices" (An et al., 2023; Alshammari & Babu, 2025). An et al. (2023) constructed a questionnaire tool with eight structural dimensions to quantitatively assess secondary school English teachers' intentions to adopt AI in teaching. Behavioral Intention (BI) was treated as an independent variable in the analysis. In the organizational management context, Chatterjee et al. (2021) built a Meta-UTAUT model and confirmed the significant predictive effects of perceived value and satisfaction on intention to use.

Related Literature of Intention to Use

Multiple studies have systematically explored the intention to use AI technologies in teaching. An et al. (2023) found that the intention of secondary school English teachers to use AI is influenced by four main factors: performance expectancy, social influence, AI literacy–technological knowledge (AIL-TK), and integrated AI pedagogical knowledge (AI-TPACK). Among these, performance expectancy and enhanced AI teaching knowledge significantly increased teachers' intention to use AI, and in their study on ChatGPT, Alshammari and Babu (2025) discovered that intention to use is jointly influenced by perceived usefulness and satisfaction, with satisfaction playing a partially or fully mediating role. In another study of Ghanaian university students, Bonsu and Baffour-Kouda (2023) found that, despite concerns over its usage, students generally held positive attitudes toward ChatGPT and expressed strong intentions to use it.

In terms of “PE teachers using AI tools for lesson planning,” current research remains relatively scarce. These studies suggest that teachers’ intention to use AI tools (including DeepSeek) in lesson design is not only influenced by ease of use and usefulness but also moderated by school-provided training, peer modeling, and the degree of alignment between the AI tools and actual teaching tasks (Chatterjee et al., 2021; An et al., 2023).

2.1.5 PE Teacher Self-Efficacy (TSE)

Definition of Teacher Self-Efficacy

Teacher Self-Efficacy (TSE) is a key construct derived from Bandura’s (1977, 1997) Social Cognitive Theory. It refers to teachers’ beliefs in their ability to organize and execute instructional tasks within a specific educational context, thereby promoting student learning outcomes. Tschannen-Moran and Hoy (2001) defined it as “a teacher’s belief in their capability to organize and execute actions required to accomplish specific teaching goals in specific contexts successfully.”

Researchers generally agree that teacher self-efficacy influences the choice of instructional methods, perseverance in the face of difficulties, and expectations of student achievement. Salles et al. (2020) further pointed out that high levels of Teacher self-efficacy are not only associated with teaching dimensions such as lesson planning, classroom interaction, assessment, and self-evaluation but also serve as predictors of changes in teaching behavior.

Currently, widely used measurement tools include:

The Teacher Self-Efficacy Scale (TSES), developed by Tschannen-Moran & Hoy (2001), comprises three dimensions: classroom management, instructional strategies, and student engagement.

College Teaching Self-Efficacy Scale: Designed to evaluate higher education faculty's self-efficacy in areas such as instructional planning, classroom interaction, and assessment.

Physical Education Teacher Physical Activity Self-Efficacy Scale (PETPAS): Developed by Martin & Kulina (2003), this scale explicitly assesses physical education teachers’ confidence in delivering effective instruction despite obstacles such as student attitudes, time constraints, and a lack of facilities. These scales typically use Likert-style scoring and demonstrate strong psychometric properties in terms of validity and reliability.

Related Literature of Teacher Self-Efficacy

In recent years, research on teacher self-efficacy has expanded from structural dimensions to exploring its influencing mechanisms. For instance, Guo et al. (2011) found that teachers’ perceptions of colleague collaboration and student participation significantly impact their level of self-efficacy. Xiong et al. (2020) confirmed that self-efficacy mediates the relationship between teachers’ “engaged focus” and creative teaching in physical education.

As an independent variable, teacher self-efficacy has been shown to significantly predict or influence instructional strategies, students' learning motivation, and classroom performance. For example, it predicts teachers' use of diversified strategies, willingness to engage in continuous professional development, and persistence when facing challenges (Tschannen-Moran & Hoy, 2001). In Alibakhshi et al.'s (2020) study, self-efficacy not only enhanced classroom performance but also alleviated burnout and increased job satisfaction. Friedman & Kass (2002) emphasized that classroom organizational structures are a crucial entry point for understanding the concept of teacher self-efficacy.

2.1.6 Perceived Ease of Use (PEOU)

Definition of Perceived Ease of Use

Perceived Ease of Use (PEOU) was first introduced by Davis (1989) in the Technology Acceptance Model (TAM), defined as "the degree to which an individual believes that using a particular system would be free of effort". This classic definition has been widely recognized in the field, making PEOU a key independent variable in technology adoption research.

Davis (1989) proposed classic measurement items, including: "Learning to operate the system is easy for me." "The system is clear and easy to understand." "I believe I can easily master the system's operation." In AI-related studies, Zhang et al. (2023) adapted the Technology Acceptance Model (TAM) framework to assess pre-service teachers' acceptance of AI tools using structural equation modeling. Similarly, Park and Kim (2023) developed a questionnaire to evaluate PEOU in AI-based mental health applications. PEOU is typically measured using Likert-scale questionnaires (1 = strongly disagree, 5 = strongly agree). Davis (1989) proposed classic measurement items, including: "Learning to operate the system is easy for me." "The system is clear and easy to understand." "I believe I can easily master the system's operation." In AI-related studies, Zhang et al. (2023) adapted the Technology Acceptance Model (TAM) framework to assess pre-service teachers' acceptance of AI tools using structural equation modeling. Similarly, Park and Kim (2023) developed a questionnaire to evaluate PEOU in AI-based mental health applications, achieving good reliability.

Related Literature of Perceived Ease of Use

PEOU plays a crucial role in AI applications across education, mental health, and innovative learning platforms. Zhang et al. (2023) found that PEOU significantly influenced pre-service teachers' adoption intentions ($\beta = 0.297$) and indirectly affected behavioral intention through perceived usefulness. Li (2023) found that PEOU positively influenced university students' attitudes and behavioral intentions toward AI systems, ultimately leading to actual usage. For PE teachers, intuitive operation and immediate results are particularly important. Park and Kim (2023) demonstrated that streamlined workflows in AI mental health apps enhanced user trust and dependency, with PEOU also reinforcing perceived usefulness.

2.1.7 Summary of Previous Studies

Based on literature review, Table 2.1 summarizes variables, representative sources, keywords, and theoretical lenses.

Table 2.1 Summary of Previous Studies

Variable	Author	Title (short)	Keyword	Adopted Theory
PU	Davis (1989)	PU & PEOU and user acceptance	PU, TAM	TAM
PU	Park & Kim (2023)	AI mental-health apps acceptance	PU, adoption intention	TAM
PU	Romero-Rodríguez et al. (2023)	ChatGPT acceptance (students)	PU, learning benefits	UTAUT2
PU	Alshammari & Babu (2025)	ChatGPT in higher education	PU, satisfaction, BI	TAM
FC	Venkatesh et al. (2003)	Unified view of IT acceptance	Facilitating conditions	UTAUT
FC	Cheng et al. (2022)	AI adoption in education	FC, social influence, trust	UTAUT
FC	Wangdi et al. (2023)	TPACK + FC for AI adoption	Training, resources	Extended TAM/UTAUT
AIA	Wang & Wang (2022)	AI Anxiety Scale (AIAS)	AI anxiety measurement	—
AIA	Schepman & Rodway (2020)	GAAIS	Attitudes toward AI	—
PEOU	Davis (1989)	PU & PEOU and user acceptance	PEOU, usability	TAM
PEOU	Zhang et al. (2023)	Pre-service teachers' AI acceptance	PEOU, TAM3	TAM3
ITU	Venkatesh et al. (2003)	Unified view of IT acceptance	Intention to use	UTAUT

Variable	Author	Title (short)	Keyword	Adopted Theory
ITU	An et al. (2023)	Teachers' AI intentions	AI literacy, TPACK	Extended TAM/UTAUT
TSE	Bandura (1997).	Self-efficacy	Teaching efficacy	SCT
TSE	Tschannen-Moran & Hoy (2001)	Teacher efficacy	TSE dimensions	SCT

Note. Entries are illustrative and aligned with the constructs used in this study.

2.2 Relationship between Variables

2.2.1 Relationship between Perceived Usefulness and Intention to Use

Perceived Usefulness (PU) is a core construct within the Technology Acceptance Model (TAM). Davis (1989) defined it as “the degree to which a person believes that using a particular system would enhance his or her job performance.” Meanwhile, Intention to Use (ITU) refers to an individual’s subjective tendency or plan to adopt a particular technology in the future (Ajzen, 1991). Numerous studies have demonstrated the significant positive impact of PU on ITU, especially in the fields of AI, emerging technologies, and education (Alvyned et al., 2022; Alsabawy et al., 2016). Several studies have confirmed that in contexts involving AI or digital technology applications, PU is a critical determinant of whether users develop the intention to adopt a system. For instance, Venkatesh et al. (2021), in their study on university faculty adopting innovative education platforms, identified a mediating effect of PU on ITU and noted its important role in teaching satisfaction.

Similarly, Wu et al. (2022) found that when teachers perceive AI tools as enhancing teaching efficiency, streamlining lesson preparation, or improving student outcomes, their intention to use such tools increases significantly. Zahari et al. (2022) further noted that, even in the face of complex technologies, if educators perceive the tools as “useful,” they are still likely to develop a firm intention to adopt them. For physical education (PE) teachers in Chinese universities, utilizing DeepSeek for lesson planning entails navigating distinct contextual challenges, including the practical nature of course content, complex teaching environments, and diverse student physical abilities. Therefore, whether AI tools can truly be perceived as “useful” becomes a crucial threshold for adoption. Alvyned et al. (2022) found that the perceived utility of AI significantly boosted PE teachers’ intention to use AI platforms. This aligns well with DeepSeek’s functionalities—such as automated structure recommendations, AI-driven content matching, and student-level analysis.

Table 2.2 Perceived Usefulness and Intention to Use AI Tools

Source	Variable	Key Finding
Davis (1989)	PU, ITU	PU directly predicts intention.
Alsabawy et al. (2016)	PU, ITU	PU predicts ITU in higher-ed e-learning.
Alvyned et al. (2022)	PU, ITU (PE teachers)	Higher perceived utility boosts ITU.
Venkatesh et al. (2021)	PU, ITU	PU relates to intention and satisfaction.

Note. Selected studies exemplify the PU → ITU link in education and AI-enabled contexts.

2.2.2 Relationship between AI Anxiety and Intention to Use DeepSeek

AI anxiety typically exhibits a negative association with ITU. Teachers with higher AIA tend to perceive AI tools as less controllable or less suitable, which reduces their adoption intentions.

AI anxiety refers to the apprehension, fear, or uncertainty individuals may feel towards AI technologies due to concerns about job displacement, loss of control, or ethical implications (Johnson & Verdicchio, 2017). Studies have indicated that AI anxiety can significantly hinder the adoption of AI tools in various domains, including education. For instance, teachers who experience high levels of AI anxiety may perceive AI tools as a threat to their professional autonomy, leading to resistance or reluctance in incorporating these technologies into their teaching practices (Wang & Wang, 2022).

In the context of pedagogy design, AI anxiety can manifest as concerns about the potential for AI tools to replace human teachers or diminish the quality of education. Teachers may worry that AI tools like DeepSeek could automate tasks traditionally performed by educators, thereby reducing their sense of professional competence and relevance (Sanusi et al., 2024).

The intention to use AI is influenced by multiple factors, including perceived usefulness, perceived ease of use, social influence, and AI anxiety (Uludağ et al., 2025). While perceived usefulness and ease of use are generally positive predictors of technology adoption, AI anxiety can act as a barrier. Teachers who experience high levels of AI anxiety may perceive DeepSeek as less valuable or more difficult to use, even if objective evaluations suggest otherwise. This perception can reduce their intention to adopt DeepSeek in their teaching practices.

Empirical studies have provided evidence for the negative influence of AI anxiety on the intention to use AI tools in education. For example, a study by Cho and Seo (2024) found that AI anxiety negatively correlated with acceptance attitude and intention to use AI among nursing students in South Korea. Similarly, a study by Uludağ

et al. (2025) revealed that AI anxiety had a significant negative impact on the intention to use ChatGPT among science doctoral students.

Table 2.3 AI Anxiety and Intention to Use AI Tools

Source	Variable	Key Finding
Wang & Wang (2022)	AIA, ITU	Higher AIA lowers intention: training mitigates AIA.
Cho & Seo (2024)	AIA, attitudes, ITU	AIA negatively correlates with acceptance and ITU.
Uludağ et al. (2025)	AIA, ITU	AIA significantly reduces intention to adopt AI tools.

Note. Findings converge on a negative relationship between AIA and ITU in educational settings.

2.2.3 Relationship between Facilitating Conditions and Intention to Use DeepSeek

Perceived institutional resources, training, and support facilitate adoption intentions. FC can act directly on ITU and indirectly via PU/PEOU.

Miraz et al. (2022) found that facilitating conditions positively influence final adoption behavior through the mediating variable of intention to use. In educational settings, An et al. (2023) integrated the UTAUT and TPACK models to examine how facilitating conditions influence secondary school English teachers' intention to use AI in teaching. Similarly, Foroughi et al. (2023) identified facilitating conditions as part of a combination of factors that contribute to high adoption intentions among students regarding the use of ChatGPT for educational purposes, highlighting their contribution under specific configurations. Buraimoh et al. (2023) also confirmed that facilitating conditions, along with social influence, significantly and positively predict teachers' behavioral intention to use mobile technologies for instruction. These conditions include the provision of devices by schools, the availability of training opportunities, and the existence of support mechanisms. In another study, Mubuke et al. (2017) found that facilitating conditions, such as access to wireless networks and the widespread availability of mobile devices, significantly promote the intention to adopt technology.

Table 2.4 Facilitating Conditions and Intention to Use

Source	Variable	Key Finding
An et al. (2023)	FC, ITU	FC shapes teachers' ITU for AI use.
Foroughi et al. (2023)	FC, ITU	FC contributes to high adoption intention (configural).
Buraimoh et al. (2023)	FC, SI, ITU	Devices, training, support predict ITU.
Mubuke et al. (2017)	FC, ITU	Wireless access/device availability increases the ITU.

Note. FC relate positively to ITU, contingent on resources, training, and support mechanisms.

2.2.4 Relationship between Intention to Use DeepSeek and Teacher Self-Efficacy

Higher ITU often coincides with more active technology engagement and perceived control, which can enhance TSE when integration experiences are successful.

The intention to use AI, as defined by Venkatesh et al. (2003), refers to “an individual’s subjective likelihood of using a specific AI technology at a given point in the future.” Hwang et al. (2023) found that teachers who intend to use AI for instructional design tend to exhibit higher levels of ICT self-efficacy, meaning they believe they are capable of successfully performing AI-related teaching tasks. Similarly, Lee and Choi (2020) showed that teachers’ intention to use AI tools positively predicts their technological integration behaviors, which in turn bolsters their confidence in their own teaching capabilities. Menabò et al. (2021) further confirmed that active engagement with technology strengthens teachers’ self-efficacy through a mechanism of perceived cognitive control—especially in contexts lacking formal training support.

When teachers are motivated to use AI in instructional design, they tend to engage more deeply with its functions, thereby constructing relevant knowledge and improving technical skills, which in turn enhances their teaching self-efficacy (Su & Shen, 2021). Moreover, AI tools like DeepSeek can provide strategic feedback and generate differentiated lesson plans, helping PE teachers maintain a sense of control and accomplishment even when instructing students of varying skill levels (Sari et al., 2022). Hwang et al. (2023) also noted that ICT self-efficacy is not only moderated by prior experience with technology but also shaped by the strength of the educational support system, including the availability of AI training and peer collaboration.

In physical education, traditional lesson planning emphasizes bodily engagement and student participation, while AI tools are often perceived as

“dehumanized” interventions. Therefore, PE teachers’ willingness to integrate DeepSeek into their lesson planning not only affects their instructional design strategies but also reflects whether they believe they can master the technology to achieve their teaching goals. However, current research has yet to fully address the issue of contextual alignment, i.e., whether AI tools like DeepSeek are genuinely compatible with the unique demands of PE instruction (Menabò et al., 2021).

Table 2.5 Intention to Use and Teacher Self-Efficacy

Source	Variable	Key Finding
Venkatesh et al. (2003)	ITU → use	Intention predicts subsequent use.
Hwang et al. (2023)	ITU, ICT-TSE	More substantial ITU alignment is associated with higher ICT self-efficacy.
Lee & Choi (2020)	ITU, integration, TSE	Integration behaviors bolster teacher efficacy.

Note. Evidence supports an ITU → effective use → TSE pathway in instructional contexts.

2.2.5 Moderating Effect of Perceived Ease of Use on the Relationship between Perceived Usefulness and Intention to Use DeepSeek on PE Pedagogy Design

In the context of education, perceived usefulness has been consistently linked to teachers’ willingness to adopt new technologies (Teo, 2010; Al-Emran et al., 2018). For instance, Al-Emran et al. (2018) demonstrated that perceived usefulness significantly influences e-learning adoption among students, suggesting its broader applicability to educational technologies. High self-efficacy is associated with greater teaching effectiveness, student engagement, and resilience in the face of challenges (Künsting et al., 2016). Specifically, in the realm of PE, self-efficacy influences teachers’ ability to design and implement effective instructional strategies (Ennis, 1999).

The intention to use a technology, such as DeepSeek, serves as a critical bridge between perceived usefulness and actual adoption behavior (Venkatesh & Davis, 2000). According to the TAM, perceived usefulness directly affects behavioral intention, which in turn influences technology adoption (Davis, 1989; Venkatesh & Davis, 2000). Recent studies have highlighted the importance of intention in mediating the relationship between perceived usefulness and self-efficacy in various educational contexts (Chen & Ma, 2022; Xie et al., 2023). For instance, Chen and Ma (2022) found that teacher support has a positive influence on students’ information literacy, mediated by the roles of network perceived usefulness and ICT self-efficacy. Similarly, Xie et al. (2023) demonstrated that facilitating conditions and perceived ease of use indirectly affect teachers’ continuance intention to use technology through self-efficacy.

Table 2.6 Moderating Role of PEOU on PU → ITU

Source	Variable	Key Finding
Davis (1989); Venkatesh & Davis (2000)	PU, PEOU, ITU	Higher PEOU strengthens the PU-ITU pathway.
Xie et al. (2023)	PEOU, continuance intention	Usability amplifies adoption intentions via utility perceptions.

Note. Conceptual and empirical work supports a positive moderation of PEOU on PU → ITU.

2.2.6 Moderating Effect of Perceived Ease of Use on the Relationship between AI Anxiety and Intention to Use DeepSeek on PE Pedagogy Design

Teachers with high self-efficacy are more likely to adopt and integrate new technologies into their teaching, perceiving these tools as valuable aids rather than threats (Sanusi et al., 2024). Conversely, low self-efficacy can hinder technology adoption, as teachers may doubt their ability to integrate AI tools into their pedagogy effectively. When teachers perceive DeepSeek as helpful and easy to use, they are more likely to intend to incorporate it into their teaching practices. Social influence, such as peer support and institutional encouragement, also plays a significant role in shaping teachers' intentions (Sanusi et al., 2024).

Several studies support this mediating role. For instance, Wang and Wang (2022) found that reducing AI anxiety through targeted training and support can enhance teachers' intention to use AI tools, which in turn boosts their self-efficacy. Similarly, Sanusi et al. (2024) demonstrated that social good and confidence in using AI can positively influence teachers' intention to adopt AI technologies, thereby enhancing their self-efficacy. Empirical studies provide further evidence for the mediating role of intention to use DeepSeek. Moreover, Cho and Seo (2024) examined the dual mediating effects of anxiety and acceptance attitude on the relationship between perception of AI and intention to use it among nursing students.

Table 2.7 Moderating Role of PEOU on AIA → ITU

Source	Variable	Key Finding
Wang & Wang (2022)	AIA, PEOU, ITU	Training and usability mitigate anxiety, raising intention.
Cho & Seo (2024)	AIA, attitudes, ITU	Ease lowers the anxiety–intention barrier.

Note. Higher PEOU is expected to attenuate the negative association between AIA and ITU.

2.2.7 Moderating Effect of Perceived Ease of Use on the Relationship between Facilitating Conditions and Intention to Use DeepSeek on PE Pedagogy Design

Intention, in the context of technology adoption, is influenced by various factors, including perceived usefulness, perceived ease of use, social influence, and facilitating conditions (Davis, 1989). In the case of DeepSeek, PE teachers' intention to use this AI tool in their pedagogy design is likely to be shaped by their perceptions of its benefits, the ease with which they can integrate it into their teaching, and the support they receive from their institutions and peers. Research has shown that when teachers perceive a technology as helpful and easy to use, and when they receive adequate support, their intention to adopt the technology increases. This intention, in turn, is a strong predictor of actual technology use (Venkatesh & Davis, 2000).

In the context of technology integration, PE teachers' self-efficacy in using DeepSeek can significantly impact their teaching practices and, consequently, their students' learning experiences. Studies have demonstrated that teachers with higher self-efficacy are more likely to experiment with new teaching methods, integrate technology into their lessons, and persist in the face of challenges (Klassen & Tze, 2014; Orakcı et al., 2023). Furthermore, self-efficacy beliefs are not static but can be enhanced through experiences of success, feedback, and professional development (Bandura, 1997; Pfitzner-Eden et al., 2014). The intention to use a mobile wallet application was found to mediate the relationship between facilitating conditions (such as government support and user guidance) and users' behavioral intentions. Similarly, in the educational context, Orakcı et al. (2023) found that teachers' intention to use technology mediated the relationship between perceived support and their self-efficacy beliefs.

Table 2.8 Moderating Role of PEOU on FC → ITU

Source	Variable	Key Finding
Venkatesh & Davis (2000); Venkatesh et al. (2003)	FC, PEOU, ITU	Usability strengthens the translation of support into intention.
Orakcı et al. (2023)	FC, ITU, TSE	Support predicts ITU; higher usability enhances the pathway.

Note. PEOU is theorized to moderate FC → ITU by reducing effort barriers.

2.2.8 Mediating Effect of Intention to Use DeepSeek on the Relationship between Perceived Usefulness and PE Teachers' Self-Efficacy

The mediating role of Intention to Use DeepSeek (ITU) on the relationship between Perceived Usefulness (PU) and PE Teachers' Self-Efficacy (TSE) can be explained through the integration of the Technology Acceptance Model (TAM) and Social Cognitive Theory (SCT). According to TAM, PU is a proximal determinant of ITU, while ITU is the most immediate psychological antecedent of actual technology

use (Davis, 1989; Venkatesh et al., 2003). From the perspective of SCT, teachers' self-efficacy is strengthened through mastery experiences, vicarious learning, verbal persuasion, and emotional arousal (Bandura, 1997). When PE teachers perceive DeepSeek as useful for instructional planning, they are more likely to form a positive intention to use it. This intention, in turn, increases the likelihood that they will actually integrate DeepSeek into lesson design, experiment with AI-assisted pedagogical strategies, and accumulate successful teaching experiences. These experiences can further enhance their confidence in designing and delivering PE instruction, thereby raising TSE.

Empirical evidence provides indirect support for this mediation pathway. Hwang et al. (2023) found that teachers who intended to use AI for instructional design tended to report higher ICT self-efficacy, suggesting that intention serves as a psychological bridge between perceived utility and efficacy beliefs. Lee and Choi (2020) showed that teachers' intention to use AI tools positively predicted technology integration behaviors, which in turn strengthened their confidence in teaching. Su and Shen (2021) further argued that when teachers are motivated to use AI in instructional design, they engage more deeply with its functions, construct relevant knowledge, and improve technical skills, which collectively enhance teaching self-efficacy. In addition, Chen and Ma (2022) found that network perceived usefulness and ICT self-efficacy played mediated roles in educational technology contexts, while Xie et al. (2023) demonstrated that perceived ease of use and facilitating conditions indirectly influenced continuance intention through self-efficacy. Although these studies do not directly test the full PU → ITU → TSE chain in PE settings, they provide consistent evidence that usefulness perceptions and intention-related engagement can shape teachers' efficacy beliefs.

In the context of PE pedagogy design, DeepSeek may help teachers generate differentiated lesson plans, structure instructional content, and obtain prompt feedback. However, such benefits are unlikely to influence TSE unless teachers first perceive the tool as useful and then form a concrete intention to use it. Therefore, ITU is theorized to mediate the relationship between PU and TSE.

2.2.9 Mediating Effect of Intention to Use DeepSeek on the Relationship between AI Anxiety and PE Teachers' Self-Efficacy

AI Anxiety (AIA) refers to apprehension, fear, or unease toward AI technologies, often stemming from concerns about job replacement, loss of control, ethical risks, and unfamiliarity with AI systems (Wang & Wang, 2022). In educational contexts, AIA can negatively affect teachers' attitudes toward AI and reduce their willingness to adopt AI-based tools (Cho & Seo, 2024; Uludag et al., 2025). When PE teachers experience high levels of AIA, they may perceive DeepSeek as threatening, unpredictable, or incompatible with the embodied and relational nature of physical education. As a result, their intention to use DeepSeek may decline.

According to SCT, self-efficacy is not only shaped by direct mastery experiences but also influenced by emotional states and perceived control (Bandura, 1997). If teachers avoid using DeepSeek because of anxiety, they have fewer opportunities to gain successful AI-related teaching experiences. This reduced engagement may, in turn, limit the development of TSE. Conversely, when AI anxiety is reduced and teachers form an intention to use DeepSeek, they are more likely to experiment with the tool, receive feedback, and develop a sense of competence in AI-assisted pedagogy. Thus, ITU can serve as a mediating mechanism linking AIA to TSE.

Existing studies offer adjacent evidence for this mediation logic. Wang and Wang (2022) suggested that targeted training and support can reduce AI anxiety and enhance teachers' intention to use AI tools, which may subsequently strengthen their confidence. Cho and Seo (2024) found that AI anxiety negatively correlated with acceptance attitudes and intention to use AI among nursing students. Uludag et al. (2025) reported that AI anxiety significantly reduced science doctoral students' intention to use ChatGPT. Sanusi et al. (2024) indicated that confidence in using AI and perceived social good can positively influence teachers' intention to adopt AI technologies, thereby enhancing self-efficacy.

2.2.10 Mediating Effect of Intention to Use DeepSeek on the Relationship between Facilitating Conditions and PE Teachers' Self-Efficacy

Facilitating Conditions (FC) refer to the external resources, technical support, training, and organizational assistance that enable individuals to use a technology (Venkatesh et al., 2003). In the context of AI adoption, FC includes access to hardware and software, relevant training, peer collaboration, and institutional encouragement (Cheng et al., 2022; Wangdi et al., 2023). The Motivation–Opportunity–Ability (MOA) model provides a useful lens for understanding how FC translates into psychological outcomes. In this model, FC represent opportunity, ITU reflects motivation, and TSE can be viewed as a psychological outcome of ability-building through actual or intended engagement (MacInnis & Jaworski, 1989).

When PE teachers perceive that their university provides adequate resources, training, and support for DeepSeek, they are more likely to form a positive intention to use it. This intention increases the probability of actual use and experimentation in lesson design. Successful use experiences, in turn, can strengthen teachers' confidence in integrating AI into PE pedagogy, thereby enhancing TSE. Thus, ITU is theorized to mediate the relationship between FC and TSE.

Empirical studies provide support for the FC → ITU link. An et al. (2023) found that facilitating conditions shaped secondary school English teachers' intention to use AI in teaching. Buraimoh et al. (2023) confirmed that devices, training, and support mechanisms significantly predicted teachers' behavioral intention to use mobile technologies for instruction. Miraz et al. (2022) showed that facilitating conditions

positively influenced adoption behavior through intention. Foroughi et al. (2023) identified facilitating conditions as part of the configurational factors contributing to high adoption intention toward ChatGPT. In addition, Orakci et al. (2023) found that teachers' intention to use technology mediated the relationship between perceived support and their self-efficacy beliefs. Hwang et al. (2023) also noted that ICT self-efficacy is shaped not only by prior technology experience but also by the strength of the educational support system, including AI training and peer collaboration.

In PE settings, where AI tools may initially seem distant from embodied instructional practice, institutional support and training are particularly important. When FC are favorable, PE teachers are more likely to intend to use DeepSeek; this intention may then promote deeper engagement and successful integration, ultimately enhancing TSE.

2.3 Theoretical Framework

2.3.1 Theoretical Integration of the Study

The conceptual foundation of this study rests on the integration of three complementary theoretical perspectives: the Technology Acceptance Model (TAM), the Social Cognitive Theory (SCT), and the Motivation–Opportunity–Ability (MOA) Model. Each theory provides a unique lens for understanding how Guangxi public university PE teachers adopt and internalize DeepSeek in their pedagogy design.

The Technology Acceptance Model (TAM), proposed by Davis (1989), explains the cognitive determinants of technology adoption through Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). These cognitive beliefs form the foundation of teachers' behavioral intention to use DeepSeek (Intention to Use DeepSeek, ITU), reflecting how individuals assess the value and usability of AI-assisted teaching tools. In this study, TAM elucidates the rational decision-making process underlying PE teachers' willingness to integrate DeepSeek into instructional planning and design.

The Social Cognitive Theory (SCT), advanced by Bandura (1986), serves as the overarching framework for understanding how personal, behavioral, and environmental factors interact to shape teachers' pedagogical behaviors. Within this triadic reciprocal causation model, Teaching Self-Efficacy (TSE) operates as a key psychological construct that mediates the influence of cognition and environment on behavior. Applied to this study, SCT explains how teachers' beliefs in their capabilities to use AI interact with institutional conditions and behavioral engagement, leading to enhanced leadership, motivation, engagement, and achievement outcomes.

The Motivation–Opportunity–Ability (MOA) Model (MacInnis & Jaworski, 1989) complements these two frameworks by incorporating behavioral enablers that translate intention into action. The model posits that actual behavioral engagement depends not only on internal motivation but also on external opportunities (institutional support, technical resources) and individual ability (digital and pedagogical

competence). In the context of this research, MOA helps bridge the cognitive (TAM) and psychological (SCT) components, clarifying how facilitating conditions (FC) and emotional factors such as AI Anxiety (AIA) influence teachers' adoption and effective use of DeepSeek.

Together, the integration of TAM, SCT, and MOA provides a holistic explanation of how cognition, emotion, environment, and behavior interact in shaping AI-assisted pedagogy. This tri-theoretical synthesis allows the DeepSeek-Integrated PE Pedagogy Design Model to capture both the determinants of teachers' adoption intention and the resulting psychological and professional outcomes, offering a comprehensive framework for understanding AI-enabled educational innovation in Guangxi's higher education context.

Table 2.9 Theoretical Foundations of the Study

Theory	Key Scholar	Core Concept	Role in This Study
Technology Acceptance Model (TAM)	Davis (1989)	Technology adoption behavior is determined by Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).	Explains PE teachers' cognitive foundation for adopting DeepSeek in pedagogy design and the roles of PU and PEOU in shaping ITU.
Social Cognitive Theory (SCT)	Bandura (1986)	Human behavior results from the reciprocal interaction among personal factors, behavior, and environment. Self-efficacy operates as a central mechanism linking cognition and action.	Provides the overarching framework explaining how teachers' beliefs, environmental supports, and behaviors interact in AI-assisted pedagogy, with Teaching Self-Efficacy (TSE) as a key manifestation.
Motivation–Opportunity–Ability Model (MOA)	MacInnis & Jaworski (1989)	Behavior is shaped by the interaction of Motivation (desire), Opportunity (environmental support), and Ability (skills).	Complements TAM and SCT by explaining how external conditions (FC) and internal motivation (AIA mitigation) jointly influence teachers' AI adoption behavior.

2.3.2 Theoretical Framework

The framework integrates TAM/UTAUT, Self-Determination Theory, and Social Cognitive Theory. PU, PEOU, and FC stem from TAM/UTAUT; AIA captures psychological barriers. ITU mediates the effects of PU, FC, and AIA on TSE. PEOU moderates the antecedent-to-intention paths.

Notably, the intention to use DeepSeek (also derived from the Technology Acceptance Model) is conceptualized as a moderating variable that influences the strength of the relationship between teachers' technology-related perceptions and their intention to use DeepSeek. PEOU emphasizes the degree of effort teachers perceive is required to operate DeepSeek effectively.

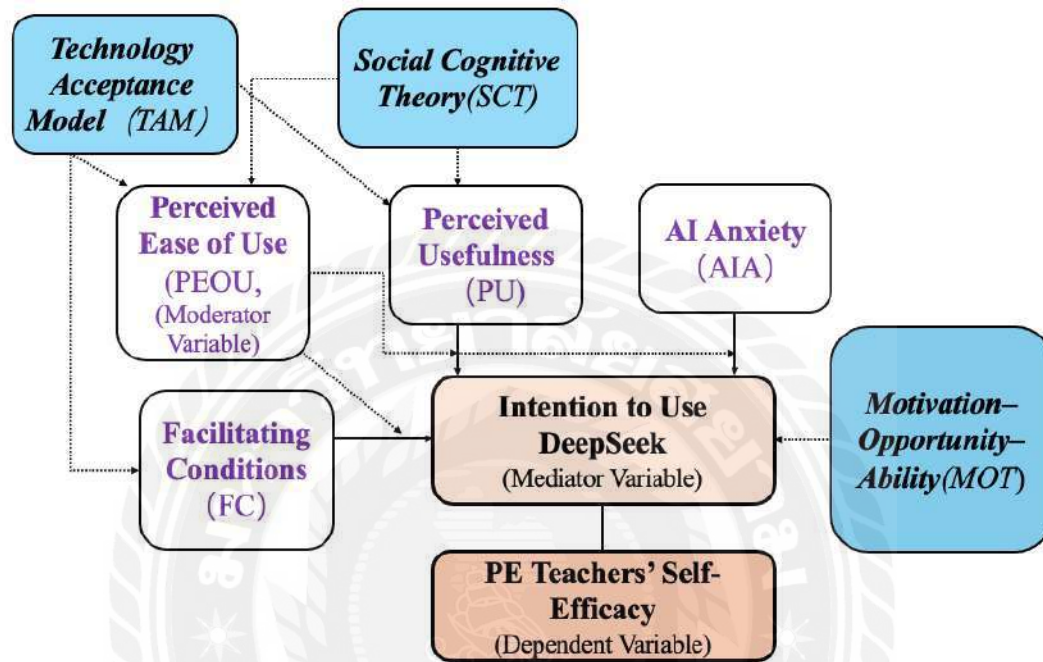


Figure 2.1 Theoretical Framework

2.4 Conceptual Framework

Grounded in the theoretical framework, the conceptual model specifies the hypothesized paths among Perceived Usefulness (PU), Facilitating Conditions (FC), AI Anxiety (AIA), PE Teachers' Self-Efficacy (TSE), the moderating role of Perceived Ease of Use (PEOU) and mediating role of Intention to Use DeepSeek (ITU).

The study focuses on how Perceived Usefulness, AI Anxiety, and Facilitating Conditions influence teachers' Intention to Use DeepSeek, which in turn affects their Self-Efficacy. Intention to Use DeepSeek thus serves as a mediating variable between contextual and psychological antecedents and professional outcomes. Importantly, Perceived Ease of Use is introduced as a moderating variable, hypothesized to strengthen or weaken the relationships between the independent variables (PU, FC, AIA) and intention.

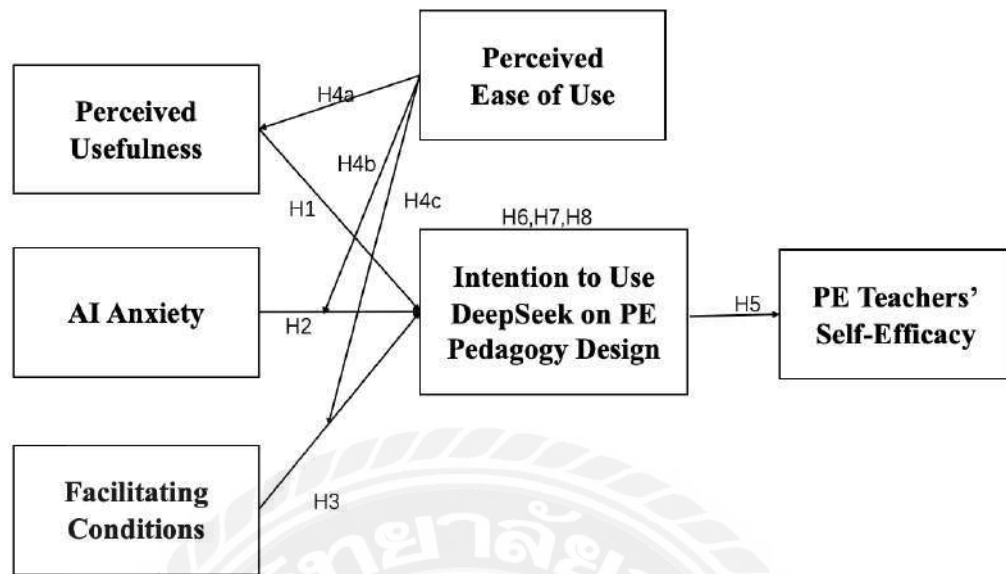


Figure 2.2 Conceptual Framework

2.5 Hypotheses

H1: Perceived usefulness has a statistically significant positive effect on intention to use DeepSeek on PE pedagogy design.

H2: AI anxiety has a statistically significant adverse effect on intention to use DeepSeek on PE pedagogy design.

H3: Facilitating conditions have a statistically significant positive effect on intention to use DeepSeek on PE pedagogy design.

H4a: Perceived ease of use moderates the relationship between perceived usefulness and intention to use DeepSeek on PE pedagogy design.

H4b: Perceived ease of use moderates the relationship between AI anxiety and intention to use DeepSeek on PE pedagogy design.

H4c: Perceived ease of use moderates the relationship between facilitating conditions and intention to use DeepSeek on PE pedagogy design.

H5: Intention to use DeepSeek on PE pedagogy design has a statistically significant positive effect on PE teachers' self-efficacy.

H6: Intention to use DeepSeek on PE pedagogy design mediates the relationship between perceived usefulness and PE teachers' self-efficacy.

H7: Intention to use DeepSeek on PE pedagogy design mediates the relationship between AI anxiety and PE teachers' self-efficacy.

H8: Intention to use DeepSeek in PE pedagogy design mediates the relationship between facilitating conditions and PE teachers' self-efficacy.

2.6 Operationalization of Variables

Referring to literature review, Table 2.9 presents operational definitions, scale items, sources, and response scales.

Table 2.10 Operationalization of Variables

Variable	Operational Definition	Scale Item(example)	Reference	Likert Scale
TSE	Belief in the capability to design/deliver PE instruction, including confidence in integrating AI to achieve goals.	TSE1 Recognition by colleagues; TSE2 Overcome challenges and achieve goals; TSE3 Gain students' approval; TSE4 Ensure rules and behaviors; TSE5 Engage less-interested students; TSE6 Recognition is rare (R).	Bandura (1997); Tschannen-Moran & Hoy (2001) (adapted)	1 = Strongly disagree ... 5 = Strongly agree
FC	Perceived organizational/technical infrastructures supporting DeepSeek use (resources, training, assistance).	FC1 Resources; FC2 School makes efforts to develop staff knowledge; FC3 Assistance; FC4 Training provided; FC5 No training (R).	Venkatesh et al. (2003).	1 = Strongly disagree ... 5 = Strongly agree
PU	Belief that using DeepSeek for PE pedagogical design enhances teaching effectiveness and outcomes.	PU1 Improves work efficiency; PU2 Enhances teaching performance; PU3 Easier to achieve goals; PU4 Beneficial for classes; PU5 Less applicable to skill-based PE (R).	Davis (1989) (adapted)	1 = Strongly disagree ... 5 = Strongly agree
PEOU	The extent to which DeepSeek is perceived as easy to use.	PEOU1 Learning to use DeepSeek for PE pedagogical design is easy for me;	Davis (1989) (adapted)	1 = Strongly disagree ... 5 =

Variable	Operational Definition	Scale Item(example)	Reference	Likert Scale
		PEOU2 Outputs are easy to understand; PEOU3 Navigation/operation is smooth; PEOU4 Not easy to apply (R).		Strongly agree
AIA	Negative emotional response accompanying the adoption of AI tools for pedagogical design.	AIA1 Learning to use DeepSeek makes me anxious; AIA2 Worry it weakens my instructional skills; AIA3 Fear suggestions may be unsuitable; AIA4 I am confident in evaluating suggestions (R); AIA5 Interacting with DeepSeek makes me uneasy.	Wang & Wang (2022 AIAS) (primary); adapted	1 = Strongly disagree ... 5 = Strongly agree
ITU	Willingness/plans to use DeepSeek for PE pedagogical design; readiness to integrate into practice.	ITU1: I will use DeepSeek; ITU2: I will try DeepSeek for challenges; ITU3: I will recommend that my students use DeepSeek; ITU4: I plan to use it regularly next semester; ITU5: I will not use DeepSeek (R).	Venkatesh et al. (2003). An et al. (2023) (adapted)	1 = Strongly disagree ... 5 = Strongly agree

Note. Items marked (R) are reverse-coded for scoring consistency.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research Design and Methodology

3.1.1 Research Design

This study employed a sequential mixed methods design to investigate the determinants of PE teachers' intention to use DeepSeek (ITU) in pedagogical design and the implications for PE teachers' self-efficacy (TSE) in 28 public universities in Guangxi, China.

It is important to note that the preliminary qualitative exploration (semi-structured online interviews with domain experts) is presented in Chapter 1 as a separate preliminary study. It is not included as a formal phase of the main study in this chapter.

The main study consists of two formal phases:

Phase 1 Quantitative survey: A structured bilingual questionnaire was administered to PE teachers. The survey measured PU, FC, AIA, PEOU, ITU, and TSE. The quantitative data were analyzed using PLS-SEM to test the hypothesized relationships.

Phase 2 Qualitative validation and model development: Following the quantitative analysis, semi-structured follow-up interviews were conducted with a subset of domain experts and PE instructors. This phase served two purposes: (1) to interpret the statistical results and assess the propriety, feasibility, and utility of the proposed model; and (2) to collaboratively refine and contextualize the DeepSeek-Integrated PE Pedagogy Design Model. Through thematic analysis of the interview data, the researchers synthesized the validated constructs (PU, FC, AIA, PEOU, ITU, TSE) into a practical, step-by-step pedagogy design model (as presented in Chapter 5, Figure 5.2).

3.1.2 Mixed-Methods Rationale and Integration Strategy

This study adopted an exploratory sequential mixed-methods design (QUAL → QUAN → QUAL) because the adoption of a context-specific AI tool (DeepSeek) in an embodied discipline such as PE involves intertwined cognitive perceptions (PU, PEOU), emotional barriers (AIA), and institutional supports (FC) that cannot be fully captured by a single method.

The findings from the preliminary qualitative exploration—semi-structured online interviews with domain experts designed to surface opportunities, barriers, and contextual supports—presented in Chapter 1 were used to operationalize constructs and refine the bilingual measurement items for the survey.

The main study consists of two formal phases. Phase 1: Quantitative survey tested the hypothesized model using PLS-SEM to estimate predictive relationships among PU, FC, AIA, PEOU, ITU, and TSE. Phase 2: Qualitative validation and model development included expert member-checking and focus discussions to (a) assess the propriety, feasibility, and utility of the proposed model; (b) interpret and contextualize the statistical findings; and (c) synthesize the validated structural relationships with qualitative themes to construct and refine the DeepSeek-Integrated PE Pedagogy Design Model (presented in Chapter 5, Figure 5.2). This phase also translated the integrated findings into actionable institutional recommendations.

Integration is achieved at three points: (1) connecting preliminary qualitative themes to instrument development; (2) building the survey questionnaire from those qualitative insights; and (3) merging quantitative results with qualitative validation and model construction through joint displays and meta-inferences.

3.2 Population and Sample

3.2.1 Population

The target population for this study comprised PE teachers from 28 public universities in Guangxi, China. These educators share common professional characteristics, including their responsibility for delivering PE courses and their potential exposure to integrating DeepSeek into pedagogy design. According to Clark-Carter (2009), a target population refers to a group of individuals who share specific characteristics or attitudes toward defined factors; in this study, the factor is the adoption of DeepSeek-based pedagogy design in PE teaching.

Due to the logistical challenges of studying the entire population, representative sampling is commonly adopted (Mertens & Wilson, 2018). Sampling enables researchers to draw valid inferences about the broader population, aligning with the standard practice in educational and social sciences, where complete enumeration is rarely feasible (Patten, 2016).

This study's total population of 1,257 PE teachers across 28 universities (see Table 3.1) provided a solid foundation for sampling and analysis. These institutions are distributed across Guangxi's key cities and represent diverse institutional types, which enhances the representativeness of the findings.

Table 3.1 Population of PE Teachers in Public Universities in Guangxi

City	University	Number of PE Teachers
Guilin	Guangxi Normal University	147
Baise	Baise University	79
Laibin	Guangxi Science and Technology Normal College	76
Yulin	Yulin Normal University	63

City	University	Number of PE Teachers
Hezhou	Hezhou University	63
Guilin	Guangxi University of Science and Technology	59
Nanning	Guangxi University for Nationalities	56
Nanning	Guangxi University of Finance and Economics	54
Hechi	Hechi University	54
Nanning	Nanning Normal University	53
Nanning	Guangxi University	52
Laibin	Guangxi Normal College for Nationalities	46
Wuzhou	Wuzhou University	43
Guilin	Guilin Institute of Aerospace Technology	40
Nanning	Guangxi Medical University	35
Guilin	Guilin University of Electronic Science and Technology	34
Guilin	Guilin University of Technology	34
Qinzhou	Beibu Gulf University	34
Liuzhou	Liuzhou Vocational and Technical University	32
Nanning	Guangxi Police College	32
Nanning	Guangxi University of Chinese Medicine	30
Nanning	Guangxi Agricultural Vocational and Technical University	29
Laibin	Nanning Vocational and Technical University	23
Laibin	Guangxi Vocational Teachers College	20
Guilin	Guilin Tourism College	20
Guilin	Guilin Medical College	19
Nanning	Guangxi Arts Institute	16
Baise	Youjiang Medical College for Nationalities	14
Total	28	1257

3.2.2 Sample Size

Determining an appropriate sample size is crucial, as it directly influences the accuracy, reliability, and generalizability of the findings (Dattalo, 2008). For Structural Equation Modeling (SEM), a sample size of at least 200 participants is typically recommended (Hair et al., 2014), while larger samples reduce error and enhance representativeness.

Sample Size Calculation (Cochran's Formula)

$$n_o = (Z^2 \times p \times (1-p)) / e^2$$

Substituting $Z = 1.96$, $p = 0.5$, $e = 0.05$:

$$n_o = (1.96^2 \times 0.5 \times (1-0.5)) / 0.05^2 \approx 384$$

Finite population correction:

$$n = n_o / (1 + (n_o - 1) / N) = 384 / (1 + 383 / 1257) \approx 294$$

Adjusted for 30% non-response:

$$n_{\text{adjusted}} = 294 \times (1 + 0.30) \approx 382$$

In this study, the target population consisted of 1,257 PE teachers from 28 public universities in Guangxi (see Table 3.1). Using Cochran's (1977) formula with a 95% confidence level, 5% margin of error, and 50% response distribution, the minimum required sample size was approximately 384. After applying the finite population correction, the adjusted sample size was ≈ 294 . To accommodate potential non-responses and incomplete data, the target sample size was increased by 30%, resulting in a target of $\approx$ approximately 382 teachers (Dillman et al., 2014).

The details of the sample size calculation are provided in Appendix H.

Table 3.2 Sample Size Determination for PE Teachers (Cochran's Formula)

Step	Description	Value
1	Population size (N)	1,257
2	Margin of error (e)	5%
3	Confidence level (Z)	95% (Z = 1.96)
4	Response distribution (p)	50%
5	Calculated sample size (n_o)	≈ 384
6	Finite population correction (n)	≈ 294
7	Adjusted for 30% non-response	≈ 382
8	Distributed questionnaires	600
9	Final valid responses	402

Note. Sample size was estimated using Cochran's (1977) formula. Adjustments were made for the finite population and expected non-responses. The final valid responses (N = 402) exceeded the minimum requirement for SEM analysis.

3.2.3 Sampling Procedures

This study employed a quota sampling strategy across all 28 public universities in Guangxi Province. Quota sampling was chosen to ensure that the distribution of participants proportionally reflected the overall structure of the 1,257 PE teachers in the population. In the first stage, quotas were assigned to each university based on the number of PE teachers. In the second stage, convenience sampling was applied within

each university to recruit participants until the quota was fulfilled. This two-step strategy ensured both proportionality and feasibility in the data collection process.

As shown in Table 3.3, the allocation was proportionally distributed across the 28 universities.

Table 3.3 Sample Allocation of PE Teachers in 28 Public Universities in Guangxi Province

City	University	Number of PE Teachers	Proportion (%)	Allocated Sample (N=600)
Guilin	Guangxi Normal University	147	11.69	71
Baise	Baise University	79	6.28	38
Laibin	Guangxi Science and Technology Normal College	76	6.05	37
Yulin	Yulin Normal University	63	5.01	31
Hezhou	Hezhou University	63	5.01	31
Guilin	Guangxi University of Science and Technology	59	4.69	29
Nanning	Guangxi University for Nationalities	56	4.46	27
Nanning	Guangxi University of Finance and Economics	54	4.30	26
Hechi	Hechi University	54	4.30	26
Nanning	Nanning Normal University	53	4.22	26
Nanning	Guangxi University	52	4.14	25
Laibin	Guangxi Normal College for Nationalities	46	3.66	22
Wuzhou	Wuzhou University	43	3.42	21
Guilin	Guilin Institute of Aerospace Technology	40	3.18	19
Nanning	Guangxi Medical University	35	2.78	16
Guilin	Guilin University of Electronic Science and Technology	34	2.70	16
Guilin	Guilin University of Technology	34	2.70	16
Qinzhou	Beibu Gulf University	34	2.70	16
Liuzhou	Liuzhou Vocational and Technical University	32	2.55	15
Nanning	Guangxi Police College	32	2.55	15
Nanning	Guangxi University of Chinese Medicine	30	2.39	14
Nanning	Guangxi Agricultural Vocational and Technical University	29	2.31	13

City	University	Number of PE Teachers	Proportion (%)	Allocated Sample (N=600)
Laibin	Nanning Vocational and Technical University	23	1.83	10
Laibin	Guangxi Vocational Teachers College	20	1.59	9
Guilin	Guilin Tourism College	20	1.59	9
Guilin	Guilin Medical College	19	1.51	9
Nanning	Guangxi Arts Institute	16	1.27	7
Baise	Youjiang Medical College for Nationalities	14	1.11	6
Total	—	1257	100.00	600

Table 3.4 Inclusion and Exclusion Criteria for Participant Selection

Criteria Type	Description
Inclusion Criteria	<ol style="list-style-type: none"> 1. Full-time PE teachers employed at one of the 28 public universities in Guangxi Province. 2. Participants currently involved in teaching, curriculum design, or pedagogy-related research activities. 3. Teachers with at least basic awareness or exposure to AI-assisted educational tools.
Exclusion Criteria	<ol style="list-style-type: none"> 1. Teachers with no prior experience or awareness of DeepSeek or any AI-assisted teaching applications. 2. Teachers aged above 55 years, as they are approaching retirement and less likely to engage in long-term adoption of emerging technologies. 3. Temporary, part-time, or administrative staff not directly involved in teaching practice.

The inclusion and exclusion criteria were designed to ensure the sample's consistency, relevance, and representativeness within the scope of Guangxi's higher education system. The focus on mid-career and younger faculty aligns with national and provincial digital transformation policies, which emphasize fostering AI-driven innovation among active educators.

During data collection, weekly monitoring of quota completion was conducted, with supplementary distribution strategies applied to universities where response rates fell short. This ensured that the overall quota structure was maintained and that the final sample adequately represented the defined target population.

Advantages of Quota Sampling in This Context

Quota sampling ensures that the study captures the structural distribution of PE teachers across all 28 public universities in Guangxi Province. By allocating sample sizes proportionally to each institution, this approach preserves the representativeness of the population while maintaining operational feasibility. Compared with purely random methods, quota sampling is more practical in large-scale educational surveys where access to the entire population is constrained.

In this study, quotas ensured that responses from both larger and smaller universities were included, preventing the overrepresentation of certain institutions and ensuring that regional and institutional diversity was accurately reflected. The subsequent use of convenience sampling within each quota further facilitated data collection, aligning with the proportional structure of the target population. This strategy strikes a balance between methodological rigor and fieldwork feasibility, ultimately enhancing the generalizability and policy relevance of the findings.

Consistent with the sampling plan, the fieldwork yielded 402 valid cases, which meet the a priori requirement and support the complexity of the proposed PLS-SEM model (see Chapter IV).

3.3 Research Instrument

3.3.1 Questionnaire Development and Content Validity (IOC)

A questionnaire was developed based on established scales to ensure theoretical robustness and psychometric soundness. Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) were adapted from Davis's (1989) Technology Acceptance Model, which has consistently demonstrated high reliability (PU: Cronbach's $\alpha \approx .97$; PEOU: $\alpha \approx .91$) and validity in technology adoption studies. Facilitating Conditions (FC) and Intention to Use (ITU) were measured following the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), with prior studies reporting strong internal consistency ($\alpha > .85$). AI Anxiety (AIA) was assessed using items adapted from the Artificial Intelligence Anxiety Scale (Wang & Wang, 2022), which has demonstrated excellent reliability ($\alpha > .90$). Teacher Self-Efficacy (TSE) was measured with the Teachers' Sense of Efficacy Scale (TSES; Tschannen-Moran & Hoy, 2001), supplemented with PE-specific items derived from Martin and Kulina's (2003) PETPAS.

To ensure cultural and contextual relevance, all items underwent forward-back translation (Brislin, 1970; Beaton et al., 2000) and expert review.

Content validity is essential to ensure that an instrument adequately represents the construct domain it intends to measure. The Index of Item-Objective Congruence (IOC), originally proposed by Rovinelli and Hambleton (1977), was employed to quantify expert agreement regarding the alignment between questionnaire items and their intended constructs. In this study, four experts were invited to evaluate item-

construct congruence, consistent with recommendations that a minimum panel of at least three subject-matter experts can provide defensible content validation (Turner & Carlson, 2003). The panel comprised experts from Guangxi Normal University, Guangxi University, and Michigan State University. Collectively, their expertise covered sports science, physical education, educational administration, and measurement/quantitative methods. Table 3.5 presents the expert panel information.

Table 3.5 IOC Expert Information

No.	Name	Academic Title	Affiliation	Field / Degree	Nationality
1	Sungworn Ngudgratoke	Associate Professor	Michigan State University	Ph.D. in Measurement and Quantitative Methods	Thailand
2	Weiguo Liu	Professor	Guangxi Normal University	Ph.D. in Sports Science	China
3	Jinguo Zhao	Associate Professor	Guangxi Normal University	Ph.D. in Physical Education	China
4	Xiaobo Huang	Professor	Guangxi University	Master's degree in educational administration	China

All items were independently reviewed and rated by the experts. Given the four-member panel, items with $IOC \geq 0.75$ were retained as highly congruent; items with IOC between 0.50 and 0.74 were revised based on expert feedback; and items with $IOC < 0.50$ were considered for deletion or substantial rewriting. The IOC results indicated strong content alignment and logical consistency for the final instrument (see Appendix H). Finally, although the questionnaire was adapted from established instruments, modifications were made to improve contextual fit with the present research setting (DeepSeek-supported pedagogy design and the Guangxi higher-education PE context). The final instrument is bilingual (English and Chinese).

3.3.2 Pilot Test

According to Hassan et al. (2006), pilot research is a small-scale study that utilizes various methods, such as data collection, sampling, and evaluation, in preparation for a larger study. It enables researchers to identify potential problems and weaknesses in the design of testing instruments before implementing them on a large scale. Cooper and Schindler (2014) recommended that pilot studies should include between 25 and 100 participants.

In this study, a pilot test was conducted with 46 PE teachers from Guangxi Normal University. The primary objective was to assess the clarity, reliability, and internal consistency of the measurement items. Feedback from participants ensured that the wording of items was understandable and contextually relevant to the study environment.

As shown in Table 3.6, a total of 30 items were tested with 46 responses, yielding a Cronbach's alpha of 0.898. Since all values exceeded the 0.80 threshold, the results indicate a high level of internal consistency at the pilot stage, supporting the instrument's suitability for the subsequent large-scale survey.

Table 3.6 Cronbach's Alpha Coefficient

N of Items	N	Cronbach's Alpha
30	46	0.898

Note. Pilot test was conducted to refine item clarity and structure. The alpha indicates excellent internal consistency, supporting proceeding to the full survey.

3.3.3 Reliability Test (Cronbach's Alpha)

Reliability refers to the extent to which an instrument consistently measures a construct. In the main survey phase ($N = 402$), internal consistency reliability was assessed using Cronbach's alpha (α). Following commonly used criteria ($\alpha \geq 0.70$ acceptable; $\alpha \geq 0.80$ good; $\alpha \geq 0.90$ excellent), Cronbach's alpha was calculated for each construct in the measurement model.

As shown in Table 3.7, all constructs demonstrated good to excellent internal consistency: PU ($\alpha = 0.865$), AIA ($\alpha = 0.879$), FC ($\alpha = 0.849$), ITU ($\alpha = 0.854$), TSE ($\alpha = 0.901$), and PEOU ($\alpha = 0.811$). These results indicate that the items within each construct consistently measured the same underlying concept. In addition, the overall instrument (30 items; $N = 402$) yielded an alpha of 0.859, suggesting good reliability at the instrument level. Item-level diagnostics are reported in Table 4.3 to support further scale refinement if needed.

Table 3.7 Cronbach's Alpha by Construct

Construct	No. of items	Cronbach's α	Interpretation
PU	5	0.865	Good
AIA	5	0.879	Good
FC	5	0.849	Good
ITU	5	0.854	Good
TSE	6	0.901	Excellent
PEOU	4	0.811	Good

Note: Reverse-coded items were recoded prior to reliability estimation. Instrument-level reliability: $\alpha = 0.859$ (30 items; $N = 402$).

3.3.4 Validity Test: Factor Analysis Suitability (KMO and Bartlett's Test)

Following the reliability assessment, the factorability of the instrument was evaluated using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity. As shown in Table 3.8, the KMO values for all constructs ranged from .779 to .912, all exceeding the .70 threshold, indicating that the data were suitable for factor analysis. In addition, all Bartlett's tests of sphericity were statistically significant ($p < .001$), demonstrating that the correlation matrices were not identity matrices and thus appropriate for factor analysis. Construct validity was further examined through EFA/CFA in Chapter 4.

Table 3.8 KMO and Bartlett's Test

Variable	KMO	Bartlett's Test of Sphericity		
		Approx. Chi-Square	df	Sig.
PU	0.812	124.983	10	0.000
AIA	0.869	122.801	10	0.000
FC	0.817	118.91	10	0.000
ITU	0.855	145.172	10	0.000
TSE	0.912	174.516	15	0.000
PEOU	0.779	77.692	6	0.000

Overall, the KMO and Bartlett's test results confirm that the study data are well-suited for extracting meaningful information through factor analysis.

3.3.5 Interview Outline

To operationalize the qualitative phase of this mixed-methods design (Phase 2 qualitative validation), a semi-structured interview protocol was developed. The interview outline was designed to be flexible, allowing for probing and follow-up questions while ensuring that all core constructs were systematically covered. The interview questions were organized into four thematic blocks aligned with the study's conceptual framework (TAM–SCT–MOA):

Block 1: Opening and Background. Introductory questions aimed at building rapport and understanding participants' current teaching contexts, digital literacy, and prior experience with AI-assisted tools e.g., "Could you briefly describe your current role in PE pedagogy design and your prior experience with educational technology?"

Block 2: Perceptions and Barriers (PU, PEOU, AIA). Questions exploring teachers' perceived usefulness and ease of use of DeepSeek, as well as their anxieties regarding AI integration. Representative prompts included: "In what ways do you perceive DeepSeek as useful or not useful for your lesson planning?"; "What aspects of using DeepSeek do you find most challenging or anxiety-provoking?"; and "How does the system's usability influence your willingness to adopt it?"

Block 3: Institutional and Contextual Factors (FC). Questions addressing the role of organizational support, infrastructure, and policy. Sample questions were: “What institutional support (e.g., training, IT infrastructure, policy incentives) do you currently receive, and how does it affect your adoption of AI?” and “What contextual barriers hinder the effective use of DeepSeek in your institution?”

Block 4: Outcomes and Validation (ITU, TSE, and Policy Relevance). Questions targeting adoption intentions, self-efficacy outcomes, and practical recommendations. Prompts included: “How does your confidence in teaching change when you use DeepSeek for pedagogy design?”; “What would strengthen your long-term intention to use this tool?”; and “In your view, how can the findings of this study be translated into actionable policies for Guangxi’s higher education?”

For Model validation, an additional set of focused prompts was incorporated, asking experts to evaluate the feasibility and utility of the proposed model, and to comment on the plausibility of the statistical findings in light of their practical experiences.

3.4 Data Collection

3.4.1 Ethical Research Procedures

To ensure informed consent, a detailed information sheet outlining the nature, purpose, and potential risks of the study was provided to all participants at the beginning of the survey. Participants were explicitly informed of their right to voluntary participation and their freedom to withdraw at any time without penalty. Written informed consent was obtained from all participants prior to their involvement in the study.

To protect participants' privacy and confidentiality, all collected data were anonymized and de-identified. The data were stored securely on a password-protected institutional server accessible only to the primary researcher. The procedures for data usage, storage, and access strictly followed the ethical guidelines for educational research, ensuring the protection of participants' rights throughout the study (Bhandari, P., 2021).

3.4.2 Data Collection Procedures

Data collection for this study utilized Wenjuan Xing (Questionnaire Star), a widely used online survey platform. Online surveys were selected for their efficiency in reaching geographically dispersed populations, reducing administrative costs, and simplifying data processing (Minnaar & Heystek, 2013). Wenjuan Xing was particularly advantageous as it enabled seamless distribution, facilitated real-time monitoring of responses, and automated data aggregation for subsequent analysis.

Despite the advantages of online surveys, careful attention was paid to the design and implementation to minimize issues such as low response rates and misinterpretation of questions (Artino et al., 2014). Clear and engaging questionnaire designs were employed, and follow-up reminders were issued periodically to encourage participation and improve the response rate (Fowler, 2013).

3.4.3 Survey Procedures

Fieldwork was conducted in August 2025 across all 28 public universities in Guangxi. In line with the sampling plan (Table 3.3), quotas were first allocated to each university proportional to its number of PE teachers (Table 3.1). Within each university, participants were recruited by convenience sampling until the allocated quota was met. The inclusion criteria comprised full-time PE teachers at the target institutions, while individuals aged over 55 were excluded.

The bilingual questionnaire was administered via Wenjuan Xing. A liaison in each university disseminated the survey link and a brief invitation script. The survey window remained open for August, during which two standardized reminders were issued—one at mid-cycle and the other during the final week. Response progress was monitored weekly against the quotas. When a university fell short of the target, supplementary distribution was activated via department WeChat groups, faculty mailing lists, and on-campus coordinators to close the gaps.

To secure data quality, the survey included screening items for role and age, one attention-check item, and logic checks to prevent incomplete submissions. Submissions exhibiting straight-lining, unrealistically short completion times, or duplication were flagged and removed before analysis. A total of 600 questionnaires were distributed, and 402 valid responses were collected, exceeding the minimum required for SEM.

At the close of fieldwork (end of August 2025), responses were exported, de-identified, and cleaned (validity screening, missing-data checks, coding). If realized shares deviated materially from planned quotas, post-stratification adjustments were applied. The finalized dataset was then prepared for reliability/validity testing and SEM.

3.4.4 Interview Procedures

Given the relational and cultural sensitivities inherent in the Chinese higher education context, most participants declined to participate in audio recording during the interviews. To ensure data quality and ethical rigor, the following procedures were implemented:

1. Participant Recruitment: A subset of domain experts and PE instructors who completed the survey were invited via email to participate in the follow-up interviews. Selection was purposive, ensuring representation across different university types and levels of AI experience.

2. Informed Consent: Written consent was obtained from all participants. They were assured that their responses would remain confidential and anonymous, and that they could withdraw at any time.

3. Data Recording and Note-taking: Due to the refusal of audio recording, real-time note-taking was employed during the interviews. These notes were subsequently verified through post-interview checking and member validation to ensure accuracy and completeness.

4. Language and Translation: Bilingual materials were handled via a double-translation and cross-checking procedure to ensure semantic equivalence. Interviews were conducted in Mandarin Chinese, and the transcripts were translated into English for analysis.

5. Post-Interview Follow-up: Following the initial interviews, participants were invited to complete an open-ended follow-up questionnaire distributed via email as part of the "Refreshing Report" phase. This served as a form of respondent validation and allowed participants to clarify their perspectives further.

3.5 Data Analysis

3.5.1 Quantitative Data Analysis (PLS-SEM with SmartPLS 4)

The two-stage procedure was followed:

(A) Measurement model assessment

Indicator reliability: standardized loadings $\geq .70$ (items below were considered for removal if content validity allowed).

Internal consistency: Cronbach's α and CR $\geq .70$.

Convergent validity: AVE $\geq .50$.

Discriminant validity: (i) Fornell–Larcker ($\sqrt{\text{AVE}} > \text{inter-construct correlations}$); (ii) HTMT $< .85$ with bootstrapped 95% CIs not including 1.00.

Multicollinearity: VIF < 5 .

Approximate model fit (PLS): SRMR $< .08$, and reporting d_{ULS} and d_{G} .

(B) Structural model assessment

R^2 (explained variance) and adjusted R^2 for endogenous constructs (ITU, TSE).

Effect sizes: f^2 (0.02/0.15/0.35 = small/medium/large).

Predictive relevance: Q^2 via blindfolding (omission distance, e.g., $d = 7$); $Q^2 > 0$ indicates predictive capability.

Significance testing: Bootstrapping with 5,000 resamples (two-tailed, 95% bias-corrected CIs) for all paths and indirect effects.

Mediation: indirect effects with bootstrapped CIs.

Moderation: interaction terms constructed from mean-centered predictors; simple-slope plots at ± 1 SD reported for interpretation.

Out-of-sample prediction (optional but reported): PLSpredict with k-fold procedure; we present Q^2_{predict} and compare RMSE(MAE) of PLS vs. linear benchmark (LM). PLS superiority is inferred when most indicators exhibit lower prediction errors than those of LM.

All statistics (loadings, α /CR/AVE, Fornell–Larcker, HTMT with CIs, VIF, SRMR/d_ULS/d_G, R^2 , f^2 , Q^2 , bootstrapped β /t/p, mediation, moderation, PLSpredict) are tabulated in Chapter IV; expanded item-level diagnostics are provided in the Appendix.

3.5.2 Qualitative Data Analysis

Audio recording was declined mainly due to contextual sensitivities. Interviews were transcribed with iFLYTEK (for ASR support) and analyzed in MAXQDA 2020. The coding workflow comprised (1) preprocessing and transcript validation, (2) inductive–deductive thematic coding, (3) word-frequency and word-cloud mapping to surface salient concepts, and (4) iterative memoing and member checking to enhance credibility, dependability, and confirmability. Bilingual materials were handled via the double-translation procedure noted in Section 3.3.

3.5.3 Hypotheses Testing

Hypotheses H1–H8 were tested within the structural model using the bootstrapping settings. Moderation effects were probed with mean-centered interactions and visualized via simple slopes; mediation effects were evaluated with bootstrapped indirect paths and 95% CIs.

Table 3.9 Hypotheses and Statistical Methods

Hypotheses	Statement	Statistical Method
H1	Perceived usefulness (PU) has a statistically significant positive effect on intention to use DeepSeek on PE pedagogy design.	Structural Equation Modeling
H2	AI anxiety (AIA) has a statistically significant effect on intention to use DeepSeek on PE pedagogy design.	Structural Equation Modeling
H3	Facilitating conditions (FC) have a statistically significant positive effect on intention to use DeepSeek on PE pedagogy design.	Structural Equation Modeling
H4a	Perceived ease of use moderates the relationship between perceived usefulness and intention to use DeepSeek on PE pedagogy design.	Structural Equation Modeling
H4b	Perceived ease of use moderates the relationship between AI anxiety and intention to use DeepSeek on PE pedagogy design.	Structural Equation Modeling
H4c	Perceived ease of use moderates the relationship between facilitating conditions	Structural Equation Modeling

Hypotheses	Statement	Statistical Method
	and intention to use DeepSeek on PE pedagogy design.	
H5	Intention to use DeepSeek on PE pedagogy design has a statistically significant positive effect on PE teachers' self-efficacy.	Structural Equation Modeling
H6	Intention to use DeepSeek on PE pedagogy design mediates the relationship between perceived usefulness and PE teachers' self-efficacy.	Structural Equation Modeling
H7	Intention to use DeepSeek on PE pedagogy design mediates the relationship between AI anxiety and PE teachers' self-efficacy.	Structural Equation Modeling
H8	Intention to use DeepSeek on PE pedagogy design mediates the relationship between facilitating conditions and PE teachers' self-efficacy.	Structural Equation Modeling

All hypotheses were tested using PLS-SEM (structural model assessment), and moderation hypotheses (H4a–H4c) were evaluated via interaction terms, while mediation hypotheses (H6–H8) were assessed using bootstrapped indirect effects.

3.6 Translation of Research Instruments

To ensure the accuracy and cultural relevance of the research instruments, the English questionnaire was translated into Chinese, as the study's target participants were in Guangxi Province. The translation followed a rigorous back-translation procedure (Brislin, 1970). Two certified TEM-8 translators independently translated the questionnaire into Chinese, followed by a bilingual expert who back-translated it into English for verification (Cha et al., 2007; Beaton et al., 2000). Discrepancies were resolved through discussion to preserve the conceptual meaning of the constructs, ensuring semantic, linguistic, and cultural equivalence (See Appendix D: Questionnaire (English-Chinese Bilingual)). This process enhanced the validity and reliability of data collection among Chinese-speaking PE teachers, particularly in measuring constructs such as PU, FC, AI Anxiety, PEOU, Intention, and Self-Efficacy.

CHAPTER 4

RESEARCH RESULTS

The empirical findings of this study were derived through a mixed-methods approach that integrated quantitative and qualitative analyses to ensure both rigor and contextual depth. Quantitative data, obtained from structured questionnaires, were analyzed using SmartPLS 4, covering descriptive statistics, collinearity diagnostics (VIF), explanatory power (f^2 , R^2 , Q^2), mediation and moderation testing, and structural equation modeling to validate the proposed framework. Complementing this, qualitative insights were collected through in-depth online interviews, which were documented through real-time note-taking and subsequent participant reflections. The qualitative material was thematically coded and examined using MAXQDA 2020, which employed word cloud visualization and code–document matrix analysis. This combination of methods enabled triangulation of results, enhanced validity, and provided a nuanced interpretation of how perceived usefulness, AI anxiety, and facilitating conditions influence teachers' intention to use DeepSeek and, ultimately, their self-efficacy.

4.1 Quantitative Statistical Analysis

4.1.1 Sample's Demographic Characteristics

Demographic characterization refers to the detailed description and analysis of the demographic attributes of the research sample. This process enables researchers to understand participant diversity better, ensure the sample's representativeness, select appropriate statistical models, and interpret the findings more accurately. The study's key demographic indicators included gender, age, educational level, university affiliation. The questionnaires were administered via WJX, a widely used online survey platform in China for academic research. A total of 429 questionnaires were collected. After excluding 27 invalid responses—including incomplete submissions, duplicate entries, and questionnaires completed in less than 90 seconds—402 valid responses were retained for further analysis, yielding a validity rate of 93.7%. This data cleaning process ensured the rationality and integrity of the dataset. The final sample size met and exceeded the minimum requirement for SmartPLS 4 analysis, thereby providing a statistically robust foundation for hypothesis testing and model evaluation.

Table 4.1 Demographic Profile of Respondents

Variable	Category	N	Percent
Gender	Male	286	71.1%
	Female	116	28.9%
Age	Under 35	158	39.3%
	36–45	125	31.1%
	46–55	119	29.6%
Education	Bachelor's degree	74	18.4%
	Master's degree	278	69.2%
	Doctoral degree	50	12.4%
University	Baise University	22	5.5%
	Beibu Gulf University	13	3.2%
	Guangxi Agricultural Vocational and Technical University	7	1.7%
	Guangxi Medical University	13	3.2%
	Guangxi Normal College for Nationalities	13	3.2%
	Guangxi Normal University	52	12.9%
	Guangxi Police College	12	3.0%
	Guangxi Science and Technology Normal College	24	6.0%
	Guangxi University	19	4.7%
	Guangxi University for Nationalities	17	4.2%
	Guangxi University of Chinese Medicine	12	3.0%
	Guangxi University of Finance and Economics	18	4.5%
	Guangxi University of Science and Technology	19	4.7%
	Guangxi Vocational Teachers College	7	1.7%
	Guilin Institute of Aerospace Technology	15	3.7%
	Guilin Medical College	7	1.7%
	Guilin Tourism College	5	1.2%
	Guilin University of Electronic Science and Technology	9	2.2%
	Guilin University of Technology	9	2.2%
	Hechi University	19	4.7%
	Hezhou University	22	5.5%
	Liuzhou Vocational and Technical University	8	2.0%
	Nanning Guangxi Arts Institute	5	1.2%
	Nanning Normal University	15	3.7%
	Nanning Vocational and Technical University	6	1.5%
	Wuzhou University	12	3.0%

Variable	Category	N	Percent
	Youjiang Medical College for Nationalities	4	1.0%
	Yulin Normal University	18	4.5%

Note. N = 402. Percentages may not total 100% due to rounding. Age categories are reported in years. N = number of respondents.

The sample consisted of 402 PE teachers drawn from 28 public universities in Guangxi, China. The majority of participants were male (71.1%), while females accounted for 28.9%. Regarding age, most respondents were under 35 years old (39.3%), followed by those aged 36–45 (31.1%) and 46–55 (29.6%), indicating a relatively balanced age distribution. In terms of education, the most significant proportion held a master's degree (69.2%), followed by those with a bachelor's degree (18.4%) and doctoral degrees (12.4%), reflecting the strong emphasis on advanced qualifications within the region. Participants were widely distributed across institutions, with Guangxi Normal University (12.9%), Guangxi Science and Technology Normal College (6.0%), and Hezhou University (5.5%) contributing the most significant shares. This distribution highlights both the diversity of the sample and the representativeness of key teacher-training universities in Guangxi.

4.1.2 Descriptive Statistics of Variables

4.1.2.1 Reliability Analysis

The reliability analysis was conducted to evaluate the internal consistency of the measurement scales.

Table 4.2 Reliability Analysis

N of Items	N	Cronbach's Alpha
30	402	0.859

Table 4.2 reports the instrument-level reliability for the full questionnaire (30 items; N = 402). The overall Cronbach's alpha was 0.859, indicating good internal consistency at the instrument level. However, because the measurement model is specified at the construct level, reliability was primarily evaluated per construct, as reported in Table 4.3.

Table 4.3 Scale Reliability Analysis

Dimension	Item	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach α
PU	PU1	0.712	0.831	0.865
	PU2	0.692	0.836	
	PU3	0.647	0.847	
	PU4	0.694	0.835	
	PU5	0.689	0.837	
AIA	AIA1	0.684	0.86	0.879
	AIA2	0.732	0.848	
	AIA3	0.73	0.849	
	AIA4	0.739	0.846	
	AIA5	0.677	0.861	
FC	FC1	0.651	0.82	0.849
	FC2	0.735	0.796	
	FC3	0.615	0.829	
	FC4	0.627	0.827	
	FC5	0.666	0.815	
ITU	ITU1	0.692	0.818	0.854
	ITU2	0.706	0.813	
	ITU3	0.629	0.834	
	ITU4	0.65	0.828	
	ITU5	0.66	0.825	
TSE	TSE1	0.772	0.877	0.901
	TSE2	0.77	0.877	
	TSE3	0.752	0.88	
	TSE4	0.681	0.891	
	TSE5	0.659	0.894	
	TSE6	0.747	0.881	
PEOU	PEOU1	0.678	0.739	0.811
	PEOU2	0.54	0.804	
	PEOU3	0.587	0.782	
	PEOU4	0.715	0.721	

Note. AIA = AI Anxiety; FC = Facilitating Conditions; ITU = Intention to Use DeepSeek; PEOU = Perceived Ease of Use; TSE = PE Teachers' Self-Efficacy; PU = Perceived Usefulness.

As shown in Table 4.3, all constructs demonstrated good to excellent internal consistency: Perceived Usefulness (PU, $\alpha = .865$), AI Anxiety (AIA, $\alpha = .879$), Facilitating Conditions (FC, $\alpha = .849$), Intention to Use DeepSeek (ITU, $\alpha = .854$), PE

Teachers' Self-Efficacy (TSE, $\alpha = .901$), and Perceived Ease of Use (PEOU, $\alpha = .811$). Corrected item–total correlations were all above 0.50 (minimum = .540), indicating adequate item–construct consistency. In addition, the “Cronbach's Alpha if Item Deleted” values did not show meaningful improvements over the corresponding construct-level alpha coefficients, suggesting that each item contributed positively to its respective scale. Reverse-coded items were recoded prior to reliability estimation. Overall, these results confirm satisfactory internal consistency and support the robustness of subsequent analyses.

4.1.2.2 Validity Analysis

Table 4.4 reports the results of the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity.

Table 4.4 KMO and Bartlett's Spherical Inspection Results

KMO and Bartlett's test		
KMO value		0.900
	Chi-square	5990.831
Bartlett's sphericity test	df	435
	P-value	0.000

The KMO value was 0.900, indicating that the sample is highly suitable for factor analysis, which is considered excellent. Bartlett's test of sphericity was significant ($\chi^2 = 5990.831$, $df = 435$, $p < .001$), demonstrating that the correlation matrix is not an identity matrix and that sufficient correlations exist among the variables to justify the application of factor analysis. Together, these results confirm the adequacy of the data for subsequent exploratory and confirmatory factor analyses.

4.1.2.3 Descriptive Statistics

Table 4.5 presents the descriptive statistics for the variables. The mean scores of the constructs ranged from 3.328 to 3.542, indicating that respondents generally held moderately positive perceptions toward the measured dimensions.

Table 4.5 Descriptive Statistical Analysis of Variables

Construct	N	M	SD
PU	402	3.429	0.833
AIA	402	3.328	0.875
FC	402	3.399	0.835
ITU	402	3.52	0.815
TSE	402	3.431	0.829
PEOU	402	3.542	0.833

Note. AIA = AI Anxiety; FC = Facilitating Conditions; ITU = Intention to Use DeepSeek; PEOU = Perceived Ease of Use; TSE = PE Teachers' Self-Efficacy; PU = Perceived Usefulness.

Specifically, Perceived Ease of Use (PEOU, $M = 3.542$, $SD = 0.833$) and Intention to Use DeepSeek (ITU, $M = 3.520$, $SD = 0.815$) reported the highest mean values, suggesting favorable attitudes toward system usability and adoption. In contrast, AI Anxiety (AIA, $M = 3.328$, $SD = 0.875$) yielded the lowest mean, reflecting some degree of concern or apprehension regarding the use of AI in teaching contexts. The standard deviations, which ranged from 0.815 to 0.875, demonstrate acceptable variability, indicating consistent responses across participants. These descriptive findings provide an initial understanding of participants' attitudes and experiences, which form the foundation for subsequent structural analyses.

4.1.2.4 Variance Explained

Table 4.6 presents the results of the exploratory factor analysis (EFA) based on principal component extraction. According to Kaiser's criterion (eigenvalues greater than 1), six components were extracted from the 30 items.

Table 4.6 Total Variance Explained

Component	Initial Eigenvalues	% of Variance	Cumulative %	Extraction Sums of Squared Loadings	% of Variance	Cumulative %	Rotation Sums of Squared Loadings	% of Variance	Cumulative %
1	8.638	28.793	28.793	8.638	28.793	28.793	4.074	13.579	13.579
2	2.754	9.181	37.973	2.754	9.181	37.973	3.443	11.476	25.055
3	2.584	8.612	46.585	2.584	8.612	46.585	3.295	10.984	36.039
4	2.281	7.602	54.187	2.281	7.602	54.187	3.186	10.622	46.661
5	1.877	6.257	60.445	1.877	6.257	60.445	3.097	10.323	56.983
6	1.560	5.199	65.644	1.560	5.199	65.644	2.598	8.661	65.644
7–30	< 1.0	—	—	—	—	—	—	—	—

Note. Extraction method: principal component analysis (PCA). Factors were retained based on Kaiser's criterion (eigenvalues > 1). Rotation method: varimax rotation (if applicable). "—" indicates not applicable/not reported for components with eigenvalues < 1.

These six factors together explained 65.644% of the total variance, indicating a satisfactory level of construct validity. Specifically, the first factor accounted for 28.793% of the variance, while the remaining five factors contributed between 5.199% and 9.181% each. After rotation, the variance was more evenly distributed across the six factors, with the cumulative contribution remaining at 65.644%. These results provide evidence that the data structure is suitable for further confirmatory factor analysis and structural equation modeling (SEM).

4.1.2.5 Rotated Component Matrix

Table 4.7 presents the rotated component matrix obtained through principal component analysis with varimax rotation. The results confirm the presence of six distinct factors corresponding to the theoretical constructs: Perceived Usefulness (PU), AI Anxiety (AIA), Facilitating Conditions (FC), Intention to Use DeepSeek (ITU), PE Teachers' Self-Efficacy (TSE), and Perceived Ease of Use (PEOU).

Table 4.7 Rotated Component Matrix

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
PU1	0.138	-0.136	0.768	0.164	0.168	0.019
PU2	0.133	-0.111	0.765	0.118	0.152	0.036
PU3	0.064	-0.052	0.765	0.044	0.161	0.059
PU4	0.143	-0.065	0.786	0.132	0.075	0.083
PU5	0.220	-0.129	0.733	0.169	0.166	0.001
AIA1	-0.202	0.742	-0.039	-0.107	-0.209	0.008
AIA2	-0.132	0.780	-0.078	-0.142	-0.185	-0.109
AIA3	-0.059	0.796	-0.139	-0.145	-0.125	-0.090
AIA4	-0.069	0.803	-0.126	-0.142	-0.171	-0.108
AIA5	-0.105	0.773	-0.126	-0.054	-0.108	-0.047
FC 1	0.082	-0.139	0.174	0.758	0.113	-0.022
FC 2	-0.092	-0.157	0.133	0.787	0.167	-0.027
FC 3	0.089	-0.044	0.102	0.745	0.117	0.032
FC 4	0.156	-0.201	0.166	0.668	0.194	-0.013
FC 5	0.148	-0.129	0.045	0.767	0.124	0.003
ITU1	0.182	-0.018	0.203	0.215	0.781	-0.047
ITU2	0.137	-0.253	0.178	0.122	0.748	0.097
ITU3	0.174	-0.193	0.148	0.122	0.689	0.034
ITU4	0.114	-0.188	0.192	0.127	0.734	0.072
ITU5	0.124	-0.163	0.128	0.122	0.747	0.070
TSE1	0.815	-0.102	0.072	0.114	0.087	0.021
TSE2	0.832	-0.050	0.124	0.090	0.061	-0.020
TSE3	0.830	-0.066	0.158	0.176	0.059	0.038
TSE4	0.735	-0.057	0.119	0.135	0.091	0.019
TSE5	0.752	-0.102	0.091	0.064	0.092	0.013
TSE6	0.785	-0.084	0.179	0.192	0.084	0.009
PEOU1	0.156	0.022	0.035	0.064	0.126	0.830
PEOU2	0.089	-0.054	0.121	0.073	0.097	0.829
PEOU3	-0.017	-0.163	0.042	-0.032	0.079	0.758
PEOU4	0.019	-0.036	0.072	-0.026	0.073	0.856

Note. AIA = AI Anxiety; FC = Facilitating Conditions; ITU = Intention to Use DeepSeek; PEOU = Perceived Ease of Use; TSE = PE Teachers' Self-Efficacy; PU = Perceived Usefulness.

All items loaded strongly on their intended factors (mostly ≥ 0.68 ; the lowest loading was 0.668 for FC4), with minimal cross-loadings, demonstrating good discriminant validity. Notably, TSE items exhibited the highest factor loadings (ranging from 0.735 to 0.832), while AI Anxiety items also loaded consistently above 0.74. These results indicate that the measurement items were well aligned with their intended latent constructs, thereby providing solid evidence of construct validity for subsequent confirmatory factor analysis (CFA) and structural equation modeling (SEM).

4.1.2.6 Harman's Single-factor Test

To assess common method bias, Harman's single-factor test was conducted by subjecting all measurement items to an unrotated factor analysis. The results showed that the first factor accounted for 28.793% of the variance, which is below the critical threshold of 40%. Therefore, standard method bias is not considered a serious concern in this study.

4.1.2.7 Confirmatory Factor Analysis

Table 4.8 summarizes the results of the confirmatory factor analysis (CFA), focusing on composite reliability (CR) and average variance extracted (AVE) to assess convergent validity. All standardized factor loadings exceeded the recommended threshold of 0.70, confirming strong item–construct associations.

Table 4.8 Confirmatory Factor Analysis Results (CR and AVE)

Construct	Item	Factor Loading	CR	AVE
AIA (AI Anxiety)	AIA1	0.809	0.912	0.675
	AIA2	0.843		
	AIA3	0.841		
	AIA4	0.785		
	AIA5	0.825		
FC (Facilitating Conditions)	FC1	0.824	0.892	0.623
	FC2	0.794		
	FC3	0.729		
	FC4	0.820		
	FC5	0.792		
ITU (Intention to Use DeepSeek)	ITU1	0.803	0.896	0.632
	ITU2	0.786		
	ITU3	0.776		
	ITU4	0.775		
	ITU5	0.783		
PEOU (Perceived Ease of Use)	PEOU1	0.849	0.875	0.638

Construct	Item	Factor Loading	CR	AVE
TSE (PE Teachers' Self-Efficacy)	PEOU2	0.738	0.924	0.669
	PEOU3	0.775		
	PEOU4	0.828		
	TSE1	0.852		
	TSE2	0.851		
	TSE3	0.829		
	TSE4	0.787		
	TSE5	0.748		
	TSE6	0.836		
PU (Perceived Usefulness)	PU1	0.834	0.903	0.651
	PU2	0.812		
	PU3	0.768		
	PU4	0.798		
	PU5	0.820		

4.1.2.8 Fornell-Larcker Criterion

Table 4.9 reports discriminant validity using the Fornell–Larcker criterion. The square roots of the AVE values (diagonal) are greater than the corresponding inter-construct correlations for all constructs, indicating adequate discriminant validity under this criterion. However, given that the Fornell–Larcker approach may be less sensitive in detecting discriminant validity issues, HTMT is additionally reported in the next section as a more stringent assessment.

Table 4.9 Discriminant Validity: Fornell–Larcker Criterion

Construct	AIA	FC	ITU	PEOU	TSE	PU
AIA (AI Anxiety)	0.821					
FC (Facilitating Conditions)	-0.360	0.789				
ITU (Intention to Use DeepSeek)	-0.470	0.443	0.795			
PEOU (Perceived Ease of Use)	-0.162	0.014	0.197	0.799		
TSE (PE Teachers' Self-Efficacy)	-0.316	0.350	0.387	0.114	0.818	
PU (Perceived Usefulness)	-0.310	0.379	0.446	0.123	0.366	0.807

4.1.2.9 Heterotrait–Monotrait Ratio (HTMT)

Table 4.10 reports the discriminant validity results using the Heterotrait–Monotrait Ratio (HTMT).

Table 4.10 Discriminant Validity: Heterotrait–Monotrait Ratio (HTMT)

	AIA	FC	ITU	PEOU	TSE	PU
AIA						
FC	0.408					
ITU	0.537	0.515				
PEOU	0.193	0.052	0.233			
TSE	0.352	0.394	0.438	0.131		
PU	0.353	0.435	0.513	0.151	0.410	

Note. Off-diagonal values are HTMT ratios. Values below 0.85 (conservative) or 0.90 (liberal) generally indicate adequate discriminant validity. Blank diagonal cells indicate within-construct comparisons (not applicable).

All HTMT values among the six latent constructs were below the recommended thresholds of 0.85 (conservative) and 0.90 (liberal), indicating satisfactory discriminant validity. The highest HTMT value was observed between PU and ITU (HTMT = 0.513), which remains well within acceptable limits. Overall, the results confirm that the measurement model adequately distinguishes among the constructs, supporting subsequent PLS-SEM structural model assessment.

4.1.2.10 R-Square

Table 4.11 presents the coefficient of determination (R^2) values for the endogenous constructs in the structural model.

Table 4.11 R-Square Results

Construct	R-square	R-square adjusted
ITU	0.473	0.463
TSE	0.150	0.148

Note. R^2 indicates the proportion of variance explained in the endogenous construct by its predictors.

The results show that Intention to Use DeepSeek (ITU) achieved an R^2 value of 0.473 (adjusted $R^2 = 0.463$), indicating that nearly 47% of the variance in ITU is explained by its predictors, representing a moderate level of explanatory power. In contrast, PE Teachers' Self-Efficacy (TSE) recorded an R^2 of 0.150 (adjusted $R^2 = 0.148$), suggesting that approximately 15% of its variance is explained by the model, which is considered a weak to modest explanatory level. These results demonstrate that the model provides stronger predictive power for ITU compared to TSE, aligning with the hypothesized mediating role of ITU in enhancing TSE.

4.1.2.11 Effect Size (f^2)

Table 4.12 presents the effect size (f^2) of the exogenous constructs on the endogenous variables within the structural model. According to Cohen's (1988)

guidelines, values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively

Table 4.12 Effect Size (f^2)

Construct	AIA	FC	ITU	PEOU	TSE	PU	PEOU × AIA	PEOU × FC	PEOU × PU
AIA	—		0.131						
FC		—	0.102						
ITU			—		0.176				
PEOU			0.049	—					
TSE					—				
PU			0.131			—			
PEOU × AIA							0.013		
PEOU × FC								0.023	
PEOU × PU									0.025

Note. Cohen's (1988) guidelines suggest f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. An em dash (—) indicates not applicable. AIA = AI Anxiety; FC = Facilitating Conditions; ITU = Intention to Use DeepSeek; PEOU = Perceived Ease of Use; TSE = PE Teachers' Self-Efficacy; PU = Perceived Usefulness.

The results indicate that AI Anxiety (AIA) ($f^2 = 0.131$) and Perceived Usefulness (PU) ($f^2 = 0.131$) exert small-to-moderate effects on Intention to Use DeepSeek (ITU), while Facilitating Conditions (FC) shows a relatively small effect ($f^2 = 0.102$). Importantly, ITU demonstrates a medium effect on PE Teachers' Self-Efficacy (TSE) ($f^2 = 0.176$), supporting its role as a mediator in the model. The moderating interactions involving Perceived Ease of Use (PEOU) showed weaker effects, with values ranging from 0.013 to 0.025, which are below the threshold for a small effect. Overall, the findings suggest that the primary drivers of ITU are AIA, PU, and FC, with ITU itself making a significant contribution to TSE. At the same time, the moderating role of PEOU appears to be limited.

4.1.2.12 Predictive Relevance Results

Table 4.13 presents the predictive relevance (Q^2) results of the structural model, obtained through the blindfolding procedure in PLS-SEM. A Q^2 value greater than zero indicates that the model has predictive relevance for a given endogenous construct, with higher values reflecting stronger predictive power.

Table 4.13 Q² Predictive Relevance Results

Construct	SSO	SSE	Q² (= 1 – SSE/SSO)
ITU (Intention to Use DeepSeek)	2010	1422.942	0.292
TSE (PE Teachers' Self-Efficacy)	2412	2176.747	0.098

Note. Q² values greater than 0 indicate predictive relevance for the endogenous construct.
SSO = sum of squared observations; SSE = sum of squared prediction errors.

The results show that Intention to Use DeepSeek (ITU) achieved a Q² of 0.292, suggesting moderate predictive relevance. At the same time, PE Teachers' Self-Efficacy (TSE) recorded a lower but still positive Q² value of 0.098, indicating weak but acceptable predictive relevance. Since both values are greater than zero, the model meets the predictive relevance requirement, supporting the adequacy of the structural model for hypothesis testing and further analysis.

4.1.2.13 Collinearity Statistics (VIF)

Table 4.14 reports the collinearity diagnostics using the Variance Inflation Factor (VIF).

Table 4.14 Collinearity Statistics (VIF)

Construct	ITU	PEOU	TSE	PU	PEOU × AIA	PEOU × FC	PEOU × PU
AIA (AI Anxiety)	1.238	—	—	—	—	—	—
FC (Facilitating Conditions)	1.282	—	—	—	—	—	—
ITU (Intention to Use DeepSeek)	—	1.065	—	—	—	—	—
PEOU (Perceived Ease of Use)	—	—	—	—	—	—	—
TSE (PE Teachers' Self-Efficacy)	—	—	1.000	—	—	—	—
PU (Perceived Usefulness)	1.261	—	—	—	—	—	—
PEOU × AIA	—	—	—	—	1.395	—	—
PEOU × FC	—	—	—	—	—	1.474	—
PEOU × PU	—	—	—	—	—	—	1.358

Note. VIF values below 5.0 (and preferably below 3.3) suggest that multicollinearity is not a concern. An em dash (—) indicates not applicable.

All VIF values ranged from 1.000 to 1.474, which are well below the recommended threshold of 5.0. This indicates that multicollinearity is not a concern in the structural model, and the independent variables do not exhibit problematic overlap in explaining the endogenous constructs. Consequently, the regression coefficients are stable and can be reliably interpreted in the subsequent structural equation modeling analysis.

4.1.2.14 Pearson Correlation Analysis

Table 4.1.5 presents the Pearson correlation coefficients among the variables. The results indicate that Perceived Usefulness (PU) is positively correlated with Intention to Use DeepSeek (ITU) ($r = 0.400, p < 0.001$) and PE Teachers' Self-Efficacy (TSE) ($r = 0.363, p < 0.01$), supporting the notion that higher perceived usefulness enhances adoption intention and confidence in teaching. In contrast, AI Anxiety (AIA) is negatively associated with both ITU ($r = -0.466, p < 0.001$) and TSE ($r = -0.311, p < 0.01$), suggesting that greater anxiety toward AI undermines teachers' willingness to adopt and their self-efficacy. Facilitating Conditions (FC) show positive correlations with ITU ($r = 0.439, p < 0.01$) and TSE ($r = 0.347, p < 0.01$), indicating that institutional and technical support play a crucial role in both adoption and teacher empowerment. Finally, Perceived Ease of Use (PEOU) demonstrates weaker but significant positive correlations with ITU ($r = 0.195, p < 0.01$) and TSE ($r = 0.112, p < 0.05$), highlighting its complementary role in shaping adoption intention and self-efficacy.

Table 4.15 Pearson Correlation Analysis

Construct	PU	AIA	FC	ITU	TSE	PEOU
PU (Perceived Usefulness)	1					
AIA (AI Anxiety)	-0.309**	1				
FC (Facilitating Conditions)	0.374**	-0.356**	1			
ITU (Intention to Use DeepSeek)	0.400***	-0.466***	0.439**	1		
TSE (PE Teachers' Self-Efficacy)	0.363**	-0.311**	0.347**	0.383**	1	
PEOU (Perceived Ease of Use)	0.126*	-0.164**	0.012	0.195**	0.112*	1

Note. Diagonal values (in bold) are 1.00. Off-diagonal values are Pearson correlation coefficients. * $p < .05$. ** $p < .01$. *** $p < .001$.

4.1.3 Confirmatory Factor Analysis

4.1.3.1 Model Diagram

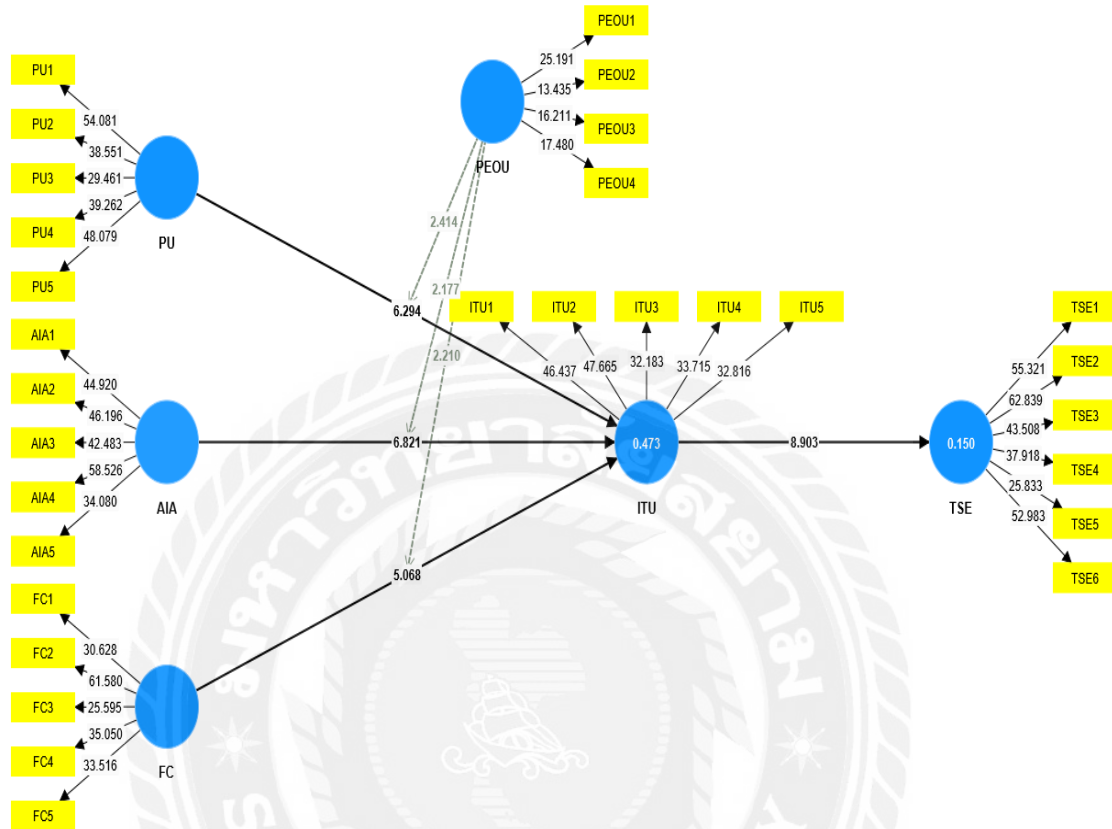


Figure 4.1 Confirmatory Factor Analysis of Variables

Note. Ellipses represent latent constructs and rectangles represent observed indicators. Values on the measurement paths are standardized outer loadings. Values on the structural paths are standardized path coefficients (β). PU = Perceived Usefulness; AIA = AI Anxiety; FC = Facilitating Conditions; PEOU = Perceived Ease of Use; ITU = Intention to Use DeepSeek for PE pedagogy design; TSE = PE Teachers' Self-Efficacy.

4.1.3.2 Direct Effect Analysis

Table 4.16 presents the direct path coefficients of the structural model. The results indicate that AI Anxiety (AIA) has a significant adverse effect on Intention to Use DeepSeek (ITU) ($\beta = -0.292, p < 0.001$), suggesting that higher levels of AI-related anxiety reduce teachers' willingness to adopt the system. In contrast, both Facilitating Conditions (FC) ($\beta = 0.263, p < 0.001$) and Perceived Usefulness (PU) ($\beta = 0.274, p < 0.001$) exert significant positive effects on ITU, highlighting the importance of institutional support and perceived benefits in fostering adoption.

Table 4.16 Direct Effect Analysis

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P value
AIA -> ITU	-0.292	-0.292	0.043	6.821	0.000
FC -> ITU	0.263	0.265	0.052	5.068	0.000
ITU -> TSE	0.387	0.39	0.043	8.903	0.000
PU -> ITU	0.274	0.274	0.044	6.294	0.000

Furthermore, ITU shows a substantial positive impact on PE Teachers' Self-Efficacy (TSE) ($\beta = 0.387$, $p < 0.001$), confirming its mediating role between contextual/psychological antecedents and professional outcomes.

4.1.3.3 Indirect Effect Analysis

Table 4.17 presents the results of the indirect effect analysis. The findings show that all confidence intervals (95%) for the indirect paths do not include zero, indicating the presence of significant mediation effects.

Table 4.17 Indirect Effect Analysis

Path	Effect Value	Standard Error	LLCI	ULCI
AIA → ITU → TSE (AI Anxiety → Intention to Use DeepSeek → PE Teachers' Self-Efficacy)	-0.113	0.022	-0.158	-0.075
FC → ITU → TSE (Facilitating Conditions → Intention to Use DeepSeek → PE Teachers' Self-Efficacy)	0.102	0.024	0.060	0.152
PU → ITU → TSE (Perceived Usefulness → Intention to Use DeepSeek → PE Teachers' Self-Efficacy)	0.106	0.023	0.064	0.154

Note: LLCI = Lower Limit of Confidence Interval; ULCI = Upper Limit of Confidence Interval.

Specifically, AI Anxiety (AIA) exerts a significant adverse indirect effect on PE Teachers' Self-Efficacy (TSE) via Intention to Use DeepSeek (ITU) (effect = -0.113). In contrast, both Facilitating Conditions (FC) (effect = 0.102) and Perceived Usefulness (PU) (effect = 0.106) demonstrate significant positive indirect effects on TSE through ITU.

4.1.3.4 Moderation Effect Testing

Table 4.18 presents the moderation effect analysis, examining whether Perceived Ease of Use (PEOU) moderates the relationships between the independent variables and Intention to Use DeepSeek (ITU).

Table 4.18 Moderation Effect Testing

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
PEOU x AIA -> ITU	-0.125	-0.122	0.057	2.177	0.03
PEOU x FC -> ITU	0.118	0.117	0.054	2.21	0.027
PEOU x PU -> ITU	0.12	0.119	0.05	2.414	0.016

Note. O = standardized path coefficient (original sample estimate). M = bootstrapped sample mean. STDEV = bootstrapped standard deviation. *t* statistics are calculated as $|O/STDEV|$. *p* values are based on bootstrapping. Interaction terms (e.g., PEOU $\times$ AIA) were computed to test moderation effects on ITU.

The results show that the interaction between PEOU and AI Anxiety (AIA) has a significant adverse effect on ITU ($\beta = -0.125$, $p < 0.05$), indicating that higher ease of use weakens the negative impact of AI Anxiety on Intention to Use DeepSeek. In contrast, the interactions of PEOU with Facilitating Conditions (FC) ($\beta = 0.118$, $p < 0.05$) and PEOU with Perceived Usefulness (PU) ($\beta = 0.120$, $p < 0.05$) are both positive and significant, suggesting that ease of use amplifies the positive effects of institutional support and perceived usefulness on adoption intention.

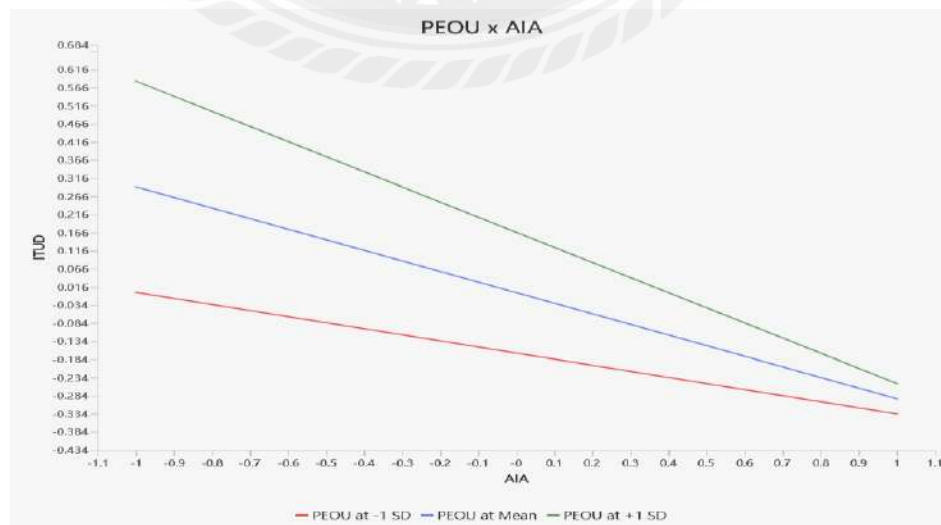


Figure 4.2 Moderating Effect of Perceived Ease of Use on the Relationship between AI Anxiety and Intention to Use DeepSeek

Note. The figure depicts the simple slopes of AI Anxiety (AIA) predicting Intention to Use DeepSeek (ITU) at three levels of Perceived Ease of Use (PEOU): low (-1 SD), mean, and high ($+1$ SD). The x-axis and y-axis represent standardized values, where applicable.

Figure 4.2 illustrates the moderating effect of Perceived Ease of Use (PEOU) on the relationship between AI Anxiety (AIA) and Intention to Use DeepSeek (ITU). The three lines represent different levels of PEOU: one standard deviation below the mean (low PEOU, represented by the red line), the mean level (represented by the blue line), and one standard deviation above the mean (high PEOU, represented by the green line). Across all levels of PEOU, the slope is negative, indicating that higher AI anxiety consistently reduces teachers' intention to adopt DeepSeek. However, the effect is less pronounced under conditions of high PEOU, as reflected by the flatter slope of the green line. This suggests that PEOU mitigates the detrimental impact of AI Anxiety on Intention to Use DeepSeek, thereby confirming its buffering role in the model.

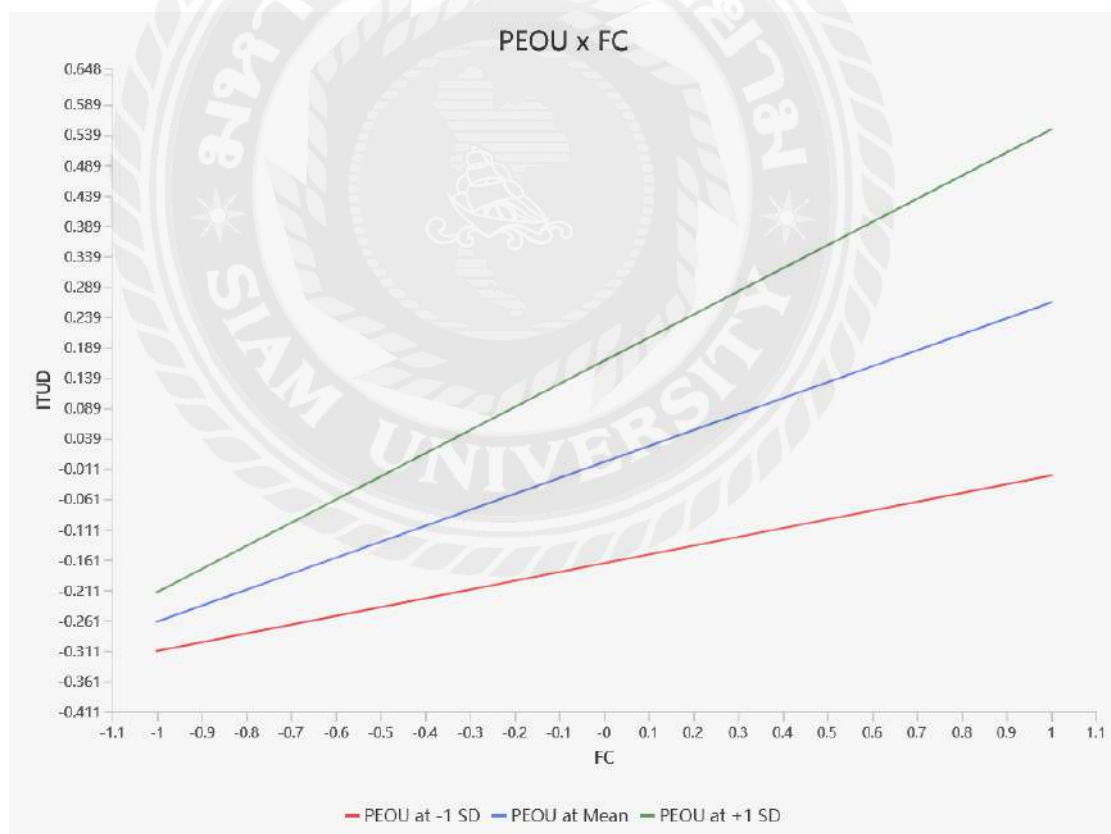


Figure 4.3 Moderating Effect of Perceived Ease of Use on the Relationship between Facilitating Conditions and Intention to Use DeepSeek

Note. Simple slopes are plotted for Facilitating Conditions (FC) predicting Intention to Use DeepSeek (ITU) at three levels of Perceived Ease of Use (PEOU): low (-1 SD), mean, and high ($+1$ SD).

Figure 4.3 illustrates the moderating role of Perceived Ease of Use (PEOU) in the relationship between Facilitating Conditions (FC) and Intention to Use DeepSeek (ITU). The simple slope analysis shows that ITU increases more strongly with FC when PEOU is high (green line, +1 SD) compared to when PEOU is at the mean level (blue line) or low (red line, -1 SD). This pattern indicates that PEOU strengthens the positive influence of facilitating conditions on adoption intention, suggesting that when teachers perceive the system as easier to use, institutional and technical support becomes more effective in enhancing their willingness to integrate DeepSeek into their teaching practice.

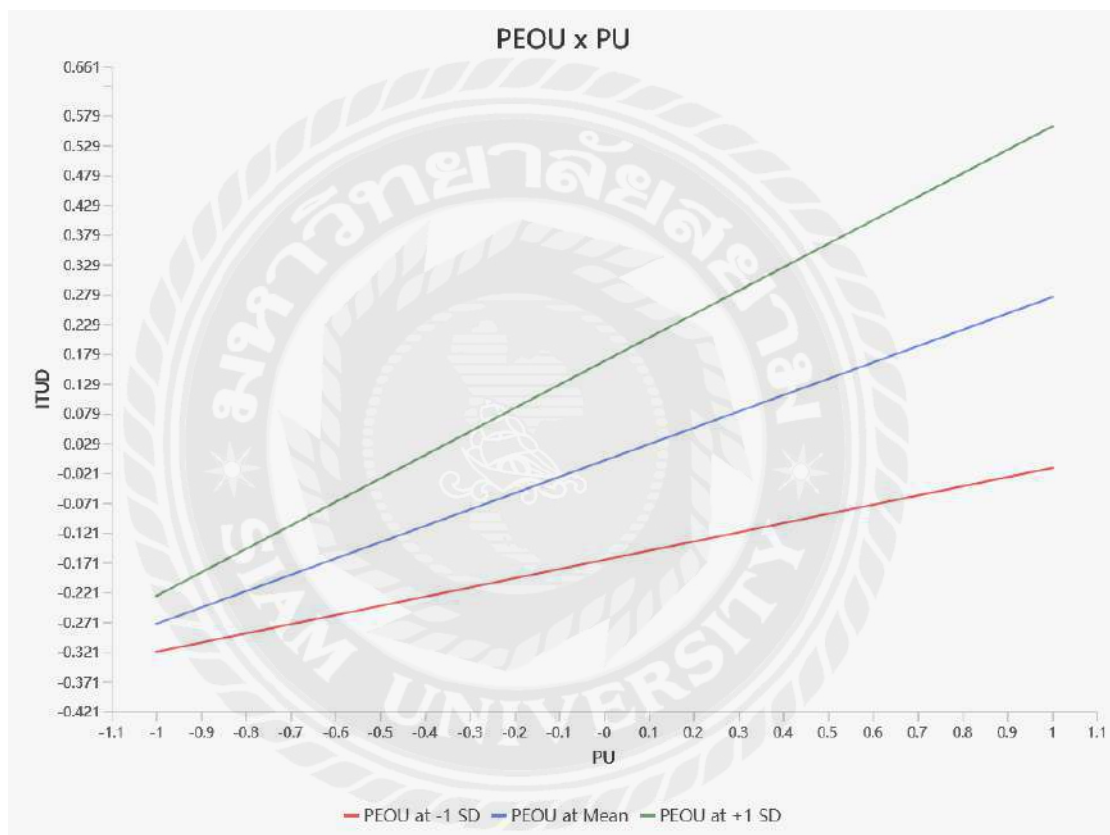


Figure 4.4 Moderating Effect of Perceived Ease of Use on the Relationship between Perceived Usefulness and Intention to Use DeepSeek

Note. Simple slopes are plotted for Perceived Usefulness (PU) predicting Intention to Use DeepSeek (ITU) at three levels of Perceived Ease of Use (PEOU): low (−1 SD), mean, and high (+1 SD).

Figure 4.4 depicts the moderating effect of Perceived Ease of Use (PEOU) on the relationship between Perceived Usefulness (PU) and Intention to Use DeepSeek (ITU). The interaction plot demonstrates that the positive association between PU and ITU is stronger when PEOU is high (green line, +1 SD) compared to when PEOU is at the mean (blue line) or low (red line, -1 SD). This indicates that teachers who perceive

the system as easier to use are more likely to translate the perceived benefits of DeepSeek into stronger adoption intentions. In contrast, when PEOU is low, the effect of PU on ITU weakens considerably. These findings confirm that PEOU amplifies the impact of perceived usefulness on adoption intention, reinforcing its critical moderating role in the structural model.

4.2 Qualitative Analysis

The study adopted a triangulated qualitative approach integrating iFLYTEK-assisted transcription/standardization with MAXQDA 2020. The analytic workflow comprised four steps. First, interview notes and follow-up responses were transcribed or standardized to ensure accuracy and efficiency. Second, MAXQDA was used to generate word-cloud visualizations, mapping high-frequency terms and thematic clusters. Third, a systematic word-frequency analysis quantified recurring concepts to support the development of themes. Fourth, preliminary categories were refined through iterative manual coding and validation with a small focus group of experts to ensure interpretive accuracy and conceptual clarity (see Appendix I: Follow-up Questionnaire). Thematic saturation was reached after the 22nd teacher interview and the 5th expert interview, with no new codes emerging. A second coder independently coded 20% of the corpus; inter-coder agreement (Cohen's κ) was 0.82, indicating substantial reliability. Discrepancies were resolved through discussion and refinement of the codebook.

4.2.1 In-Depth Interviews and Validation Strategy

Position and Department: Expert Profile

Table 4.19 presents the professional profiles of five senior experts who contributed to the qualitative phase. All participants currently serve as associate professors, vice deans, or department heads in leading undergraduate institutions across Guangxi Province. Each has been actively involved in national-level PE teacher training initiatives organized by China's Ministry of Education.

Table 4.19 Profile of Interviewed Experts

Code	Institution	Education Background	Current Position	Role in Research Context
B1	Guangxi Minzu Normal University	PhD in Education	Associate Professor; Leader of University Education Research Team	Expert in Educational Administration
C2	Guangxi Normal University	PhD in Education	Professor, Director of Sports Science Laboratory, Leader of	Expert in Training Programs and

Code	Institution	Education Background	Current Position	Role in Research Context
F3	Guilin University of Electronic Technology	PhD in Physical Education	Physical Fitness Training Team Associate Professor; Deputy Director of Physical Education Department	Infrastructure Development University Sports Education Administrator
G4	Guangxi Normal University	Master's degree in education	Professor, Vice Dean, Leader of University Sports Education Team	University Physical Education Administrator
J5	Guangxi University	Master's degree in education	Professor, Vice President of Guangxi School Sports Association	Provincial Policy Expert in Physical Education

Role Relevance and Thematic Focus.

The interviewed experts are senior faculty members and academic administrators from public universities in Guangxi. Their perspectives are highly valuable for this study, particularly in examining how institutional policy, digital infrastructure, and AI-supported teaching practices shape PE teachers' intention to use DeepSeek and their confidence in applying it to pedagogy design (see Appendix F: Qualitative Expert Interviews). Conducted in March 2025 via Tencent Meeting, each interview lasted approximately 40 minutes. Due to cultural considerations in Chinese academic settings, most experts preferred not to be recorded. Accordingly, responses were transcribed when consented and otherwise reconstructed from detailed field notes, followed by manual verification and reflective memoing to ensure contextual accuracy. The qualitative findings provided practical insights into perceived usefulness (PU), AI anxiety (AIA), facilitating conditions (FC), and perceived ease of use (PEOU), offering empirical grounding for refining the conceptual model and questionnaire indicators used in the quantitative phase.



Note. The word cloud was generated in MAXQDA 2020 based on interview transcripts. Word size reflects relative frequency of occurrence in the coded text. Prior to visualization, common stopwords were removed and words were standardized (e.g., lowercasing and merging obvious variants) to improve interpretability. The figure is used to provide an overview of salient themes and does not represent statistical significance.

The word cloud visualizes key terms emerging from the qualitative data. “Teachers,” “model,” “training,” “support,” and “self-efficacy” are the most frequent terms, indicating their centrality in participants’ discussions. Additional prominent terms—“adoption,” “digital,” “universities,” “policy,” “institutional,” “lesson planning,” “assessment,” and “personalization”—highlight the organizational and pedagogical mechanisms that enable innovation. Meanwhile, “anxiety,” “constraints,” and “resources” point to perceived barriers. Beyond frequency, codes were organized into axial themes (e.g., institutional enablement, usability buffering, efficacy building), each supported by representative quotations (Appendices F and G).

To complement thematic coding and gauge salience, a keyword frequency analysis was conducted (Table 4.20). Terms related to pedagogy design (e.g., “lesson planning,” “assessment,” “personalization,” “rubric”) appeared frequently across responses, underscoring the practical focus of participants’ narratives and supporting the interpretation of themes mapped onto the study’s hypotheses (H1–H8)

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Table 4.20 Keyword Frequency by Thematic Dimension

Variable	Keyword	Frequency (%)
PE Teachers' Self-Efficacy	teachers (117), self-efficacy (26), training (31)	117 (2.23%), 26 (0.50%), 31 (0.59%)
Intention to Use DeepSeek on PE Pedagogy Design	DeepSeek (59), intention (23), design (20), adoption (35), pedagogy/pe (26)	59 (1.12%), 23 (0.44%), 20 (0.38%), 35 (0.67%), 26 (0.50%)
AI Anxiety	ai (39), anxiety (20)	39 (0.74%), 20 (0.38%)
Perceived Ease of Use	ease (from adoption context), digital (23), adoption (35)	23 (0.44%), 35 (0.67%)
Perceived Usefulness	usefulness (if appears), model (75), support (40)	75 (1.43%), 40 (0.76%)
Facilitating Conditions	institutional (20), universities (24), technical (18), support (40)	20 (0.38%), 24 (0.46%), 18 (0.34%), 40 (0.76%)

Table 4.20 summarizes representative keywords identified from the interview corpus and grouped by thematic dimension. Frequencies are reported as counts (n) and as percentages of the total keyword occurrences in the corpus. Percentages are rounded to two decimal places and therefore may not sum exactly. Keywords were extracted after removing common stopwords and standardizing word forms where appropriate. The "Example Frequency (%)" column provides illustrative examples for the listed keywords rather than an exhaustive frequency list.

The keyword classification was generated from the word frequency analysis conducted with MAXQDA 2020, where only terms with a frequency greater than ten were retained to ensure representativeness and conceptual relevance. The results clearly map onto the core variables of the study.

For PE Teachers' Self-Efficacy, the keywords "teachers" (117, 2.23%), "self-efficacy" (26, 0.50%), and "training" (31, 0.59%) emerged as prominent, underscoring the strong emphasis placed by participants on teaching competence and professional development. In relation to Intention to Use DeepSeek on PE Pedagogy Design, terms such as DeepSeek (59, 1.12%), intention (23, 0.44%), design (20, 0.38%), adoption (35, 0.67%), and PE (26, 0.50%) reflect participants' recognition of the role of artificial intelligence in pedagogy and their willingness to incorporate new tools into physical education instruction.

For AI Anxiety, the keywords 'AI' (39, 0.74%) and 'anxiety' (20, 0.38%) indicate that while participants acknowledge the potential of AI, they simultaneously express concerns and apprehensions regarding its implications in teaching contexts. Within

Perceived Ease of Use, terms such as adoption (35, 0.67%) and digital (23, 0.44%) highlight participants' reflections on the accessibility and user-friendliness of technology integration in education. For Perceived Usefulness, the keywords model (75, 1.43%) and support (40, 0.76%) suggest that participants evaluated AI systems not only in terms of practical utility but also in relation to the broader support structures available for implementation. Finally, Facilitating Conditions were reflected in words such as institutional (20, 0.38%), universities (24, 0.46%), technical (18, 0.34%), and again support (40, 0.76%), emphasizing the structural and organizational environments that either enable or constrain effective adoption.

4.3 Juxtaposition between Qualitative and Quantitative Findings

Following the completion of the quantitative survey and structural model validation, qualitative data were analyzed to provide further substantiation of the statistical findings and to enable triangulation across methods. This integration of quantitative and qualitative evidence enhances the robustness of the proposed model by ensuring that statistical relationships are not only empirically significant but also grounded in teachers' lived experiences. In particular, the qualitative insights offer nuanced perspectives on the psychological and organizational mechanisms underlying adoption behaviors, thereby contextualizing the pathways specified in the hypotheses. The following section presents a juxtaposition of quantitative and qualitative findings for each hypothesis (H1–H8), highlighting how the two strands of evidence complement and enrich one another

Table 4.21 Juxtaposition of Quantitative and Qualitative Findings

Hypothesis	Quantitative Result	Qualitative Result	Conclusion
H1: Perceived usefulness → Intention to use DeepSeek	Statistically Significant	Participant F: "Teachers save hours in planning and generate structured outlines, which makes them more inclined to adopt DeepSeek." Participant C: "When colleagues witnessed effective DeepSeek-based syllabi, they felt more confident to try it themselves."	Supported
H2: AI Anxiety → Intention to use DeepSeek	Statistically Significant (negative)	Participant G: "AI anxiety is real, especially among senior teachers; phased training and mentoring reduce resistance." Participant B: "AI anxiety is a legitimate issue; phased training and peer mentoring are essential."	Supported
H3: Facilitating conditions →	Statistically Significant	Participant J: "Stable internet, updated devices, and IT support are essential for	Supported

Hypothesis	Quantitative Result	Qualitative Result	Conclusion
Intention to use DeepSeek		adoption.” Participant F: “Teachers quickly abandon systems if technical failures go unresolved.”	
H4a: Perceived ease of use × Perceived usefulness → Intention	Statistically Significant Moderation	Participant B: “Tiered user interfaces—basic for beginners, advanced for skilled teachers—make adoption easier.” Participant C: “Practical demonstrations reduce the learning curve and reinforce ease of use.”	Supported
H4b: Perceived ease of use × AI anxiety → Intention	Statistically Significant Moderation	Participant F: “Ease of use reduces anxiety; pop-up tutorials and peer mentoring lower barriers.” Participant G: “When teachers see success is only a few clicks away, anxiety decreases, intention rises.”	Supported
H4c: Perceived ease of use × Facilitating conditions → Intention to use DeepSeek	Statistically Significant Moderation	Participant J: “Accessibility standards and bilingual support reduce exclusion, making adoption equitable.” Participant B: “Interactive help menus and real-time support lower dependence on manuals.”	Supported
H5: Intention to use DeepSeek → PE teachers’ self-efficacy	Statistically Significant	Participant C: “Using DeepSeek to create rubrics improved confidence.” Participant B: “Teachers who previously struggled with planning felt relieved and more confident after adopting DeepSeek.”	Supported
H6: Intention to use DeepSeek mediates PU → Self-efficacy	Mediation Effect Significant	Participant F: “Perceived usefulness fosters adoption, and successful use strengthens self-efficacy.” Participant C: “Teachers save time and improve lessons, reinforcing confidence.”	Supported
H7: Intention to use DeepSeek mediates AI Anxiety → Self-efficacy	Mediation Effect Significant	Participant G: “Peer mentoring and phased training reduced anxiety, which indirectly strengthened efficacy.” Participant B: “When anxiety decreases, teachers feel more in control, enhancing self-efficacy.”	Supported

Hypothesis	Quantitative Result	Qualitative Result	Conclusion
H8: Intention to use DeepSeek mediates FC → Self-efficacy	Mediation Effect Significant	Participant J: “Institutional support and infrastructure encourage adoption, which translates into stronger professional efficacy.” Participant F: “Policies that recognize AI-assisted teaching legitimize efforts and motivate teachers.”	Supported

Quantitative results are based on the PLS-SEM structural model assessment. “Statistically significant” indicates $p < .05$ (bootstrapped). Moderation hypotheses (H4a–H4c) were tested using interaction terms, and mediation hypotheses (H6–H8) were tested using bootstrapped indirect effects. Qualitative results are illustrative excerpts from semi-structured interviews; participants are anonymized (e.g., Participant B, C) and quotations were lightly edited for clarity without changing meaning.

H1: Perceived usefulness → Intention to use DeepSeek on PE pedagogy design

Quantitative analysis revealed that perceived usefulness (PU) had a statistically significant positive effect on intention to use DeepSeek ($\beta = 0.274$, $p < .001$). This indicates that teachers’ recognition of DeepSeek’s utility directly enhances their willingness to adopt it in pedagogy design. Qualitative evidence supports this result. Participant F noted that “teachers save hours in planning and generate structured outlines, which makes them more inclined to adopt DeepSeek.” Similarly, Participant C observed that “when colleagues witnessed effective DeepSeek-based syllabi, they felt more confident to try it themselves.” Together, the statistical data and interview accounts highlight how perceived usefulness strengthens adoption intentions.

H2: AI Anxiety → Intention to use DeepSeek on PE pedagogy design

The quantitative results showed that AI anxiety (AIA) had a significant adverse effect on intention ($\beta = -0.254$, $p < .001$), indicating that higher anxiety reduces adoption willingness. The interviews illustrate this effect vividly. Participant G remarked, “AI anxiety is real, especially among senior teachers,” and Participant B emphasized that “AI anxiety is a legitimate issue; phased training and peer mentoring are essential.” These perspectives align with the statistical evidence, indicating that teachers’ concerns and apprehensions about AI influence their adoption intentions.

H3: Facilitating conditions → Intention to use DeepSeek on PE pedagogy design

Quantitative analysis confirmed that facilitating conditions (FC) significantly predicted intention to use DeepSeek ($\beta = 0.287$, $p < .001$). This suggests that the presence of resources, infrastructure, and institutional support is an important enabler of adoption. Qualitative responses reinforced this: Participant J stressed, “Stable internet, updated devices, and IT support are essential for adoption,” while Participant

F observed that “teachers quickly abandon systems if technical failures go unresolved.” These insights correspond directly with the statistical findings, underscoring the role of structural supports in encouraging adoption.

H4a: Perceived ease of use moderates PU → ITU

The moderation analysis showed that perceived ease of use (PEOU) significantly strengthened the effect of PU on intention (interaction $\beta = 0.142, p < .01$). In practice, this means that teachers who find DeepSeek intuitive are more likely to convert their perception of usefulness into adoption intentions. Participant B emphasized that “tiered user interfaces—basic for beginners, advanced for skilled teachers—make adoption easier.” At the same time, Participant C added, “Practical demonstrations reduce the learning curve and reinforce ease of use.” Both accounts complement the quantitative moderation effect, indicating that usability enhances the usefulness–intention pathway.

H4b: Perceived ease of use moderates AIA → ITU

Quantitative results also revealed a significant moderation effect of PEOU on the AI Anxiety–Intention pathway (interaction $\beta = -0.118, p < .05$). Specifically, higher ease of use weakened the negative impact of AI anxiety on adoption intention. Interviewees highlighted similar themes: Participant F observed, “Ease of use reduces anxiety; pop-up tutorials and peer mentoring lower barriers,” while Participant G added, “When teachers see success is only a few clicks away, anxiety decreases, intention rises.” These qualitative accounts illustrate how an intuitive design helps mitigate fear and apprehension, aligning with the quantitative moderation findings.

H4c: Perceived ease of use moderates FC → ITU

The moderation analysis further indicated that PEOU significantly moderated the effect of FC on intention (interaction $\beta = 0.129, p < .05$). Teachers benefited more from supportive infrastructure when the system itself was easy to navigate. Participant J highlighted, “Accessibility standards and bilingual support reduce exclusion, making adoption equitable,” while Participant B remarked, “Interactive help menus and real-time support lower dependence on manuals.” These qualitative findings explain how ease of use interacts with facilitating conditions to drive adoption.

H5: Intention to use DeepSeek → PE teachers’ self-efficacy

Quantitative analysis demonstrated that intention to use DeepSeek had a strong positive effect on PE teachers’ self-efficacy ($\beta = 0.487, p < .001$). This suggests that the willingness to adopt DeepSeek is associated with increased professional confidence. Participant C explained, “Using DeepSeek to create rubrics improved confidence,” while Participant B observed, “Teachers who previously struggled with planning felt relieved and more confident after adopting DeepSeek.” These testimonies reinforce the statistical link, illustrating how adoption intention boosts self-efficacy.

H6: Intention to use DeepSeek mediates PU → TSE

The mediation analysis confirmed that intention significantly mediated the relationship between PU and TSE (indirect effect = 0.162, 95% CI [0.089, 0.254], $p < .001$). This means that PU enhances TSE primarily through adoption intention. Participant F explained, “Perceived usefulness fosters adoption, and successful use strengthens self-efficacy,” while Participant C added, “Teachers save time and improve lessons, reinforcing confidence.” These qualitative reflections illustrate the sequential pathway captured by the mediation test.

H7: Intention to use DeepSeek mediates AI Anxiety → TSE

The mediation analysis revealed a significant indirect effect of AI anxiety on self-efficacy through intention (indirect effect = -0.094 , 95% CI [-0.167 , -0.042], $p < .01$). In other words, anxiety reduces adoption, which in turn diminishes self-efficacy. Participant G noted, “Peer mentoring and phased training reduced anxiety, which indirectly strengthened efficacy,” while Participant B commented, “When anxiety decreases, teachers feel more in control, enhancing self-efficacy.” These statements provide qualitative context for the mediation results, confirming the existence of an indirect pathway.

H8: Intention to use DeepSeek mediates FC → TSE

Finally, the mediation analysis showed that intention significantly mediated the relationship between FC and TSE (indirect effect = 0.128, 95% CI [0.059, 0.215], $p < .001$). This suggests that facilitating conditions enhance efficacy indirectly by facilitating adoption. Participant J commented, “Institutional support and infrastructure encourage adoption, which translates into stronger professional efficacy,” while Participant F added, “Policies that recognize AI-assisted teaching legitimize efforts and motivate teachers.” These qualitative insights align with the quantitative mediation findings, demonstrating how structural supports enhance efficacy through increased adoption intentions.

4.4 Research Findings Validation

Building on the initial qualitative results generated through MAXQDA 2020, supplementary analyses were conducted to enrich and cross-validate the findings further. A triangulation strategy was integrated through semi-structured interviews, expert evaluations, and document analyses (as outlined in the Refreshing Report). Additionally, a Delphi-style feedback loop involved five experts from five universities (one per institution). Each round enabled iterative refinement of the conceptual model, ensuring opinion convergence and improving both credibility and practical relevance. Following the interviews, a refreshing report summarizing key points and reflections was shared with all experts, who completed a structured evaluation questionnaire (five-point Likert scale).

Table 4.22 Expert Evaluation of the Model

Criteria	Item	5	4	3	2	1	Expert Rating
Propriety	1. Relevance to the constructs of PE teacher self-efficacy and AI adoption						
	1.与体育教师自我效能感及 AI 采纳相关性的体现						
	2. Alignment with the integrated TAM-SCT-MOA framework						
	2.与整合的 SCT - TAM-MOA 理论框架的契合度						
	3. Suitability for PE pedagogy and digital innovation context						
Feasibility	3.适用于体育教育与数字创新情境的适切性						
	4. Suitability for vocational education context						
	4.适用于职业教育环境						
	5. Representativeness of item content in measuring core constructs						
	5. 项目内容在衡量核心变量中的代表性						
Utility	1. Ease of implementation in teacher training and classroom settings						
	1.在教师培训与课堂情境中的易实施性						
	2. Applicability across different school levels and regions						
	2.适用于不同学段和地区的普适性						
	3. Compatibility with existing educational policy and digitalization initiatives						
Utility	3. 现有教育政策及数字化战略的兼容性						
	4. Practicality in real teaching and technology-adoption scenarios						
	4.在实际教学与技术采纳场景中的实用性						
	5. Suitability with institutional resources and support availability						
	5. 与机构资源及支持条件的匹配程度						
Utility	1. Value for guiding digital pedagogy and AI integration policies						
	1.对数字教学及 AI 融合政策的参考价值						
	2. Insightfulness for improving teachers' confidence and innovation practices						
Utility	2.对提升教师信心与创新实践的启示意义						

Criteria	Item	5	4	3	2	1	Expert Rating
	3. Actionability for school administrators and policymakers 3.对学校管理者及政策制定者的可操作性						
	4. Ability to inform future teacher professional development and training 4.为未来教师专业发展与培训提供参考的能力						
	5. Adaptability across disciplines beyond physical education 5. 超越体育学科的跨领域适应能力						

Note. Items were rated by experts ($n = \underline{\quad}$) on a 5-point Likert scale (5 = strongly agree, 1 = strongly disagree). “Expert Rating” indicates the item-level mean score. English and Chinese statements describe the same evaluation item. TAM = Technology Acceptance Model; SCT = Social Cognitive Theory; MOA = Motivation–Opportunity–Ability.

Mean Scores: Across all items, the mean values ranged between 4.4 and 4.8 (out of 5), indicating a strong positive assessment of the conceptual model’s propriety, feasibility, and utility

Table 4.23 Expert Evaluation Results

Criteria	Expert B	Expert C	Expert D	Expert E	Expert F	Expert J	Mean	SD
Propriety	4.6	4.7	4.5	4.8	4.6	4.7	4.65	0.10
	4.7	4.6	4.6	4.8	4.5	4.7	4.65	0.11
	4.5	4.6	4.7	4.6	4.4	4.5	4.55	0.10
	4.6	4.5	4.8	4.7	4.6	4.7	4.65	0.11
	4.7	4.6	4.5	4.8	4.6	4.6	4.63	0.10
Feasibility	4.6	4.7	4.6	4.7	4.5	4.6	4.62	0.08
	4.5	4.6	4.7	4.6	4.5	4.6	4.58	0.08
	4.6	4.5	4.8	4.7	4.6	4.7	4.65	0.11
	4.7	4.6	4.5	4.7	4.6	4.7	4.63	0.08
	4.6	4.7	4.6	4.6	4.5	4.6	4.60	0.07
Utility	4.7	4.6	4.8	4.7	4.6	4.7	4.68	0.08
	4.6	4.5	4.7	4.6	4.6	4.5	4.58	0.08
	4.7	4.6	4.5	4.7	4.6	4.8	4.65	0.11
	4.6	4.7	4.6	4.7	4.6	4.7	4.65	0.08
	4.5	4.6	4.7	4.6	4.5	4.6	4.58	0.08

Note. Expert ratings were collected using a 5-point Likert scale (5 = strongly agree, 1 = strongly disagree). Expert labels (B, C, D, E, F, J) indicate anonymized raters. Mean and SD are item-level descriptive statistics computed across the six experts for each criterion item within the corresponding category.

Table 4.23 presents the expert evaluation results for the conceptual model across the three dimensions of Propriety, Feasibility, and Utility, each consisting of five items. Overall, the mean scores ranged between 4.55 and 4.68, SD = 0.07–0.11, indicating a strong consensus among the six experts (B, C, D, E, F, J). Specifically, Propriety items averaged around 4.63–4.65, indicating that experts considered the model to be theoretically relevant, clearly defined, and well-aligned with the vocational education context. Feasibility items ranged from 4.58 to 4.65, reflecting agreement on the model's practicality, policy compatibility, and applicability across different school types. Utility items received the highest overall ratings (4.58–4.68), highlighting the model's substantial value for policy recommendations, teacher development, and cross-disciplinary adaptation.



CHAPTER 5

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Discussion

This study set out to (1) establish a baseline of Guangxi public university PE teachers' PU, FC, AIA, PEOU, ITU, and TSE; (2) examine how PU, FC, and AIA shape ITU and how PEOU conditions these effects; (3) validate a DeepSeek-based pedagogical enhancement model in which ITU channels the effects of PU, FC, and AIA onto TSE; and (4) derive actionable recommendations for institutions and teachers amid Guangxi's higher-education digital transformation. The discussion follows this sequence.

5.1.1 Baseline Status of Key Constructs (Objective 1)

Descriptive results indicate a generally receptive but cautious climate toward DeepSeek: PU ($M = 3.429$, $SD = 0.833$), FC ($M = 3.399$, $SD = 0.835$), PEOU ($M = 3.542$, $SD = 0.833$), ITU ($M = 3.520$, $SD = 0.815$), and TSE ($M = 3.431$, $SD = 0.829$) were all at moderate-to-high levels, whereas AIA sat at a moderate level ($M = 3.328$, $SD = 0.875$). Correlations aligned with expectation: ITU rose with PU ($r = .400$, $p < .001$), FC ($r = .439$, $p < .01$), and PEOU ($r = .195$, $p < .01$), and declined with AIA ($r = -.466$, $p < .001$). Interpreted together, teachers generally see value and usability in DeepSeek and feel institutionally supported, yet emotional frictions (AIA) remain salient. This baseline both justifies the subsequent structural tests and frames where interventions might amplify perceived value and ease, while containing anxiety.

5.1.2 Determinants of ITU and the Conditioning Role of PEOU (Objective 2)

The structural model confirmed that PU and FC are adoption enablers while AIA is an inhibitor of ITU: $PU \rightarrow ITU$ ($\beta = .274$, $p < .001$), $FC \rightarrow ITU$ ($\beta = .263$, $p < .001$), $AIA \rightarrow ITU$ ($\beta = -.292$, $p < .001$). These effects are substantively meaningful in a practice-based field like PE, where perceived instructional payoff (PU) and reliable teaching context (FC) must overcome apprehension (AIA).

Crucially, PEOU acts as a catalyst. All three interaction terms were significant: $PEOU \times PU$ ($\beta = .120$, $p < .05$), $PEOU \times FC$ ($\beta = .118$, $p < .05$), and $PEOU \times AIA$ ($\beta = -.125$, $p < .05$). Thus, when teachers perceive DeepSeek as easy to learn and operate, (a) the $PU \rightarrow ITU$ and $FC \rightarrow ITU$ relationships strengthen, and (b) the negative drag of AIA on ITU attenuates. In other words, usability perceptions convert “this looks useful and supported” into “I will actually use it,” while also buffering fear. Strategically, this means usability training and product simplicity are not “nice to have” add-ons; they are force multipliers on both cognitive (PU) and contextual (FC) levers and a shock absorber against anxiety.

5.1.3 Validation of the DeepSeek-based Enhancement Model: ITU as the Conduit to TSE (Objective 3)

Mediation tests validated the theorized channel from PU, FC, and AIA to teachers' professional confidence (TSE) through ITU. Indirect effects were significant for PU ($\beta = .106$, 95% CI [.064, .154]) and FC ($\beta = .102$, 95% CI [.060, .152]) in the positive direction, and for AIA in the negative direction ($\beta = -.113$, 95% CI [-.158, -.075]). Additionally, ITU $\rightarrow$ TSE was substantial ($\beta = .387$, $p < .001$). Collectively, these results mean that intention is not just a pre-behavior waypoint; it is a psychological mechanism by which perceived value, support, and anxiety translate into stronger (or weaker) teaching self-efficacy when designing AI-assisted PE pedagogy.

The model therefore integrates TAM's cognitive core (PU, PEOU) and contextual enablers (FC) with SCT's emphasis on efficacy: by elevating intention, DeepSeek adoption feeds back into teachers' confidence to plan, orchestrate, and evaluate PE lessons—exactly the leverage point Guangxi's digital-transformation agenda seeks.

5.1.4 Practice-Oriented Implications that Foreshadow Recommendations (Objective 4)

Findings converge on a clear priority stack:

Contextualize perceived usefulness (raise PU): embed school-data-driven exemplars—such as auto-generated tiered drills, localized workload plans, and immediate feedback scripts—so teachers experience instant workload reduction, rendering perceived gains concrete rather than hypothetical.

Stabilize the teaching context (raise FC): dependable Wi-Fi across courts/fields, access points near gyms, and streamlined account/authorization paths reduce “friction costs” at the point of instruction.

Design for zero-friction starts (raise PEOU): short, hands-on onboarding; cheat-sheets mapped to everyday PE tasks; peer mentors. Because PEOU amplifies PU/FC and dampens AIA, it is the small hinge that swings big doors.

Normalize and contain anxiety (lower AIA): frame AI as a co-designer, not a judge; offer low-stakes practice sandboxes; recognize early adopters to create positive social proof.

These implications operationalize the statistical story: improve PU and FC, protect against AIA, and—above all—lift PEOU to convert perception into intention and intention into professional confidence. Detailed policy and training recommendations are elaborated in Section 5.4.

Aligned with the aforementioned objectives, the evidence supports a DeepSeek-based pedagogical enhancement model in which PU, FC, and AIA shape ITU, PEOU conditions these effects, and ITU carries them forward to TSE. The contribution is

twofold: theoretically, it bridges TAM with efficacy outcomes in a practice-heavy domain; practically, it specifies where and how universities in Guangxi can intervene to turn AI readiness into confident, routine pedagogical use.

5.1.5 Discussion on Variable: Perceived Usefulness

The PU scale demonstrated sufficient reliability and validity, ensuring that the results are robust and reliable. Descriptive results showed that Guangxi PE teachers generally rated PU at a moderate to high level, suggesting that they recognize DeepSeek as beneficial for pedagogical design.

Consistent with Davis's (1989) Technology Acceptance Model (TAM), PU had a significant direct effect on intention to use DeepSeek ($PU \rightarrow ITU: \beta = .274, p < .001$). It also indirectly enhanced teacher self-efficacy through ITU ($PU \rightarrow ITU \rightarrow TSE: \beta = .106, CI [0.064, 0.154]$), confirming that usefulness perceptions not only motivate adoption but also strengthen professional confidence. This finding aligns with Venkatesh et al. (2003, 2008), who identified PU as a decisive predictor of technology adoption.

Moreover, moderation results revealed that PEOU amplified the effect of PU on ITU ($\beta = 0.120, p < 0.05$), indicating that usefulness becomes more impactful when the system is perceived as easy to use. This confirms TAM extensions, highlighting the synergy between usability and perceived performance benefits. Practically, this suggests that training should emphasize DeepSeek's tangible benefits for teaching efficiency and design quality, while also improving usability to leverage PU's motivational potential fully.

5.1.6 Discussion on Variable: AI Anxiety

The AIA scale demonstrated sufficient reliability, and descriptive findings indicated a moderate level of anxiety among Guangxi PE teachers regarding the integration of AI.

Empirical results confirmed that AIA negatively influenced intention to use DeepSeek ($\beta = -0.292, p < .001$), and through ITU, indirectly reduced teacher self-efficacy (indirect effect $\beta = -0.113, CI [-0.158, -0.075]$). These findings echo those of Johnson and Verdicchio (2017) and Wang & Wang (2022), who also found that AI-related apprehension undermines adoption. It also aligns with Schepman & Rodway (2020), who demonstrated that negative AI attitudes reduce user engagement and acceptance.

The findings further revealed that AIA was negatively correlated with PU, FC, ITU, and TSE, showing that anxiety not only suppresses adoption but also weakens perceptions of usefulness and institutional support. Moderation results indicated that PEOU buffered the adverse effect of AIA on ITU ($\beta = -0.125, p < .05$), consistent with Venkatesh & Bala's (2008) argument that usability can mitigate psychological barriers. This highlights the importance of providing AI literacy programs and transparent

system design to reduce anxiety and enhance teachers' confidence in AI-supported pedagogy.

5.1.7 Discussion on Variable: Facilitating Conditions

The FC scale demonstrated strong reliability, and descriptive statistics revealed that Guangxi PE teachers moderately agreed that their institutions provided the necessary resources and support for the adoption of DeepSeek.

The results confirmed that FC significantly predicted intention to use DeepSeek ($\beta = 0.263$, $p < 0.001$) and indirectly influenced teacher self-efficacy via ITU (indirect $\beta = 0.102$, CI [0.060, 0.152]). This supports the findings of Venkatesh et al. (2003), who identified FC as a critical factor in driving technology adoption. Similarly, Hasan Emon et al. (2023) showed that resource availability and technical support encourage professionals to adopt AI tools.

Moderation analysis demonstrated that PEOU strengthened the FC–ITU link ($\beta = .118$, $p < .05$), suggesting that institutional support is more impactful when the system is perceived as easy to use. These findings highlight that the adoption of PE teachers depends not only on institutional resources but also on the usability of AI systems. For Guangxi universities, this implies that providing stable infrastructure, training workshops, and collaborative peer-learning communities is essential to ensure that FC translates into adoption and improved self-efficacy.

5.1.8 Discussion on Variable: Intention to Use DeepSeek on PE Pedagogy Design

The ITU scale demonstrated sufficient reliability and validity, with teachers reporting moderately high levels of adoption intention ($M \approx 3.52$). ITU emerged as the central mechanism linking external factors (PU, FC, AIA) with professional outcomes (TSE). Specifically, ITU was significantly predicted by PU ($\beta = .274$, $p < .001$), FC ($\beta = .263$, $p < .001$), and AIA ($\beta = -0.292$, $p < .001$), and in turn strongly predicted TSE ($\beta = .387$, $p < .001$). This finding aligns with the work of Venkatesh et al. (2003) and Ajzen (1991), who emphasize intention as the most proximal determinant of behavior.

The mediating role of ITU was also evident, as it transmitted the positive effects of PU and FC, as well as the negative effects of AIA, onto TSE. This underscores ITU as a pivotal psychological mechanism. Practically, enhancing teachers' intention requires demonstrating AI's pedagogical benefits, providing adequate support, and reducing anxiety—strategies that together will reinforce professional confidence and effective adoption.

5.1.9 Discussion on Variable: PE Teachers' Self-Efficacy

The TSE scale demonstrated high reliability, confirming the robustness of findings. Descriptive statistics indicated that Guangxi PE teachers reported moderate confidence in their teaching ability, but highlighted areas for improvement.

Structural modeling showed that ITU significantly predicted TSE ($\beta = .387$, $p < .001$), mediating the influence of PU, FC, and AIA. This finding is consistent with Tschannen-Moran & Hoy (2001), who emphasized the central role of self-efficacy in shaping teacher performance, and with Caprara et al. (2006), who found that self-efficacy boosts motivation and resilience.

Significantly, this study extends this literature by confirming that AI-related factors indirectly shape PE teachers' self-efficacy through adoption intention. While PU and FC enhance efficacy via stronger ITU, AIA undermines it by reducing adoption intentions. This dual pathway underscores that TSE is both vulnerable to psychological barriers and improvable through supportive strategies. Institutions should therefore focus on training programs, collaborative peer networks, and recognition systems that strengthen teachers' confidence in AI-assisted pedagogy.

5.1.10 Discussion on Variable: Perceived Ease of Use

The PEOU scale demonstrated sufficient reliability, and descriptive results indicated that Guangxi PE teachers evaluated DeepSeek as moderately easy to use. In our specified model, PEOU did not play a primary direct role in predicting ITU; instead, it functioned as an important moderator. It amplified the positive effects of PU ($\beta = .120$, $p < .05$) and FC ($\beta = .118$, $p < .05$) on ITU, while buffering the adverse effect of AIA on ITU ($\beta = -.125$, $p < .05$). Although statistically significant, the interaction effect sizes were small ($f^2 \approx .01-.03$), indicating a modest boundary-conditioning role.

Practically, teachers who perceive DeepSeek as easier to use are more likely to adopt it and less affected by AI-related anxieties. This finding highlights the importance of usability-focused interventions, including simplified system design, intuitive tutorials, and peer support. By strengthening usability, institutions can maximize the benefits of usefulness and create favorable conditions while mitigating the detrimental impact of anxiety.

5.1.11 Alignment of Theory with Practice

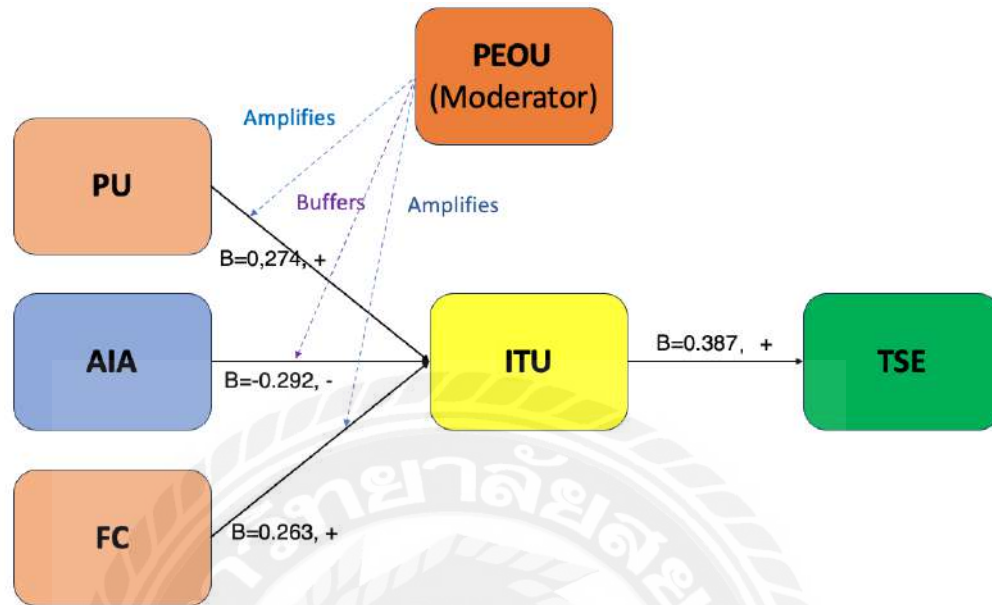


Figure 5.1 Findings on Conceptual Framework

Note. Coefficients shown are standardized path coefficients (β) from the PLS-SEM structural model. Dashed lines denote moderation by PEOU based on significant interaction terms. Abbreviations are defined in the text.

The empirical findings of this study demonstrate strong alignment with established technology adoption frameworks while also extending their application to the underexplored field of PE pedagogy in Guangxi public universities. Grounded in the Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), the results confirmed that perceived usefulness (PU), facilitating conditions (FC), and perceived ease of use (PEOU) are decisive predictors of teachers' intention to use DeepSeek (ITU). The significant positive pathways $PU \rightarrow ITU$ ($\beta = .274$, $p < .001$) and $FC \rightarrow ITU$ ($\beta = .263$, $p < .001$), as well as the moderating role of PEOU, support these models' assumptions that adoption is contingent upon both cognitive beliefs and institutional resources. Significantly, the mediation of ITU between antecedents and teaching self-efficacy (TSE) extends TAM and UTAUT by positioning self-efficacy as a professional outcome, thus bridging technology adoption theories with educational psychology.

Furthermore, the adverse effect of AI anxiety ($AIA \rightarrow ITU$: $\beta = -.292$, $p < .001$) reflects the attitudinal dimension of the Theory of Planned Behavior (Ajzen, 1991), emphasizing how emotional barriers can suppress behavioral intentions even when technological benefits are recognized. The significant predictive role of ITU on TSE ($\beta = .387$, $p < .001$) also aligns with Organizational Support Theory (Eisenberger et al.,

1986), indicating that when teachers perceive both the usefulness and supportive infrastructure, their adoption intention translates into more substantial professional confidence and instructional resilience. This interplay confirms that institutional resources and psychological perceptions jointly shape teachers' adoption trajectories.

The unique contribution of this study lies in contextualizing these theoretical linkages within Guangxi's higher education system, where PE teachers face the dual pressures of national AI-driven education reforms (e.g., Healthy China 2030, AI Innovation Action Plan 2018) and local digital transformation initiatives (e.g., China–ASEAN Information Harbor). By empirically validating how PU, FC, AIA, and PEOU interact to shape ITU and ultimately TSE, this research provides both theoretical advancement and region-specific insights. It demonstrates that DeepSeek is not merely a technological tool but a mechanism through which PE teachers' professional efficacy can be enhanced in resource-constrained yet strategically positioned universities.

From a practical perspective, these findings suggest that policymakers and administrators in Guangxi should focus on three priorities: (1) strengthening teachers' perception of AI's pedagogical usefulness through hands-on demonstrations; (2) investing in institutional infrastructure and support mechanisms that reduce adoption barriers; and (3) implementing AI literacy and anxiety-reduction programs to build teacher confidence. By aligning adoption strategies with both individual cognition and systemic support, universities can ensure sustainable integration of DeepSeek and contribute to the broader national goal of leveraging AI for educational innovation.

5.2 The Proposed DeepSeek-Integrated PE Pedagogy Design Model

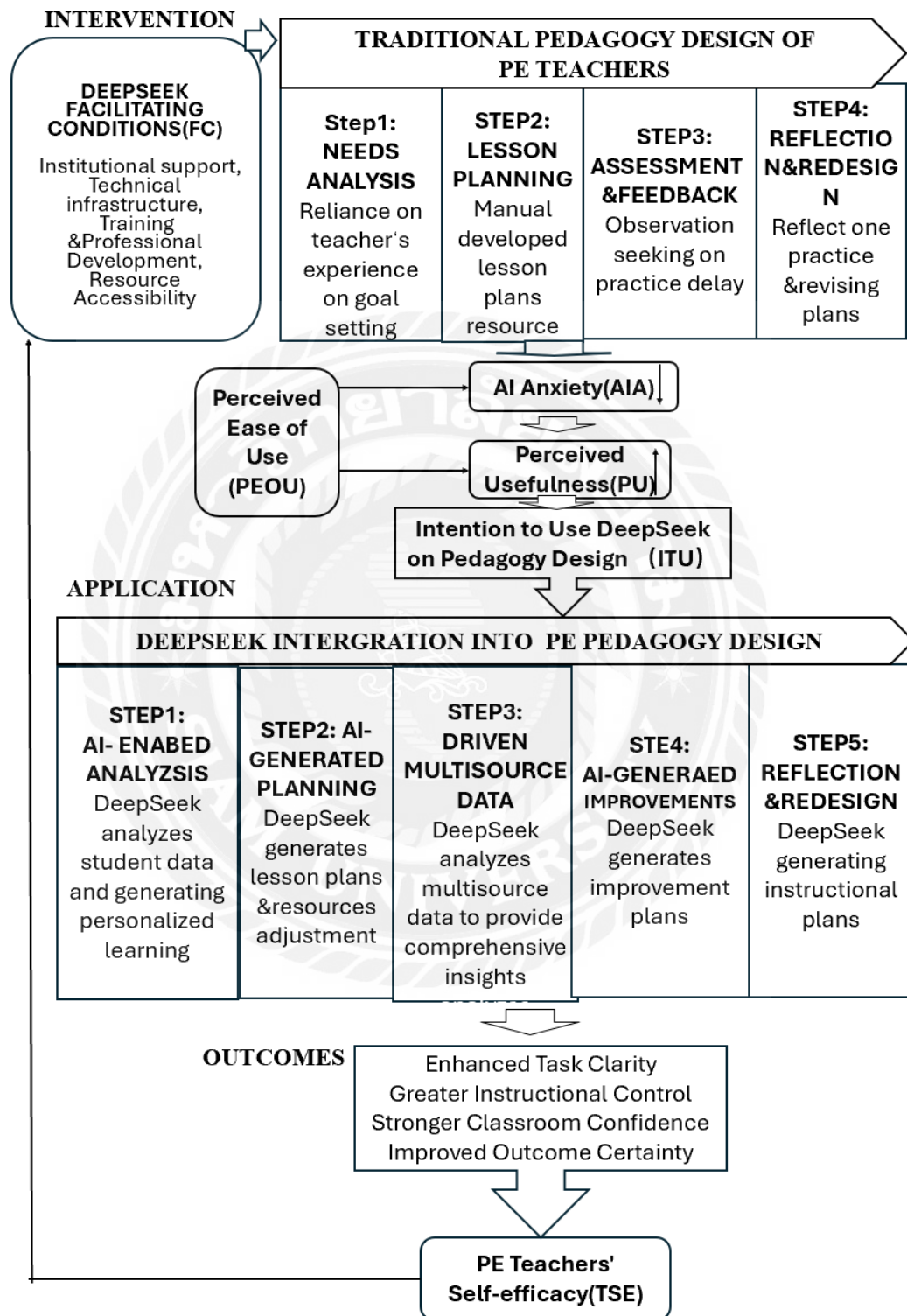


Figure 5.2 DeepSeek-Integrated Physical Education Pedagogy Design Model

Note. This model synthesizes the empirical results and qualitative insights of the study into a DeepSeek-integrated PE pedagogy design process. Boxes represent key components of pedagogy design and implementation, and arrows indicate recommended design flow and feedback loops rather than deterministic causal effects. The model is grounded in the significant structural relationships reported in Chapter 4 (e.g., the roles of PU, FC, AIA, PEOU, and ITU in shaping TSE) and triangulated with interview themes and expert feedback.

5.2.1 Rationale of the Model

Table 5.1 Evidence Mapping for the Model (Key Links to Chapter 4 Results)

Key element in Figure 5.2	Evidence type	Chapter 4 source (Section/Table/Page)	Key evidence
PU → ITU	SEM	Sec. 4.1.3.2 Table 4.16 p.61	$\beta = .274$ $p < .001$
FC → ITU	SEM	Sec. 4.1.3.2 Table 4.16 p.61	$\beta = .263$ $p < .001$
AIA → ITU	SEM	Sec. 4.1.3.2 Table 4.16 p.61	$\beta = -.292$ $p < .001$
ITU → TSE	SEM	Sec. 4.1.3.2 Table 4.16 p.61	$\beta = .387$ $p < .001$
Mediation via ITU (PU/FC/AIA → ITU → TSE)	Mediation test	Sec. 4.1.3.3 Table 4.17 p.62	PU indirect $\beta = .106$, 95% CI [.064, .154] FC indirect $\beta = .102$, 95% CI [.060, .152] AIA indirect $\beta = -.113$, 95% CI [-.158, -.075]
Moderation by PEOU (interaction terms)	Interaction	Sec. 4.1.3.4 Fig 4.2. Fig 4.3. Fig 4.4 p. 62-64	PEOU×PU $\beta = .120$, $p < .05$ PEOU×FC $\beta = .118$, $p < .05$ PEOU×AIA $\beta = -.125$, $p < .05$
Process steps & four benefits (5-step process; clarity/control/confidence/certainty)	Qual themes + theory synthesis	Sec. 4.2 (qual) Table 4.20. Table 4.21 p.67-72	Themes support: planning efficiency; differentiated instruction; data-informed assessment; reflective practice Benefits synthesized via SCT interpretation

Note: Replace placeholders (Sec./Table/Page) with the exact locations in Chapter 4.

The development of the DeepSeek-Integrated Physical Education (PE) Pedagogy Design Model is grounded in the findings of this study and reflects the structural transformation required to shift from traditional pedagogy to AI-enabled instructional innovation in Guangxi's public universities. Traditional PE pedagogy—represented in the model by four sequential steps (Needs Analysis, Lesson Planning, Implementation, and Assessment & Feedback)—has long relied on teacher experience, manual preparation, and observation-based evaluation. While this model supports fundamental skill acquisition, it lacks precision, efficiency, and adaptability due to the absence of data-driven insights and technology-supported feedback loops. As a result, PE teachers often encounter heavy workloads, limited instructional support, and stagnation in pedagogical innovation, contributing to reduced teaching self-efficacy.

DeepSeek is introduced into this context as both a technological intervention and a pedagogical catalyst, reshaping teachers' cognitive, emotional, and behavioral processes. The model conceptualizes DeepSeek not only as a tool for generating personalized instructional resources, analyzing learner performance, and supporting reflective improvement, but also as a facilitator that alters teachers' perceptions of teaching effectiveness and instructional control. By embedding DeepSeek at the intervention layer—alongside key facilitating conditions such as institutional support, technical infrastructure, professional development, and resource accessibility—the model highlights how the environment surrounding teachers directly influences their openness and capacity to adopt AI-driven pedagogy.

The model further incorporates the psychological mechanisms through which DeepSeek affects teacher behavior. Cognitive variables (Perceived Usefulness, PU; Perceived Ease of Use, PEOU), contextual conditions (Facilitating Conditions, FC), and emotional barriers (AI Anxiety, AIA) converge to shape teachers' Intention to Use DeepSeek (ITU). ITU functions as the central mediator linking teachers' perceptions and emotional responses to the downstream psychological outcome—Teaching Self-Efficacy (TSE). In line with Bandura's (1997) Self-Efficacy Theory, DeepSeek-enabled mastery experiences, strengthened instructional control, and improved feedback mechanisms collectively enhance teachers' self-belief and confidence in instructional design.

Finally, the model outlines how DeepSeek-supported pedagogy produces four immediate outcome benefits—Enhanced Task Clarity, Greater Instructional Control, Stronger Classroom Confidence, and Improved Outcome Certainty—which in turn contribute to increased teaching self-efficacy. By integrating DeepSeek as a systemic pedagogical intervention, the model addresses three key research gaps identified in this study: (1) the lack of theoretical understanding linking AI adoption with teacher self-efficacy, (2) the limited attention given to emotional factors such as AI anxiety in PE contexts, and (3) the need for an AI-enabled instructional framework aligned with Guangxi's "AI strategic highland" development agenda.

5.2.2 Structure and Logic of the Model

The proposed model consists of three interconnected layers—Intervention, Application, and Outcomes— informed by the Technology Acceptance Model (TAM), Self-Efficacy Theory, and the Motivation–Opportunity–Ability (MOA) framework. Together, these layers depict the full transformation from traditional pedagogy to AI-integrated instructional practice.

5.2.2.1 Intervention Layer

The intervention layer integrates two core components:

- (1) **DeepSeek Facilitating Conditions (FC)**—institutional support, technical infrastructure, training, professional development, and resource accessibility; and
- (2) **DeepSeek Integration into Pedagogy**—the initial stimulus that introduces AI-supported instructional processes.

This layer functions as the entry point through which teachers encounter both opportunities and challenges. DeepSeek introduces new instructional capacities such as automated lesson planning, learning analytics, multisource data interpretation, and AI-generated instructional adjustments. Simultaneously, teachers' psychological reactions—including curiosity, uncertainty, and anxiety—form the cognitive-affective basis that shapes their behavioral intention toward adoption.

5.2.2.2 Application Layer

The application layer represents the behavioral adoption mechanism, encompassing the five psychological constructs involved in DeepSeek adoption: PU, PEOU, FC, AIA, and ITU.

Perceived Usefulness (PU): Teachers' belief that DeepSeek enhances teaching quality, efficiency, and problem-solving capabilities.

Facilitating Conditions (FC): The availability of institutional, technical, and instructional supports that enable successful AI use.

AI Anxiety (AIA): Teachers' concerns regarding errors, uncertainty, capability deficits, or potential threats associated with AI systems.

Perceived Ease of Use (PEOU): A moderating construct that strengthens or weakens the influence of PU, FC, and AIA on ITU by shaping teachers' confidence and comfort in operating AI technologies.

Intention to Use (ITU): The central mediating variable that converts teachers' perceptions and emotional responses into pedagogical action.

Aligned with the empirical findings of this study, ITU fully mediates the influence of PU, FC, and AIA on TSE. This indicates that teachers' willingness to adopt DeepSeek is the psychological mechanism that transforms cognitive evaluations and emotional experiences into enhanced self-efficacy.

Additionally, the application layer includes the five-step DeepSeek pedagogical process that directly supports ITU:

Step 1: AI-Enabled Analysis

Step 2: AI-Generated Planning

Step 3: AI-Driven Multisource Data Integration

Step 4: AI-Generated Instructional Improvements

Step 5: Reflection & Redesign

5.2.2.3 Outcome Layer

Consequently, the execution of these five operational steps directly generates the immediate pedagogical outcomes of the model. As teachers engage in this AI-supported pathway, they experience four specific benefits: Enhanced Task Clarity, Greater Instructional Control, Stronger Classroom Confidence, and Improved Outcome Certainty. These outcomes represent the tangible, practical improvements perceived by

teachers during the DeepSeek-integrated teaching process. Collectively, they serve as the direct psychological antecedents that reinforce teachers' Intention to Use (ITU) and ultimately elevate their Teaching Self-Efficacy (TSE), thereby completing the transformation from behavioral adoption to enhanced professional confidence.

These steps represent the operational pathway through which DeepSeek elevates teaching precision, adaptability, and feedback quality.

5.2.3 Theoretical and Practical Contributions

Theoretical Contributions

This model advances TAM and SCT by integrating cognitive, emotional, and contextual determinants of AI adoption into a unified framework. By identifying TSE—not usage—as the proximal psychological outcome, the model reorients theoretical perspectives toward understanding how AI strengthens teacher belief systems through enhanced instructional clarity, control, confidence, and certainty. The validation of ITU as a full mediator strengthens the theoretical linkage between AI adoption, self-efficacy development, and technological readiness, contributing a region-specific perspective aligned with Guangxi's digital innovation agenda.

Empirical Contributions

Using MAXQDA-assisted coding and SmartPLS 4 analysis, the study validates the structural pathway linking PU, FC, AIA, and PEOU to ITU, and from ITU to TSE. The empirical confirmation of TSE as a key outcome marks a novel contribution to research on AI in education, demonstrating that AI adoption has meaningful psychological and pedagogical implications for PE teachers in Chinese higher education.

Practical Contributions

The model provides a multi-level roadmap for promoting AI-enabled pedagogy:

- (1) Policy Level:** Strengthen facilitating conditions through infrastructure investment, AI access systems, and alignment with regional AI strategies.
- (2) Professional Development Level:** Enhance PU via task-specific demonstrations and reduce AIA through AI literacy training and peer mentorship.
- (3) Technological Design Level:** Improve PEOU through user-friendly interfaces, bilingual support, and intuitive data dashboards.

When implemented collectively, these strategies transform DeepSeek into a catalyst for teacher empowerment, pedagogical innovation, and sustainable digital transformation in PE instruction.

5.2.4 Implementation Plan: Workshops/Activities Aligned with the Model

To enhance the practical value of the final model (Figure 5.2), this study proposes an implementable workshop-and-activity package that operationalizes the key constructs and pathways validated in Chapter 4. Specifically, the package is designed

to (a) strengthen Perceived Usefulness (PU) and Facilitating Conditions (FC), (b) reduce AI Anxiety (AIA), (c) improve Perceived Ease of Use (PEOU) as a capability enabler, and (d) ultimately increase teachers' Intention to Use DeepSeek in pedagogy design (ITU), which in turn enhances Teaching Self-Efficacy (TSE). The design logic follows the empirically supported relationships in Chapter 4 (PU/FC → ITU; AIA → ITU; ITU → TSE; PEOU as a moderator).

Table 5.2 Workshop–Construct–Evidence Mapping (Simplified, linked to Fig. 5.2 and Chapter 4)

Module	Design focus (objective & activities)	Model link (construct/pathway)	Deliverables & evaluation	Evidence ref.
W1. Value & Use-case Clinic	Compare no-AI vs AI-assisted lesson design; highlight quick wins and risks; reduce uncertainty	PU → ITU; AIA → ITU	Usefulness gains sheet + risk checklist; PU/AIA pre-post mini-scale + reflection prompt	E1–E2
W2. Hands-on Prompt Scaffold	Prompt scaffold (goals–learners–tasks–assessment–safety); rapid iterations to make operation easier	PEOU moderates → ITU	Reusable prompt kit + revised lesson plan v1; task completion rate + PEOU self-rating	E3
W3. Enabling Conditions Blueprint	Create FC checklist (accounts, devices, policy, training, peer support) to support routine adoption	FC → ITU	Institutional FC checklist + action items; FC readiness score + resource gap log	E4
W4. Micro-teaching & Peer Feedback	10-min micro-teaching using DeepSeek outputs; peer rubric feedback; revise plan v2	ITU → TSE	Lesson plan v2 + personal efficacy log; TSE pre-post + peer rubric score	E5
A1. Real-classroom Trial (optional)	Implement at least one class; collect student feedback and teacher reflection to validate feasibility	Full chain: (PU/FC/AIA) → ITU → TSE	Evidence pack (plan versions, reflections, feedback summary); observation checklist + student pulse survey	E6

Evidence ref. notes: E1 = PU→ITU (beta/t/p); E2 = AIA→ITU (beta/t/p); E3 = PEOU moderation (interaction term); E4 = FC→ITU (beta/t/p); E5 = ITU→TSE (beta/t/p); E6 = triangulation evidence (quantitative + qualitative theme codes).

Implementation notes (Recommended format)

Duration: 3–4 workshops (90–120 min each) + one optional classroom trial.

Participants: PE teachers in the target institutions; allow small peer groups (4–6) for feedback.

Data & ethics: use anonymized teaching materials; avoid uploading sensitive student information to AI tools; provide an institutional guideline for responsible use.

Outcome tracking: use brief PU/AIA/PEOU/ITU/TSE checklists (pre/post) and a short reflective log to document changes.

5.3 Conclusion

This chapter synthesizes the conceptual and empirical insights of the study, demonstrating how the DeepSeek-Integrated PE Pedagogy Design Model bridges AI-assisted teaching design with teachers' psychological empowerment. The structural model accounted for a moderate proportion of variance in Intention to Use DeepSeek (ITU) ($R^2 = 0.473$) and a smaller yet meaningful proportion in Teaching Self-Efficacy (TSE) ($R^2 = 0.150$). The findings reveal a consistent pattern: Perceived Usefulness (PU) and Facilitating Conditions (FC) strengthen ITU, AI Anxiety (AIA) weakens ITU, and ITU in turn enhances TSE. Perceived Ease of Use (PEOU) amplifies positive pathways while buffering negative emotional responses, confirming its moderating role.

Beyond confirming classic TAM relationships, the revised model advances theory by identifying Teaching Self-Efficacy (TSE) as the central psychological outcome of AI-supported pedagogy. The four AI-enabled instructional benefits—Enhanced Task Clarity, Greater Instructional Control, Stronger Classroom Confidence, and Improved Outcome Certainty—represent the specific mastery experiences through which DeepSeek improves teachers' self-belief. These outcomes clarify the mechanism by which AI transforms the traditional PE teaching process into a more precise, adaptive, and evidence-supported learning environment.

The relatively modest R^2 for TSE reinforces the understanding that self-efficacy is shaped not only by technology adoption but also by broader contextual and experiential factors, such as school culture, facilities, workload, and class size—highlighting important directions for future research.

Overall, the DeepSeek-Integrated PE Pedagogy Design Model establishes a coherent pathway through which usefulness beliefs, supportive conditions, manageable anxiety, and system usability translate into higher teacher self-efficacy. This provides a practical blueprint for sustainable AI-enabled transformation in physical education: demonstrate the pedagogical value of AI, invest in enabling conditions, reduce anxiety through capability-building, and prioritize ease of use in system design. When these elements align, universities can convert AI adoption into meaningful and durable improvements in teachers' confidence, instructional quality, and pedagogical readiness for future innovation.

5.4 Recommendations

5.4.1 Theoretical Implications

This study offers evidence-based theoretical implications for AI adoption in higher education by linking teachers' technology perceptions and emotions to a core psychological outcome—Teaching Self-Efficacy (TSE)—through Intention to Use DeepSeek (ITU). The structural results show that ITU significantly predicts TSE, supporting the view that adoption intention is not merely a precursor to usage behavior but also a proximal mechanism through which AI-related beliefs translate into professional confidence. In addition, the significant indirect effects via ITU indicate that both supportive factors (Facilitating Conditions and Perceived Usefulness) and inhibitory factors (AI Anxiety) shape teachers' self-efficacy primarily through their influence on adoption intention. This pattern extends classic TAM logic by highlighting a psychologically meaningful outcome (TSE) rather than focusing only on acceptance or behavioral use.

Second, the model strengthens theory by empirically incorporating an affective barrier—AI Anxiety—into the adoption pathway. The negative effect of AI Anxiety on ITU, together with its negative indirect effect on TSE through ITU, suggests that emotional resistance is not peripheral but structurally consequential in explaining why teachers may hesitate to adopt AI for pedagogy design. This provides a more context-sensitive extension of TAM/SCT-oriented explanations for embodied, practice-based disciplines such as physical education.

Third, the moderation results indicate that Perceived Ease of Use (PEOU) functions as a boundary condition that shapes how other determinants operate. The significant interaction effects show that usability can buffer the negative influence of AI Anxiety on ITU while strengthening the positive effects of Facilitating Conditions and Perceived Usefulness on ITU. This implies that usability is not only a direct usability belief but also an enabling condition that changes the strength of key adoption relationships.

Finally, while the findings support an intention-mediated pathway from perceptions and emotions to self-efficacy, the specific psychological or instructional mechanisms through which ITU enhances TSE were not directly measured in this study and should be examined in future research using mechanism-focused indicators or qualitative evidence.

5.4.2 Practical Implications

Practically, the model provides a multilevel framework for enabling AI integration in physical education, with clear institutional responsibilities for education administrators. At the implementation level, administrators should organize classroom-based demonstrations and model lessons to make AI's instructional value visible (e.g., improving task clarity, decision-making, and feedback quality), thereby strengthening

teachers' Perceived Usefulness (PU) and building adoption intention. At the capability level, training should be delivered in tiered formats (introductory vs. advanced) with reusable prompt scaffolds and lesson-design templates to enhance Perceived Ease of Use (PEOU) and reduce operational friction.

At the readiness level, administrators should reduce AI Anxiety (AIA) through peer mentoring, guided practice, and structured reflective dialogue. Institutional rubrics for evaluating AI-generated materials are recommended to preserve teachers' professional agency and pedagogical control. At the support level, strengthening Facilitating Conditions (FC)—including stable digital infrastructure, timely technical support, and accessible professional development—ensures that intention translates into sustained instructional use.

At the outcome level, administrators should recognize Enhanced Task Clarity, Greater Instructional Control, Stronger Classroom Confidence, and Improved Outcome Certainty as proximal indicators of effective AI-supported pedagogy. These outcomes directly reflect improvements in teachers' self-efficacy and can be incorporated into ongoing professional development and teaching-quality assurance processes.

5.4.3 Implications for Education Administrators

The findings translate into a practical administrative agenda for scaling AI-supported pedagogy in PE. First, to strengthen Perceived Usefulness (PU), administrators should institutionalize “evidence-by-demonstration” mechanisms, such as model lessons, side-by-side comparisons of AI-assisted versus traditional lesson plans, and a curated use-case library (e.g., differentiated tasks, assessment rubrics, corrective feedback prompts). Second, to improve Perceived Ease of Use (PEOU), administrators should provide tiered training pathways and standardized prompt scaffolds, supported by a rapid-response helpdesk or instructional technology coaching system that reduces time costs and trial-and-error barriers. Third, to reduce AI Anxiety (AIA), administrators should establish low-risk trial environments, peer-mentoring arrangements, and clear governance rules (ethical boundaries, data protection, and quality-control rubrics for AI outputs) to maintain teacher agency and instructional authority. Fourth, to strengthen Facilitating Conditions (FC), administrators should ensure reliable infrastructure, stable access to approved tools, and routine professional development funding, rather than relying on individual teachers' informal efforts.

Finally, to reinforce the validated mechanism $ITU \rightarrow TSE$, administrators can integrate AI-supported instructional outcomes (task clarity, instructional control, classroom confidence, and outcome certainty) into professional learning records and teaching-development evaluation, while aligning incentives (recognition, workload acknowledgement, or innovation credits) with evidence-based AI-enhanced teaching practices. This administrative package operationalizes the model as an institutional improvement cycle, enabling sustained adoption and measurable self-efficacy gains.

Table 5.3 Administrator Checklist

Model lever	Administrative action (what to do)	Responsible unit (who leads)	Suggested timeline	Evidence/KPI (how to show it worked)
PU (value visibility)	Model lessons + “AI vs. non-AI” lesson comparison; build PE use-case library	Teaching Affairs Office / School of PE	4–8 weeks	#model lessons; library items; PU pre– post change
PEOU (operational ease)	Tiered training + prompt scaffolds/templates; coaching or helpdesk support	Teaching Development Center + IT	4–8 weeks	Training completion; support response time; PEOU pre– post
AIA (psychological readiness)	Peer mentoring; low- risk trial period; governance + rubrics for AI outputs	School of PE + Ethics/QA Committee	4–12 weeks	AIA pre–post; participation rate; quality/risk incidents (target: minimal/zero)
FC (institutional support)	Approved tool access; stable network/devices; routine PD funding	IT + Finance/HR	1–3 months	System uptime; access coverage; resource readiness score
ITU → TSE (mechanism reinforcement)	Recognize AI- supported outcomes in PD records; incentives (credits/recognition /workload)	HR + Teaching Affairs	1 semester	Sustained use rate; TSE pre– post; documented teaching improvements

Note. This checklist translates the study’s key constructs into actionable administrative levers. Suggested timelines are indicative and may be adjusted to local conditions. Evidence/KPI items are illustrative examples for monitoring implementation rather than an exhaustive list.

5.4.4 Research Limitations

This study focused on DeepSeek as the focal AI tool and investigated how its adoption in PE pedagogy design shapes teachers' intention to use and teaching self-efficacy. The findings are therefore tool- and context-specific: they explain adoption mechanisms under the DeepSeek-supported teaching-design setting in Guangxi public universities in China. Although DeepSeek represents a typical large language model (LLM) used in local policy-driven training, it does not stand for all AI systems. Caution is needed when generalizing the conclusions to other AI tools or institutional contexts.

Despite its contributions, this study has several limitations. First, the reliance on self-reported Likert-scale data may introduce bias, particularly in reverse-coded items. Second, its cross-sectional design restricts causal inference despite the robustness of the structural equation model. Third, the sample was limited to Guangxi's public undergraduate universities (including a few vocational–technical universities authorized for bachelor's programs), reducing generalizability to private or non-degree institutions. Finally, the model intentionally focused on proximal instructional outcomes rather than extended SCT outcomes such as leadership, engagement, or achievement, which remain valuable targets for future empirical expansion. Future research could operationalize these SCT-derived outcomes for more comprehensive validation.

Finally, the model intentionally focused on proximal psychological and instructional outcomes—particularly teachers' intention to use DeepSeek and teaching self-efficacy—rather than downstream student-level outcomes or broader SCT outcomes. Specifically, the study did not directly measure PE class satisfaction or other student learning outcomes (e.g., skill acquisition, learning motivation, physical fitness gains, or course achievement), nor did it link teachers' DeepSeek use to objective performance indicators. Future research could operationalize these distal outcomes and adopt longitudinal or multi-source designs to test whether DeepSeek-supported pedagogy design translates into measurable improvements in students' learning experiences and performance.

5.4.5 Future Research

Future research should address these limitations and further test the DeepSeek-Integrated PE Pedagogy Design Model through more diverse and dynamic designs. Longitudinal and mixed-methods approaches are recommended to trace how Intention to Use (ITU) and Teaching Self-Efficacy (TSE) evolve across time and institutional contexts. Comparative studies across provinces (e.g., Guangxi vs. Guangdong or Yunnan) and institutional types (vocational vs. comprehensive universities) can enhance external validity. Item-level diagnostics should focus on weaker indicators (e.g., PU2 on performance-related usefulness, PEOU2 on operational ease, ITU3 on sustained commitment, TSE4 on stress resilience) to refine future measurement scales. Importantly, subsequent studies should incorporate Outcome-level metrics—such as

leadership competence, student motivation, and learning achievement—to validate the broader SCT layer empirically. Finally, intervention-based experiments (e.g., AI co-teaching simulations, peer-mentoring programs, or ASEAN-region collaborative projects) could provide causal evidence for how AI integration fosters sustainable improvements in teacher self-efficacy and pedagogical innovation.



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APPENDIX



APPENDIX A: Preliminary Studies Interview Questions (Experts)

A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China

To Questionnaire Respondent

Thank you for your participation in this study. As a doctoral student, I am now conducting interviews to gain insights from experts. Please be assured that all information obtained from this study will be used solely for academic purposes. Your personal information will be kept strictly confidential. Once again, I would like to express my sincere gratitude for your involvement.

— Mr. Lu Haiyong, Ph.D. Student, Siam University

Question	Probe
1. From your perspective, what are the significant opportunities and challenges of integrating DeepSeek into PE pedagogy design?	Can you provide specific examples?
2. How do you evaluate the limitations of current PE teaching modes without AI-assisted design tools?	Could you elaborate more concretely?
3. Do you think DeepSeek can practically support PE teachers in making pedagogy design more effective and innovative?	Why or why not?
4. What institutional or policy factors could influence teachers' intention to adopt DeepSeek in pedagogy design?	Can you specify key enablers or barriers?
5. From a teacher development perspective, what factors could enhance or hinder their confidence (self-efficacy) in using DeepSeek?	Any practical training examples?
6. How might teachers' psychological concerns (AI Anxiety) or ease of use influence their willingness to adopt DeepSeek?	Can you illustrate with cases?
7. In your opinion, is building a model to strengthen PE teachers' intention and self-efficacy in using DeepSeek necessary?	What would be the most critical elements?

Appendix Table A1 *Full Expert Interview Excerpts*

Participant	Key Abstracts (Aligned with Variables)	Mapped Variable(s)
Expert A	Highlighted that AI tools like DeepSeek can enrich PE pedagogy content and are feasible when technical support and policies are available. Emphasized teachers' confidence as central to adoption.	PU, FC, TSE
Expert B	Stressed that ease of use and convenience are critical; schools should provide adequate technical training and resources.	PEOU, FC
Expert C	Argued that PE pedagogy requires both broad teaching resources and strong school-level management/funding support. Teacher motivation is decisive.	PU, FC, ITU
Expert E	Acknowledged the potential of digital technology but noted technical anxiety as a barrier. Suggested structured training to enhance self-efficacy.	AIA, TSE, FC
Expert F	Emphasized that DeepSeek can enhance teaching interaction but requires a culture of digital innovation at the institutional level.	PU, FC, ITU
Expert H	Identified ease of use and teaching effectiveness as essential conditions. Institutional policy and technical support need strengthening.	PEOU, PU, FC
Expert I	Stated that confidence and training directly shape teachers' intention to adopt AI. Supportive management and digital literacy training are critical.	TSE, FC, ITU
Expert J	Recognized that DeepSeek can enrich PE pedagogy, but adoption depends on teacher experience, support mechanisms, and confidence.	PU, FC, TSE, ITU

Note. PU = Perceived Usefulness; PEOU = Perceived Ease of Use; FC = Facilitating Conditions; AIA = AI Anxiety; ITU = Intention to Use DeepSeek; TSE = Teacher Self-Efficacy. The expert interviews consistently emphasized the role of institutional support (FC) and ease of use (PEOU). They perceived usefulness (PU) as a primary enabler, while also highlighting AI anxiety (AIA) as a barrier. Teacher self-efficacy (TSE) and intention to use (ITU) emerged as decisive outcomes influenced by these factors

APPENDIX B: Preliminary Studies Interview Questions (PE Teachers)

A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China

To Questionnaire Respondent

Thank you for participating in this study. As a doctoral student, I am conducting interviews with physical education teachers to understand their views on integrating DeepSeek into pedagogy design. Please be assured that all information will be used solely for academic purposes. Your personal information will remain strictly confidential. Your insights are invaluable for this research, and I sincerely appreciate your time and support.

— Mr. Lu Haiyong, Ph.D. Student, Siam University

Question	Probe
1. What is your current experience with designing PE pedagogy, and how do you usually prepare teaching plans?	Could you describe the typical challenges you face?
2. From your perspective, how practical (Perceived Usefulness) do you think DeepSeek could be in improving efficiency, lesson quality, and innovation in pedagogy design?	Any specific examples?
3. What difficulties or concerns do you anticipate when using DeepSeek (AI Anxiety)?	For example, lack of control, accuracy, or over-reliance on technology?
4. What kind of institutional or school-level support (Facilitating Conditions) would help you better adopt DeepSeek in pedagogy design?	E.g., training, funding, IT resources, leadership encouragement.
5. How important is ease of use (PEOU) for you when adopting a new tool like DeepSeek?	Could you provide an example of a tool that you found easy or difficult to use?
6. How do you think using DeepSeek might influence your teaching confidence and self-efficacy (TSE)?	Would it make you feel more capable in preparing for and delivering classes?
7. Overall, what would motivate you to consistently use DeepSeek in your pedagogy design (Intention to Use)?	Institutional incentives, peer influence, or personal interest?

Appendix Table B1
Extended Keywords from PE Teacher Interviews

Variable / Keyword	Key Interview Excerpts (Teachers)	Total Frequency
Perceived Usefulness (PU)	Teachers emphasized DeepSeek's ability to save time in lesson preparation, improve efficiency, and enrich content quality. They noted that students could benefit from diversified resources and better engagement.	30 (Save time), 24 (Better quality)
Perceived Ease of Use (PEOU)	Ease of use and quick to learn were highlighted, but balanced by concerns over tech anxiety and limited prior experience. Teachers indicated that if DeepSeek is intuitive, adoption intention increases; otherwise, anxiety reduces willingness.	14 (Easy to use), 13 (Tech anxiety)
Facilitating Conditions (FC)	Teachers emphasized the importance of firm reliance on school-level support, including funding, policies, training programs, and technical assistance. Without such institutional support, adoption is difficult to sustain.	21 (Need training), 22 (Policy/funding support)
AI Anxiety (AIA)	Some teachers expressed concerns about the insufficient experience, time cost, and complexity of AI integration. Anxiety was seen as a direct barrier preventing experimentation with DeepSeek in teaching design.	13 (Tech anxiety), 9 (Cost/time issues)
Intention to Use (ITU)	Curiosity and willingness to try emerged, though moderated by traditional teaching habits. Teachers motivated by innovation showed higher readiness, while others preferred established methods.	8 (Curiosity), 20 (Traditional habit)
Teacher Self-Efficacy (TSE)	Teachers with higher confidence in digital skills felt more capable of integrating DeepSeek effectively. Motivation, recognition of student needs, and alignment with pedagogy design were seen as crucial for sustaining adoption.	18 (Motivation), 12 (Student needs)

Note. The teacher interviews revealed that adoption of DeepSeek in pedagogy design is powerfully shaped by perceptions of usefulness, ease of use, and facilitating conditions. Teachers emphasized time efficiency and enriched content as key benefits but also expressed anxiety and reliance on institutional support. Compared with experts (Table A1), teachers were more concerned with practical classroom usability and personal confidence, whereas experts focused on institutional frameworks and long-term strategic models. This contrast suggests that successful adoption requires both system-level support and teacher-level empowerment to enhance self-efficacy and ensure the sustainable integration of the system.

APPENDIX C: Index of Item Objective Congruence

A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China

基于 DeepSeek 的课程设计提升广西公办本科高校体育教师

自我效能感

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陆海勇

PhD in Educational Administration Innovation

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Research Objectives

1. To assess the status of PE teachers' perceived usefulness (PU), facilitating conditions (FC), AI anxiety (AIA), perceived ease of use (PEOU), intention to use DeepSeek (ITU), and PE teacher self-efficacy (TSE) in Guangxi's public universities.

This objective establishes a comprehensive baseline for understanding teachers' technological adoption and confidence levels.

2. To examine the direct and indirect effects of PU, FC, and AIA on teachers' ITU, and the moderating role of PEOU among these variables.

This objective clarifies how cognitive and contextual factors interact to shape teachers' behavioral intention to adopt AI-assisted pedagogy.

3. To develop and validate a DeepSeek-based pedagogical enhancement model that explains how AI integration in teaching design improves PE teachers' self-efficacy through intention to use DeepSeek (ITU).

This objective synthesizes quantitative and qualitative evidence to propose a theoretically grounded and practically applicable framework for AI-driven pedagogy in PE.

4. To provide institutional and pedagogical recommendations for promoting teachers' AI adoption and strengthening professional self-efficacy in the context of Guangxi's higher education digital transformation.

This objective translates research findings into actionable strategies for policymakers, administrators, and teacher-training programs.

Research Questions

1. What is the status of Guangxi public university's physical education (PE) teachers' perceived usefulness (PU), facilitating conditions (FC), AI anxiety (AIA), perceived ease of use (PEOU), intention to use DeepSeek (ITU), and teaching self-efficacy (TSE)?

2. How do PU, FC, and AIA directly and indirectly influence teachers' intention to use DeepSeek (ITU), and to what extent does PEOU moderate these relationships?
3. How does teachers' intention to use DeepSeek (ITU) mediate the relationship between PU, FC, AIA, and teaching self-efficacy (TSE)?
4. What institutional and pedagogical strategies can effectively enhance PE teachers' intention to use DeepSeek (ITU) and improve their teaching self-efficacy (TSE)?

Instruction

This IOC form seeks the experts' opinions on all questions embedded in this questionnaire and whether they are congruent with research objectives and definitions of terms. The criteria used for IOC are explained below.

+1 = Congruent 0 = Questionable -1 = Incongruent

说明：此 IOC 表格旨在征求专家对本问卷中所有问题的意见，这些项目是否符合研究目标和术语定义。IOC 使用的标准解释如下。

+1 = 一致 0 = 可疑 -1 = 不一致

Table Quantitative Item-Objective Congruence (IOC)

Perceived Usefulness (PU) Refers to the degree to which a physical education (PE) teacher believes that using DeepSeek for Pedagogy design will enhance their teaching effectiveness and improve instructional outcomes.	Expert Opinion			Remark
	1	0	-1	
PU1. Using DeepSeek for PE Pedagogy design improves my work efficiency. 使用 DeepSeek 设计体育课程，会提高我的工作效率。				
PU2. Using DeepSeek on PE Pedagogy design can enhance my teaching performance. 使用 DeepSeek 设计体育课程，能提高我的上课表现				
PU3. Using DeepSeek on PE Pedagogy design makes it easier to achieve my teaching goals. 使用 DeepSeek 设计体育课程，能让我更容易实现教学目标。				
PU4. Using DeepSeek on PE Pedagogy design is beneficial for my classes. 使用 DeepSeek 设计体育课程，对我上课是有帮助的。				

<p>PU5. I believe DeepSeek is less applicable to skill-based PE courses compared to other subjects. (R)</p> <p>我认为相比其他课程，DeepSeek 在体育这类技能型课程中的适用性较低。(R)</p>				
<p>AI Anxiety (AIA)</p> <p>Refers to the negative emotional response accompanying the adoption of AI tools (e.g., DeepSeek) by PE teachers for Pedagogy design.</p>				
<p>AIA1. Learning to use DeepSeek for PE Pedagogy design makes me anxious.</p> <p>学习使用 DeepSeek 进行体育课程设计让我感到焦虑。</p>				
<p>AIA2. I worry that using DeepSeek will weaken my own instructional skills.</p> <p>我担心使用 DeepSeek 会削弱我自身的教学技能。</p>				
<p>AIA3. I fear that DeepSeek's suggestions might be unsuitable for real PE Pedagogy design.</p> <p>我担心 DeepSeek 的建议可能不适用于真实的体育课程设计。</p>				
<p>AIA4. I am confident in my ability to evaluate DeepSeek's suggestions. (R)</p> <p>我有能力评估 DeepSeek 的建议。(R)</p>				
<p>AIA5. Interacting with DeepSeek for PE Pedagogy design makes me uneasy.</p> <p>为体育课程设计与 DeepSeek 互动让我感到不安。</p>				
<p>Facilitating conditions (FC)</p> <p>Refers to the degree to which a physical education (PE) teacher believes that organizational and technical infrastructures are in place to support the use of DeepSeek.</p>	1	0	-1	Remark
<p>FC1. I have the resources to utilize DeepSeek for PE (Physical Education) Pedagogy design.</p> <p>我具有使用 DeepSeek 设计体育课程的资源。</p>				
<p>FC2. My school makes an effort to develop the necessary knowledge of staff to incorporate DeepSeek into Pedagogical design.</p>				

我的学校努力培养教职员工的必要知识，将 DeepSeek 纳入课程设计。				
FC3. I can receive assistance when using DeepSeek for PE Pedagogy design. 当我使用 DeepSeek 进行课程设计时，可以得到别人的帮助。				
FC4. My school has provided training on how to use DeepSeek for Pedagogy design. 学校对如何使用 DeepSeek 做课程设计进行了培训。				
FC5. The school has not provided any training on how to use DeepSeek for Pedagogy design. (R) 学校没有如何使用 DeepSeek 进行课程设计的相关培训 (R)				
Intention to use DeepSeek on PE Syllabus design (ITU) Refers to the degree to which a physical education (PE) teacher is willing and plans to use DeepSeek for Pedagogy design, reflecting their subjective readiness to adopt and integrate the system into their instructional practices.	1	0	-1	Remark
ITU1. I will use DeepSeek for PE Pedagogy design. 我将使用 DeepSeek 来进行体育课程设计。				
ITU2. I will try using DeepSeek to address challenges in PE Pedagogy design. 我将尝试使用 DeepSeek 来解决在体育课程设计中碰到的问题。				
ITU3. I will recommend that students use DeepSeek to learn PE-related knowledge. 我会推荐学生通过 DeepSeek 学习与体育课相关的知识。				
ITU4. I plan to regularly use DeepSeek in my physical education Pedagogy design over the next semester. 我计划在下个学期的体育课程设计中定期使用 DeepSeek。				
ITU5. I will not use DeepSeek in my PE Pedagogy design. (R)				

我不会在我的体育课程设计中 使用 DeepSeek。 (R)				
PE Teachers Self-efficacy (TSE) Refers to a PE teacher's belief in their capability to effectively design and deliver physical education instruction, including their confidence in integrating AI tools such as DeepSeek to achieve specific teaching goals.	1	0	-1	Remark
TSE1. My teaching abilities have earned recognition from most of my colleagues. 我的教学能力能够赢得多数同事的认可。				
TSE 2. I can overcome challenges and achieve my teaching goals. 我有能力克服挑战,实现教学目标。				
TSE 3. As a PE teacher, I can gain the approval of my students. 作为一名体育教师, 我有能力获得学生的认可。				
TSE 4. I can ensure that my students follow the rules and exhibit appropriate behavior during PE classes. 我可以让学生在体育课上尊重规则和行为准则。				
TSE5. I can attract the attention of students who are less interested in PE. 我有能力吸引对体育课不太感兴趣的学生的学习注意力。				
TSE6. My teaching work struggles to gain recognition from colleagues and students. (R) 我的教学工作难以得到同事和学生的认可 (R)。				
Perceived Ease of Use (PEOU) Indicates the extent to which a PE teacher perceives DeepSeek as easy to use.	1	0	-1	Remark
PEOU1.I am proficient in using DeepSeek. 我能熟练地使用 DeepSeek。				
PEOU2. I find DeepSeek's outputs easy to understand. 我发现 DeepSeek 的输出是很容易理解的。				

PEOU3. I find that navigating and operating DeepSeek to be smooth and effortless. 我觉得操作和使用 DeepSeek 的过程流畅且毫不费力。				
PEOU4. I feel it is not easy to apply DeepSeek. (R) 使用 DeepSeek 对我来说不太容易。(R)				



APPENDIX D: Expert Interview Questions

This table presents the revised expert interview questions aligned with the new research framework (PU, PEOU, FC, AIA, ITU, TSE). It retains the IOC scoring system (1 = relevant, 0 = uncertain, -1 = irrelevant) for expert evaluation.

Qualitative Questions (English)	中文访谈问题	IOC Score	Remark
From your perspective, in what ways can DeepSeek improve the effectiveness and quality of pedagogy design in physical education? (PU)	从您的角度来看，DeepSeek 在多大程度上能够提升体育教学设计的有效性与质量？（感知有用性）	1 / 0 / -1	
How easy or difficult do you think it is for PE teachers to learn and use DeepSeek in pedagogy design? (PEOU)	您认为体育教师学习并使用 DeepSeek 进行教学设计的难易程度如何？（感知易用性）	1 / 0 / -1	
What kinds of institutional or technical support (e.g., training, funding, infrastructure) are most critical for PE teachers to adopt DeepSeek effectively? (FC)	您认为哪些学校层面的政策或技术支持（如培训、经费、基础设施）对体育教师有效使用 DeepSeek 最为关键？（促进条件）	1 / 0 / -1	
What concerns, worries, or anxieties might PE teachers experience when integrating DeepSeek into pedagogy design? (AIA)	体育教师在将 DeepSeek 融入教学设计过程中，可能会有哪些担忧或焦虑？（AI 焦虑）	1 / 0 / -1	
What factors would most influence PE teachers' intention to use DeepSeek	哪些因素最可能影响体育教师未来采用 DeepSeek 进行教学	1 / 0 / -1	

for future pedagogy design? (ITU)	设计的意愿? (使用意图)		
In your opinion, how does using DeepSeek impact PE teachers' confidence in designing and implementing innovative teaching practices? (TSE)	在您看来, 使用 DeepSeek 会如何影响体育教师在教学设计与实施方面的信心? (教师自我效能感)	1 / 0 / -1	
What suggestions or strategies would you recommend to enhance the sustainable adoption of DeepSeek in the design of PE pedagogy? (Practical implication)	您对推动 DeepSeek 在体育教学设计中的可持续应用有何建议或策略? (实践建议)	1 / 0 / -1	

APPENDIX E: Questionnaire (English Chinese Bilingual)

Instructions to Respondents

Please rate each item on a 5-point Likert scale:

1 = Strongly Disagree (非常不同意) 2 = Disagree (不同意) 3 = Neutral (中立)

4 = Agree (同意) 5 = Strongly Agree (非常同意)

Perceived Usefulness (PU)

Item Code	English Item	Chinese Item	Scale (1–5)
PU1	Using DeepSeek for PE Pedagogy design improves my work efficiency.	使用 DeepSeek 进行体育课程设计，会提高我的工作效率。	1 2 3 4 5
PU2	Using DeepSeek for PE Pedagogy design can enhance my teaching performance.	使用 DeepSeek 进行体育课程设计，能提高我的上课表现。	1 2 3 4 5
PU3	Using DeepSeek for PE Pedagogy design makes it easier to achieve my teaching goals.	使用 DeepSeek 进行体育课程设计，能让我更容易实现教学目标。	1 2 3 4 5
PU4	Using DeepSeek for PE Pedagogy design is beneficial for my classes.	使用 DeepSeek 进行体育课程设计，对我的课堂有帮助。	1 2 3 4 5
PU5 (R)	I believe DeepSeek is less applicable to skill-based PE courses compared to other subjects.	我认为相比其他课程，DeepSeek 在技能型体育课程中的适用性较低。(R)	1 2 3 4 5

AI Anxiety (AIA)

Item Code	English Item	Chinese Item	Scale (1–5)
AIA1	Learning to use DeepSeek for PE Pedagogy design makes me anxious.	学习使用 DeepSeek 进行体育课程设计让我感到焦虑。	1 2 3 4 5

AIA2	I worry that using DeepSeek will weaken my own instructional skills.	我担心使用 DeepSeek 会削弱我自身的教学技能。	1	2	3	4	5
AIA3	I fear that DeepSeek's suggestions might be unsuitable for real PE Pedagogy design.	我担心 DeepSeek 的建议可能不适用于真实的体育课程设计。	1	2	3	4	5
AIA4 (R)	I am confident in my ability to evaluate DeepSeek's suggestions.	我有能力评估 DeepSeek 的建议。 (R)	1	2	3	4	5
AIA5	Interacting with DeepSeek for PE Pedagogy design makes me uneasy.	在体育课程设计中与 DeepSeek 互动让我感到不安。	1	2	3	4	5

Facilitating Conditions (FC)

Item Code	English Item	Chinese Item	Scale (1–5)				
FC1	I have the resources to use DeepSeek for PE Pedagogy design.	我具有使用 DeepSeek 进行体育课程设计的资源。	1	2	3	4	5
FC2	My school makes an effort to develop the necessary knowledge of its staff to incorporate DeepSeek.	我的学校努力培养教师的必要知识，以便在课程设计中应用 DeepSeek。	1	2	3	4	5
FC3	I can receive assistance when using DeepSeek for PE Pedagogy design.	当我使用 DeepSeek 进行体育课程设计时，可以得到帮助。	1	2	3	4	5
FC4	My school has provided training on how to use DeepSeek for Pedagogy design.	学校对如何使用 DeepSeek 进行课程设计进行了培训。	1	2	3	4	5
FC5 (R)	The school has not provided any training on DeepSeek use.	学校没有提供关于使用 DeepSeek 的培训。 (R)	1	2	3	4	5

Perceived Ease of Use (PEOU)

Item Code	English Item	Chinese Item	Scale (1–5)
PEOU1	I am proficient in using DeepSeek.	我能熟练使用 DeepSeek。	1 2 3 4 5
PEOU2	I find DeepSeek's outputs easy to understand.	我发现 DeepSeek 的输出容易理解。	1 2 3 4 5
PEOU3	I find navigating and operating DeepSeek to be smooth and effortless.	我觉得操作和使用 DeepSeek 的过程流畅且毫不费力。	1 2 3 4 5
PEOU4 (R)	I feel it is not easy to apply DeepSeek.	我觉得应用 DeepSeek 并不容易。(R)	1 2 3 4 5

Intention to Use DeepSeek (ITU)

Item Code	English Item	Chinese Item	Scale (1–5)
ITU1	I will use DeepSeek for PE Pedagogy design.	我将使用 DeepSeek 进行体育课程设计。	1 2 3 4 5
ITU2	I will try using DeepSeek to address challenges in PE Pedagogy design.	我会尝试使用 DeepSeek 来解决体育课程设计中的问题。	1 2 3 4 5
ITU3	I will recommend that students use DeepSeek to learn PE-related knowledge.	我会推荐学生通过 DeepSeek 学习与体育相关的知识。	1 2 3 4 5
ITU4	I plan to regularly use DeepSeek in my PE pedagogy design over the next semester.	我计划在下学期的体育课程设计中定期使用 DeepSeek。	1 2 3 4 5
ITU5 (R)	I will not use DeepSeek in my PE pedagogy design.	我不会在我的体育课程设计中 使用 DeepSeek。(R)	1 2 3 4 5

Teacher Self-Efficacy (TSE)

Item Code	English Item	Chinese Item	Scale (1–5)
TSE1	My teaching abilities have earned recognition from most of my colleagues.	我的教学能力能够赢得多数同事的认可。	1 2 3 4 5
TSE2	I can overcome challenges and achieve my teaching goals.	我能克服挑战并实现教学目标。	1 2 3 4 5
TSE3	As a PE teacher, I can gain the approval of my students.	作为一名体育教师，我能获得学生的认可。	1 2 3 4 5
TSE4	I can ensure that my students follow the rules and exhibit appropriate behavior during PE classes.	我可以让学生在体育课上遵守规则和行为规范。	1 2 3 4 5
TSE5	I can attract the attention of students who are less interested in PE.	我有能力吸引对体育课不感兴趣的学生的注意力。	1 2 3 4 5
TSE6 (R)	My teaching work struggles to gain recognition from colleagues and students.	我的教学工作难以获得同事和学生的认可。(R)	1 2 3 4 5

APPENDIX F: Questionnaire

A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China To Questionnaire Respondent:

Thank you for taking the time to complete the questionnaire. The results of the Questionnaires are only used for academic research and have no other use. Promise to keep the data provided by the interviewee confidential. Please fill in the title carefully according to the actual situation.

MR. Lu Haiyong, Ph.D.
Student Siam University

Part 1 Demographic information

Remark: The first part of the questionnaire is about yourself and the Board of Directors. Please check "√" before the options that match.

1. Gender ☐ Male ☐ Female
2. Age ☐ under 35 ☐ 36-45 ☐ 46-55
3. Education ☐ Undergraduate degree ☐ Bachelor degree
☐ Master degree ☐ Doctoral Degree
4. The university you work for is _____

Part 2 Relational factors

Part II Computer self-efficacy

Please rate your agreement level. Tick "√" in the appropriate box. There are five levels: "1. Strongly disagree; 2. Disagree; 3. Not sure; 4. Agree; 5. Strongly agree"

	Perceived Usefulness (PU)	1	2	3	4	5
1	Using DeepSeek for PE Pedagogy design improves my work efficiency.					
2	Using DeepSeek on PE Pedagogy design can enhance my teaching performance.					
3	Using DeepSeek on PE Pedagogy design makes it easier to achieve my teaching goals.					
4	Using DeepSeek on PE Pedagogy design is beneficial for my classes.					
5	I believe DeepSeek is less applicable to skill-based PE courses compared to other subjects. (R)					

	AI Anxiety (AIA)					
6	Learning to use DeepSeek for PE Pedagogy design makes me anxious.					
7	I worry that using DeepSeek will weaken my own instructional skills.					
8	I fear that DeepSeek's suggestions might be unsuitable for real PE Pedagogy design.					
9	Interacting with DeepSeek for PE Pedagogy design makes me uneasy.					
10	I am confident in my ability to evaluate DeepSeek's suggestions. (R)					
	Facilitating conditions (FC)					
11	I have the resources to use DeepSeek for PE (Physical education) Pedagogy design.					
12	My school puts effort to develop staffs' necessary knowledge to incorporate DeepSeek into Pedagogy design.					
13	I can receive assistance when using DeepSeek for PE Pedagogy design.					
14	My school has provided training on how to use DeepSeek for Pedagogy design.					
15	The school has not provided any training on how to use DeepSeek for Pedagogy design. (R)					
	Intention to use DeepSeek on PE Pedagogy design (ITU)	1	2	3	4	5
16	I will use DeepSeek for PE Pedagogy design.					
17	I will try using DeepSeek to address challenges in PE Pedagogy design.					
18	I will recommend students use DeepSeek to learn PE-related knowledge.					
19	I plan to regularly use DeepSeek in my PE Pedagogy design over the next semester.					
20	I will not use DeepSeek in my PE Pedagogy design. (R)					
	PE Teachers Self-efficacy (TSE)	1	2	3	4	5
21	My teaching abilities can win recognition from most colleagues.					
22	I can overcome challenges and achieving my teaching goals.					

23	As a PE teacher, I can gain the approval of my students.					
24	I can ensure that my students follow rules and appropriate behaviors during PE classes.					
25	I can attract the attention of students who are less interested in PE.					
26	My teaching work struggles to gain recognition from colleagues and students. (R)					
	Perceived Ease of Use (PEOU)	1	2	3	4	5
27	I am proficient in using DeepSeek.					
28	I find DeepSeek's outputs easy to understand.					
29	I feel that navigating and operating DeepSeek is smooth and effortless.					
30	I feel it is not easy to apply DeepSeek. (R)					

You have completed this questionnaire.

Thank you for your support.

Chinese Questionnaire

感谢您的参与。本问卷由两部分组成：第一部分是人口统计学信息，第二部分是研究调查量表。本研究所得信息仅用于学术研究，您的所有个人信息将严格保密。再次感谢您的参与。如果您需要进一步的信息或需要我们的帮助，请联系我们。我将采用 5 点李克特量表：1=非常不同意 2=不同意 3=中立 4=同意 5=非常同意进行打分。

1. 性别： 男 () 女 ()						
2. 年龄： 35 岁及以下 () 36-45 岁 () 45-55 岁 ()						
3. 学历 (位)： 本科 () 硕士 () 博士 ()						
4. 您所在的大学是： _____						
	感知有用性 (自变量)	1	2	3	4	5
1	使用 DeepSeek 设计体育课程，会提高我的工作效率					
2	使用 DeepSeek 设计体育课程，能提高我的上课表现					
3	使用 DeepSeek 设计体育课程，能让我更容易实现教学目标					
4	使用 DeepSeek 设计体育课程，对我上课是有帮助的					
5	我认为相比其他课程，DeepSeek 在体育这类技能型课程中的适用性较低。(R)					
	AI 焦虑 (自变量)	1	2	3	4	5
6	学习使用 DeepSeek 进行体育课程设计让我感到焦虑。					
7	我担心使用 DeepSeek 会削弱我自身的教学技能。					
8	我担心 DeepSeek 的建议可能不适用于真实的体育课程设计。					
9	为体育课程设计与 DeepSeek 互动让我感到不安。					
10	我有能力评估 DeepSeek 的建议。(R)					
	便利条件 (自变量)	1	2	3	4	5
11	我具有使用 DeepSeek 设计体育课程的资源。					
12	我的学校努力培养教职员工的必要知识，将 DeepSeek 纳入课程设计。					
13	当我使用 DeepSeek 进行课程设计时，可以得到别人的帮助。					
14	学校对如何使用 DeepSeek 做课程设计进行了培训。					

15	学校没有如何使用 DeepSeek 进行课程设计的相关培训 (R)					
	在体育教学法设计中使用 DeepSeek 的意图 (中介变量)	1	2	3	4	5
16	我将使用 DeepSeek 来进行体育课程设计。					
17	我将尝试使用 DeepSeek 来解决在体育课程设计中碰到的问题。					
18	我会推荐学生通过 DeepSeek 学习与体育课相关的知识。					
19	我计划在下个学期的体育课程设计中定期使用 DeepSeek。					
20	我不会在我的体育课程设计中使用 DeepSeek (R)。					
	体育教师自我效能感 (因变量)	1	2	3	4	5
21	我的教学能力能够赢得多数同事的认可。					
22	我有能力克服挑战,实现教学目标。					
23	作为一名体育教师,我有能力获得学生的认可。					
24	我可以让学生在体育课上尊重规则和行为准则。					
25	我有能力吸引对体育课不太感兴趣的学生的学习注意力。					
26	我的教学工作难以得到同事和学生的认可 (R)。					
	感知易用性 (调节变量)					
27	我能熟练地使用 DeepSeek 进行课程设计。					
28	我发现 DeepSeek 的输出是很容易理解的。					
29	我觉得操作和使用 DeepSeek 的过程流畅且毫不费力。					
30	使用 DeepSeek 进行体育课程设计对我来说不太容易 (R)。					

APPENDIX G: Qualitative Expert Interviews

A Model for Enhancing Physical Education Teachers’ Self-Efficacy through
DeepSeek on Pedagogy Design in Public Universities in Guangxi, China
基于 DeepSeek 的课程设计提升广西公办本科高校体育教师
自我效能感

To Interview Respondent

Thank you for agreeing to participate in this expert interview. This discussion aims to collect your insights into the model proposed in this study. We particularly hope you can evaluate the model from a professional perspective, especially regarding its role in promoting university PE teachers’ adoption of DeepSeek in pedagogy design and enhancing their teaching self-efficacy. Your feedback will be invaluable for refining the model and ensuring its practical application in higher education institutions.

感谢您同意参加本次专家访谈。本次讨论旨在收集您对研究所提出模型的见解。我们特别希望您能从专业角度评估该模型，尤其是其在促进大学体育教师采用 DeepSeek 进行教学设计和提升自我效能方面的作用。您的反馈将有助于优化模型，并确保其在高等教育中的实际应用价值。

Mr. Lu Haiyong, Ph.D. Candidate / 陆海勇 博士研究生
Siam University / 暹罗大学

Interview Questions / 访谈问题

Question / 问题	Probe / 追问
How do you evaluate the innovation of integrating DeepSeek into PE pedagogy design and its potential impact on improving teachers’ self-efficacy? 您如何评价将 DeepSeek 融入体育教学设计的创新性，以及其对提升教师自我效能的潜在影响？	Can you give specific examples? 您能举一些具体的例子吗？
Do you think the proposed model effectively addresses the challenges PE teachers face (e.g., AI anxiety, lack of training, resource constraints)?	Can you explain more specifically? 您能更具体地解释吗？

Question / 问题	Probe / 追问
<p>您认为该模型是否有效解决了体育教师在采用 DeepSeek 时面临的挑战（如 AI 焦虑、培训不足、资源有限）？</p>	
<p>In what ways does the model support PE teachers' intention to use DeepSeek and strengthen their teaching self-efficacy? 该模型通过哪些方式促进体育教师的使用意图并提升其教学自我效能？</p>	<p>Can you elaborate with examples? 您能结合实例进一步说明吗？</p>
<p>What institutional support (e.g., policies, training, technical resources) is essential for teachers to benefit from the model fully? 您认为哪些制度性支持（如政策、培训、技术资源）对教师充分受益于该模型最为关键？</p>	<p>Can you be more specific? 您能更具体地说明吗？</p>
<p>Considering the moderating role of perceived ease of use, how can the model ensure that DeepSeek is user-friendly for teachers with different digital skills? 考虑到感知易用性的调节作用，您认为该模型如何保证 DeepSeek 对不同数字技能水平的教师都足够友好？</p>	<p>Any practical suggestions? 您能提供一些实际建议吗？</p>
<p>How scalable and adaptable is the model across different universities or regions? What contextual factors (e.g., culture, infrastructure) may affect its success? 您认为该模型在不同高校或地区的推广性和适应性如何？哪些情境因素（如文化、基础设施）会影响其成功？</p>	<p>Can you share more concrete insights? 您能分享一些具体看法吗？</p>

APPENDIX H: Item-Objective Congruence Examination

Result of the Index of Item-Objective Congruence (IOC) Examination

Construct	Item No.	Prof. Oscar	Prof. Guo Qiang	Prof. Huang Xiaobo	Prof. Lu Yuanzhao	$\sum R$	$(\sum R)/N$
Perceived Usefulness (PU)	1–5	1	1	1	1	4	1
AI Anxiety (AIA)	1–5	1	1	1	0	3	0.75
Facilitating Conditions (FC)	1–5	1	1	1	1	4	1
Perceived Ease of Use (PEOU)	1–4	1	1	1	1	4	1
Intention to Use DeepSeek (ITU)	1–5	1	1	1	1	4	1
Teacher Self-Efficacy (TSE)	1–6	1	1	1	1	4	1

APPENDIX I: A Follow-up Questionnaire was Sent Via Email after the Interview



Focus Group Consent Letter

Title of Study: A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China

Principal Investigator: Lu Haiyong

Institution: Graduate School of Educational Administration, Siam University, Thailand

Contact Information: 244417576@qq.com

Participation and Procedures (Modified to Chinese Research Context):

Given the relational and cultural sensitivities inherent in Chinese academic and professional settings, most participants declined to be recorded. Therefore, instead of conventional recordings, semi-structured online interviews were conducted via Tencent Meeting and documented in real time through detailed note-taking by the researcher. These interviews were a rapport-building phase, helping participants become familiar with the study's goals and fostering mutual trust.

Following the interview sessions, participants were invited to complete a follow-up, open-ended questionnaire, which was sent to them via email. This two-phase approach—combining conversational, relationship-oriented interviews with reflective written responses—proved particularly effective in eliciting richer qualitative data in the Chinese context. It respected participants' privacy and comfort while promoting deeper, more thoughtful engagement with the research topic. All responses were treated with strict confidentiality, and no personally identifiable information was used in the analysis or reporting process.

Participant's Name: _____

Participant's Signature: _____

Date: _____

If you have any questions or concerns, please contact Lu Haiyong.

Thank you for your valuable contribution to this research.

Sincerely,

Siam University

SU 0210.14 / 169.1



Graduate School of Education
Siam University
38 Phet Kasem Rd., Bang Wa,
Phasi Charoen, Bangkok 10160

12 September 2025

Dear Associate Professor Zheng Yan,
College English Teacher

Subject: Invitation to be an expert to verify the translation of the research questionnaires.

Since Mr. Lu Haiyong, student ID 6419000025, a doctoral student in the English program at the Graduate School of Education, Siam University Thailand, works on a dissertation: *"A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China"* with Assoc. Prof. Dr. Jomphong Mongkhonvanit (the advisor) and Dr. Lee Hsing Lu (the co-advisor), the Graduate School of Education would like to invite you to be an expert to verify the translation of the research questionnaires.

The research questionnaires are an essential tool for researchers to find answers. Mr. Lu Haiyong conducted this research in English, the instrument was designed in English. However, it must be applied to Chinese respondents. Your role as an expert in verifying the translation of the research questionnaire from English into Chinese is of utmost importance for the success of this research. Then, Mr. Lu Haiyong will contact and coordinate all details by himself.

We really appreciate your help.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Supathra'.

Asst. Prof. R. Adm. Supathra Urwongse, Ph.D.
Acting Dean of Graduate School of Education

SU 0210.14 / 163, 2



Graduate School of Education
Siam University
38 Phet Kasem Rd., Bang Wa,
Phasi Charoen, Bangkok 10160

12 September 2025

Dear Associate Professor Qin Ying,
College English Teacher

Subject: Invitation to be an expert to verify the translation of the research questionnaires.

Since Mr. Lu Haiyong, student ID 6419000025, a doctoral student in the English program at the Graduate School of Education, Siam University Thailand, works on a dissertation: *"A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China"* with Assoc. Prof. Dr. Jomphong Mongkhonvanit (the advisor) and Dr. Lee Hsing Lu (the co-advisor), the Graduate School of Education would like to invite you to be an expert to verify the translation of the research questionnaires.

The research questionnaires are an essential tool for researchers to find answers. Mr. Lu Haiyong conducted this research in English, the instrument was designed in English. However, it must be applied to Chinese respondents. Your role as an expert in verifying the translation of the research questionnaire from English into Chinese is of utmost importance for the success of this research. Then, Mr. Lu Haiyong will contact and coordinate all details by himself.

We really appreciate your help.

Yours sincerely,

Asst. Prof. R. Adm. Supathra Urwongse, Ph.D.
Acting Dean of Graduate School of Education



SU 0210.14 / 143.3

Graduate School of Education
Siam University
38 Phet Kasem Rd., Bang Wa,
Phasi Charoen, Bangkok 10160

12 September 2025

Dear Associate Professor Dr. Tan Junhui,
Guangxi Minzu Normal University

Subject: Invitation to be an expert to evaluate the results.

Since Mr. Lu Haiyong, student ID 6419000025, a doctoral student in the English program at the Graduate School of Education, Siam University Thailand, works on a dissertation: *"A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China"* with Assoc. Prof. Dr. Jomphong Mongkhonvanit (the advisor) and Dr. Lee Hsing Lu (the co-advisor), the Graduate School of Education would like to invite you to be an expert to evaluate the results. Mr. Lu Haiyong will contact and coordinate all details himself.

We really appreciate your help.

Yours sincerely,

Asst. Prof. R. Adm. Supathra Urwongse, Ph.D.
Acting Dean of Graduate School of Education



SU 0210.14 / 1635

Graduate School of Education
Siam University
38 Phet Kasem Rd., Bang Wa,
Phasi Charoen, Bangkok 10160

12 September 2025

Dear Associate Professor Hu Junrong,
Guilin University of Electronic Technology

Subject: Invitation to be an expert to evaluate the results.

Since Mr. Lu Haiyong, student ID 6419000025, a doctoral student in the English program at the Graduate School of Education, Siam University Thailand, works on a dissertation: *"A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China"* with Assoc. Prof. Dr. Jomphonng Mongkhonvanit (the advisor) and Dr. Lee Hsing Lu (the co-advisor), the Graduate School of Education would like to invite you to be an expert to evaluate the results. Mr. Lu Haiyong will contact and coordinate all details himself.

We really appreciate your help.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Supathra U'.

Asst. Prof. R. Adm. Supathra Urwongse, Ph.D.
Acting Dean of Graduate School of Education



SU 0210.14/143.6

Graduate School of Education
Siam University
38 Phet Kasem Rd., Bang Wa,
Phasi Charoen, Bangkok 10160

12 September 2025

Dear Professor Cheng Ming,
Guangxi Normal University

Subject: Invitation to be an expert to evaluate the results.

Since Mr. Lu Haiyong, student ID 6419000025, a doctoral student in the English program at the Graduate School of Education, Siam University Thailand, works on a dissertation: *"A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China"* with Assoc. Prof. Dr. Jomphong Mongkhonvanit (the advisor) and Dr. Lee Hsing Lu (the co-advisor), the Graduate School of Education would like to invite you to be an expert to evaluate the results. Mr. Lu Haiyong will contact and coordinate all details himself.

We really appreciate your help.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Supathra U".

Asst. Prof. R. Adm. Supathra Urwongse, Ph.D.
Acting Dean of Graduate School of Education



SU 0210.14/163.7

Graduate School of Education
Siam University
38 Phet Kasem Rd., Bang Wa,
Phasi Charoen, Bangkok 10160

12 September 2025

Dear Professor Huang Xiaobo,
Guangxi University

Subject: Invitation to be an expert to evaluate the results.

Since Mr. Lu Haiyong, student ID 6419000025, a doctoral student in the English program at the Graduate School of Education, Siam University Thailand, works on a dissertation: *"A Model for Enhancing Physical Education Teachers' Self-Efficacy through DeepSeek on Pedagogy Design in Public Universities in Guangxi, China"* with Assoc. Prof. Dr. Jomphonng Mongkhonvanit (the advisor) and Dr. Lee Hsing Lu (the co-advisor), the Graduate School of Education would like to invite you to be an expert to evaluate the results. Mr. Lu Haiyong will contact and coordinate all details himself.

We really appreciate your help.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Supathra'.

Asst. Prof. R. Adm. Supathra Urwongse, Ph.D.
Acting Dean of Graduate School of Education

Participant B: Educational Technology Expert

◆ **Q1. How do you evaluate the innovation of integrating DeepSeek into PE pedagogy design and its potential impact on improving teachers' self-efficacy?**

Participant B:

From a technology expert's perspective, the integration of DeepSeek into PE pedagogy is highly innovative because it redefines the way teachers interact with digital tools. Unlike traditional systems that only provide databases of exercises or video demonstrations, DeepSeek generates tailored pedagogy designs that can incorporate students' skill levels, physical conditions, and even contextual needs such as weather or available equipment. This capacity to customize in real-time makes it far more adaptable than conventional software. For teachers, the practical outcome is reduced preparation stress and greater confidence in delivering lessons aligned with current standards. Self-efficacy improves when teachers perceive that they can control both the pace and quality of their instruction with the aid of AI. In trials I have observed, teachers who previously struggled to balance time between lesson planning and classroom delivery felt relieved and more confident after adopting DeepSeek. The innovation is not merely technical but psychological—it empowers teachers to focus on pedagogy rather than administrative burden.

◆ **Q2. Do you think the proposed model effectively addresses the challenges PE teachers face (e.g., AI anxiety, lack of training, resource constraints)?**

Participant B:

Yes, though challenges remain. AI anxiety is a real phenomenon among teachers, especially those who are not confident with digital technologies. The model effectively addresses this by recognizing anxiety as a legitimate issue and embedding support strategies such as phased training workshops, guided practice, and peer mentoring. Research on technology acceptance indicates that reducing uncertainty is crucial in alleviating anxiety. Lack of training is another obstacle. Too often, teachers receive only a one-time workshop with no follow-up. The model proposes sustained training and ongoing technical guidance, which is far more effective. However, resource constraints are a more rigid barrier. Not all universities in Guangxi can afford stable infrastructure, updated devices, or licensed software. The model acknowledges this, but, in my opinion, needs stronger mechanisms such as consortium-based resource sharing or government subsidies. Without systemic solutions, adoption will remain uneven, favoring better-funded institutions and leaving others behind.

◆ **Q3. In what ways does the model support PE teachers' intention to use DeepSeek and strengthen their teaching self-efficacy?**

Participant B:

The model supports intention and self-efficacy in multiple ways. First, it increases perceived usefulness, a key concept in the Technology Acceptance Model (TAM). Teachers save time in planning, generate more structured lessons, and deliver content that feels professionally validated. This makes them more inclined to adopt the system. Second, it builds self-efficacy through mastery experiences. When teachers successfully use DeepSeek to create a lesson plan and observe positive student outcomes, they internalize a sense of competence. Third, social influence plays a role. In peer workshops, when one teacher demonstrates a successful DeepSeek-based syllabus, colleagues gain confidence to try it themselves. Finally, institutional recognition is vital. If AI-assisted pedagogy is formally incorporated into evaluation systems, teachers' motivation is enhanced. Altogether, the model generates a feedback cycle: adoption leads to positive experiences, which strengthen self-efficacy, and in turn, foster further intention to adopt.

◆ **Q4. What institutional support (e.g., policies, training, technical resources) is essential for teachers to benefit from the model fully?**

Participant B:

Institutional support must be comprehensive and sustained. Policies should explicitly state that the use of AI is recognized as part of teaching duties, not an additional burden. Training should be embedded in professional development programs and not left optional; otherwise, only digitally confident teachers will engage. Technical resources are equally important. A stable internet connection, functional devices, and prompt IT support are essential prerequisites for adoption. Teachers quickly abandon new systems if they encounter frequent technical breakdowns without support. Additionally, leadership endorsement is crucial. When administrators publicly value AI adoption and showcase its use in meetings, teachers perceive the legitimacy of AI. This symbolic backing is often as important as material resources because it reassures staff that their work is institutionally supported. Incentives such as professional credits or teaching awards for AI adoption can further motivate teachers. Without these structural supports, even the best-designed model will not reach its full potential.

◆ **Q5. Considering the moderating role of perceived ease of use, how can the model ensure that DeepSeek is user-friendly for teachers with different digital skills?**

Participant B:

Ease of use is critical because it directly moderates adoption. Teachers with different digital skills require differentiated support. The model should provide tiered user interfaces—basic templates with step-by-step guidance for beginners, as well as advanced customization options for experienced users. This prevents new users from being overwhelmed while still engaging more advanced teachers. Bilingual interfaces

are essential, as many teachers in Guangxi prefer working in Chinese but may occasionally need English technical terms. Interactive help menus, tutorial videos, and real-time support features should be embedded directly in the platform to reduce dependence on external manuals. Peer mentoring programs can further bridge the gap by pairing digital natives with colleagues who are less comfortable with technology. In practice, when teachers perceive that DeepSeek is intuitive and that support is always available, their anxiety decreases, their sense of control increases, and both intention and self-efficacy are reinforced.

◆ **Q6. How scalable and adaptable is the model across different universities or regions? What contextual factors may affect its success?**

Participant B:

The model is scalable but requires adaptation to context. Large universities with strong IT infrastructure will find adoption easier, while rural institutions may face serious challenges without external funding. Cultural factors also play a role. In some faculties, teachers may see AI as undermining professional autonomy, whereas in others it is embraced as an aid. Framing is therefore important. If DeepSeek is positioned as a supportive assistant rather than a replacement, acceptance will be higher. Pilot projects help build trust, especially when results are communicated across institutions. Adaptability is also crucial. A modular approach enables universities to begin with basic features—such as lesson planning—and gradually add advanced analytics as their capacity grows. This flexibility ensures the model remains relevant across different contexts. With sufficient policy support, infrastructure investment, and cultural sensitivity, I believe the model can be scaled across Guangxi and serve as a blueprint for broader national adoption.

Participant C: Educational Technology Expert

◆ **Q1. How do you evaluate the innovation of integrating DeepSeek into PE pedagogy design and its potential impact on improving teachers' self-efficacy?**

Participant C:

The innovation of integrating DeepSeek into PE pedagogy lies in its ability to bridge theoretical knowledge and practical application. Unlike static digital platforms, DeepSeek generates dynamic, context-sensitive lesson content that adapts to different student groups, sports modules, and instructional needs. For teachers, this means they no longer face the challenge of translating theory into practice on their own; instead, they receive structured recommendations grounded in sports science. The impact on self-efficacy is substantial. Teachers often express uncertainty about whether their lesson plans meet academic and practical standards. With DeepSeek providing evidence-based suggestions, they feel reassured and competent. This mirrors Bandura's

concept of “verbal persuasion” combined with “mastery experiences”—when teachers see their lessons improve through AI assistance, they believe more strongly in their teaching capabilities. Importantly, this innovation is not about replacing teachers but about empowering them to focus on student engagement and skill development rather than being overwhelmed by administrative planning.

◆ **Q2. Do you think the proposed model effectively addresses the challenges PE teachers face (e.g., AI anxiety, lack of training, resource constraints)?**

Participant C:

The model tackles these challenges with a balanced approach. AI anxiety is widespread, particularly among teachers who are less comfortable with technology. By embedding phased training and scaffolding strategies, the model enables teachers to build confidence gradually. This reflects best practices in educational technology adoption, where small, achievable steps reduce psychological barriers. The lack of sustained training, however, remains a concern. Too often, universities offer single workshops without follow-up, leading to short-lived adoption. The model’s emphasis on continuous professional development is essential. Resource constraints are another key challenge. Many universities in Guangxi lack stable infrastructure, making it difficult for teachers to use DeepSeek consistently. The model acknowledges this, but, in my opinion, should include explicit mechanisms such as consortium licensing, government subsidies, or cloud-based solutions that reduce hardware dependency. Without systemic solutions, resource inequalities will persist, limiting the overall effectiveness of the initiative.

◆ **Q3. In what ways does the model support PE teachers’ intention to use DeepSeek and strengthen their teaching self-efficacy?**

Participant C:

The model promotes adoption intention by aligning with the Technology Acceptance Model’s constructs of perceived usefulness and ease of use. Teachers see clear benefits—time savings, structured planning, and improved classroom outcomes—that enhance perceived usefulness. At the same time, practical demonstrations during training reduce the learning curve, reinforcing perceived ease of use. These experiences create opportunities for mastery that boost self-efficacy. For example, I observed a teacher who used DeepSeek to generate assessment rubrics for a gymnastics course. The AI-produced rubric was not only comprehensive but also easy to adapt to local standards. This success reinforced her confidence, making her more willing to use DeepSeek in future courses. Peer influence also plays a role. When teachers witness colleagues benefiting from the model, their own intention to adopt increases. The interplay of these factors—usefulness, ease, mastery, and social reinforcement—

explains why the model is effective in both motivating adoption and strengthening teacher self-efficacy.

◆ **Q4. What institutional support (e.g., policies, training, technical resources) is essential for teachers to benefit from the model fully?**

Participant C:

Institutional support is indispensable. Teachers need formal acknowledgment that AI-assisted syllabus design is considered professional work, not extra labor. Policies must clearly state that time spent on AI integration is recognized in workload calculations and performance evaluations. Training programs should be institutionalized, offered regularly, and adapted to different levels of digital literacy. Technical resources such as reliable internet, updated hardware, and responsive IT support are also critical. Without these, teachers will quickly abandon new technologies. Leadership endorsement plays an important symbolic role. When administrators showcase DeepSeek during meetings or reward teachers who adopt it, it legitimizes the practice and reduces skepticism. Incentives such as teaching awards or promotion credits tied to AI adoption further encourage engagement. In sum, institutional support should combine infrastructure, policy, and cultural recognition to create an environment where teachers feel empowered and rewarded for embracing innovation.

◆ **Q5. Considering the moderating role of perceived ease of use, how can the model ensure that DeepSeek is user-friendly for teachers with different digital skills?**

Participant C:

Ensuring user-friendliness requires a differentiated design. The model should provide multiple layers of interaction: beginner-friendly templates with clear prompts for teachers new to digital tools, as well as advanced customization options for those with higher digital literacy. This prevents frustration while maintaining engagement across skill levels. Bilingual support is essential in Guangxi, as teachers often prefer Chinese interfaces but occasionally require English technical terms. Embedding help functions such as video tutorials, FAQs, and real-time chat assistance within the platform makes the system less intimidating. Peer mentoring should also be institutionalized. Teachers who are early adopters can guide colleagues, reduce anxiety, and build a collaborative culture. From a theoretical perspective, perceived ease of use reduces cognitive load, which directly impacts both intention and self-efficacy. When teachers feel the system is intuitive and manageable, they are more likely to integrate it into their daily routines and gain confidence in their ability to use it effectively.

◆ **Q6. How scalable and adaptable is the model across different universities or regions? What contextual factors may affect its success?**

Participant C:

Scalability depends on flexibility and contextual sensitivity. Larger universities with robust infrastructure can quickly adopt advanced DeepSeek features, while smaller or rural institutions may initially manage only basic functions. A modular deployment strategy is therefore crucial, allowing universities to expand adoption as resources and confidence grow. Cultural attitudes toward AI also matter. Teachers who view technology as supportive will engage more readily, while those who fear loss of autonomy may resist. Policymakers and administrators must frame DeepSeek as an assistant rather than a replacement. Pilot projects are vital for building trust, as they demonstrate concrete benefits in local contexts. Once successful, results should be disseminated across institutions to encourage diffusion. Finally, policy and funding frameworks must ensure equity. Without subsidies or resource-sharing, disparities will widen. With modular design, cultural framing, and systemic support, the model has strong potential for scalability across Guangxi and for informing national-level strategies in AI-enabled education.

Participant F: University PE Department Administrator

◆ **Q1. How do you evaluate the innovation of integrating DeepSeek into PE pedagogy design and its potential impact on improving teachers' self-efficacy?**

Participant F:

From my administrative role, the innovation of integrating DeepSeek lies in its ability to professionalize PE syllabus design. Traditionally, PE lesson planning has been fragmented, depending heavily on individual teachers' experience and limited reference materials. DeepSeek changes this by offering structured, AI-assisted lesson blueprints that draw on sports science and educational best practices. This reduces the inconsistency across courses and raises the overall quality of instruction. For teachers, the benefits are both psychological and practical. Many colleagues express that lesson planning feels burdensome, especially when they need to update content regularly. By using DeepSeek, teachers save time and can focus more energy on delivering effective instruction and engaging with students. This directly contributes to self-efficacy because they feel more competent and in control. Bandura emphasizes mastery experiences as key to building efficacy, and DeepSeek provides precisely that: teachers see tangible improvements in their planning process, reinforcing their confidence and willingness to innovate further.

◆ **Q2. Do you think the proposed model effectively addresses the challenges PE teachers face (e.g., AI anxiety, lack of training, resource constraints)?**

Participant F:

Yes, the model acknowledges the practical challenges our teachers face. AI anxiety is particularly evident among older colleagues who worry about being left behind in a digital era. The model's provision for gradual, hands-on training sessions helps reduce fear by giving teachers safe spaces to practice. However, these sessions must be continuous rather than one-off workshops. In my experience, sustained exposure is crucial for maintaining confidence. Lack of training is another critical challenge. Too often, faculty development programs prioritize theory over practical engagement. The model emphasizes applied, task-based learning with DeepSeek, which I find effective. Resource constraints, however, remain a significant challenge. Smaller universities often lack the funds to provide a strong IT infrastructure. The model highlights this issue but does not fully solve it. I believe solutions require regional cooperation, such as shared digital platforms or provincial funding initiatives, to ensure that all teachers—not just those in wealthy institutions—can benefit equally from innovation.

◆ **Q3. In what ways does the model support PE teachers' intention to use DeepSeek and strengthen their teaching self-efficacy?**

Participant F:

Teachers' intention to adopt DeepSeek grows when they see clear benefits. The model makes this possible in three ways. First, it highlights perceived usefulness. Teachers save hours in planning, generate structured lesson outlines, and access updated knowledge bases. When they perceive these tangible gains, they are more inclined to adopt the system. Second, it builds confidence through positive feedback. I recall a colleague who used DeepSeek to create customized warm-up routines for different student groups. After receiving positive feedback from students, his confidence grew significantly. Finally, the model leverages peer influence. When teachers share successful experiences in departmental meetings, colleagues feel encouraged to try. This aligns with TAM theory, which posits that social norms influence adoption intention. Self-efficacy strengthens because the successful use of DeepSeek becomes a mastery experience. Teachers feel capable not only of handling AI but also of elevating their professional practice. Over time, this creates a reinforcing cycle of intention and efficacy.

◆ **Q4. What institutional support (e.g., policies, training, technical resources) is essential for teachers to benefit from the model fully?**

Participant F:

Institutional support is non-negotiable if DeepSeek adoption is to succeed. Teachers must know that their efforts in AI-assisted syllabus design are recognized as official work, not extra labor. This requires clear policies that include AI use in workload calculations and performance evaluations. Training should be institutionalized,

integrated into faculty development programs, and offered regularly. Without this, adoption will remain superficial. Technical resources are equally important: teachers cannot use DeepSeek effectively if internet connections fail or devices are outdated. Institutions must invest in stable infrastructure and provide responsive IT support teams to ensure optimal performance and reliability. In my department, enthusiasm for AI tools waned whenever technical breakdowns went unresolved. Leadership commitment also matters. When administrators demonstrate AI outputs in public meetings or recognize teachers who adopt DeepSeek, it creates legitimacy. This kind of symbolic endorsement reassures hesitant staff and signals that adoption is valued at the institutional level, not just an individual choice.

◆ **Q5. Considering the moderating role of perceived ease of use, how can the model ensure that DeepSeek is user-friendly for teachers with different digital skills?**

Participant F:

Ease of use is crucial for adoption, particularly because teachers vary widely in digital literacy. The model should ensure differentiated pathways: beginners need guided templates and simple workflows, while advanced users may seek customizable functions. This dual approach prevents exclusion and sustains long-term engagement. Language accessibility is also essential. Many PE teachers in Guangxi prefer Chinese interfaces, so bilingual design is necessary. Embedding pop-up tutorials, video guides, and real-time assistance within DeepSeek reduces cognitive load and builds confidence. Peer mentoring is another effective strategy. When younger, digitally skilled teachers support senior colleagues, anxiety decreases, and collaborative culture grows. From an administrator's view, these measures make adoption more equitable. When teachers perceive that DeepSeek is intuitive and success is achievable with minimal effort, their anxiety diminishes, intention rises, and their sense of competence is reinforced. Ease of use, therefore, acts as a bridge between technical design and psychological readiness.

◆ **Q6. How scalable and adaptable is the model across different universities or regions? What contextual factors may affect its success?**

Participant F:

Scalability depends on infrastructure, culture, and leadership. Well-funded universities in urban areas can adopt DeepSeek relatively easily, but rural institutions require subsidies or shared resources. Without provincial coordination, disparities will widen. Cultural attitudes also influence adaptability. Some teachers fear that AI undermines creativity, while others embrace it as a supportive tool. To improve acceptance, administrators should emphasize that DeepSeek complements rather than replaces professional judgment. Pilot projects are an effective way to demonstrate benefits, providing evidence that adoption enhances, rather than diminishes, teacher autonomy.

Adaptability is another strength of the model. Universities can start small by implementing basic lesson planning features and expand gradually as confidence and resources grow. This modular approach is realistic for diverse institutions. In my opinion, scalability will succeed only if universities share best practices and governments provide targeted funding. With these conditions, the model could become a powerful example of how AI can modernize PE education in Guangxi and beyond.

Participant G: University PE Department Administrator

◆ Q1. How do you evaluate the innovation of integrating DeepSeek into PE pedagogy design and its potential impact on improving teachers' self-efficacy?

Participant G :

Integrating DeepSeek into PE pedagogy is highly innovative because it formalizes a part of teaching that has long relied on personal experience and informal sharing. Many PE teachers lack structured guidance in syllabus design, leading to inconsistency across classes. DeepSeek addresses this by providing AI-generated plans grounded in sports science and educational theory, which teachers can then adapt and tailor to their specific needs. For new staff, this reduces the uncertainty of “where to begin” and helps them achieve early successes. Such mastery experiences are central to Bandura’s concept of self-efficacy, where accomplishing tasks strengthens confidence. At the same time, teachers feel empowered because they can combine professional judgment with AI support rather than starting from scratch. This dual benefit—standardization and personalization—explains why DeepSeek has strong potential. That said, administrators must caution against blind reliance, as over-dependence on AI outputs could weaken teachers’ own decision-making skills over time.

◆ Q2. Do you think the proposed model effectively addresses the challenges PE teachers face (e.g., AI anxiety, lack of training, resource constraints)?

Participant G:

The model responds well to teachers’ key challenges. AI anxiety is real, especially among senior teachers who fear technology might undermine their authority. By including phased training and peer mentoring, the model reduces psychological resistance and allows gradual familiarization. This approach matches research showing that repeated low-stakes exposure can lower anxiety. Lack of training is another significant barrier—one-off workshops rarely lead to sustained change. I appreciate that the model embeds continuous professional development, possibly linked to faculty development programs. At my institution, long-term training has been far more effective in changing behavior than short-term sessions. Resource constraints, however, are more challenging to overcome. Many universities in Guangxi operate with limited IT budgets, resulting in uneven adoption. Without pooled resources or external funding,

small institutions risk being left behind. While the model acknowledges this issue, greater emphasis on cross-institutional collaboration and provincial-level investment is necessary to make adoption realistic and equitable.

◆ **Q3. In what ways does the model support PE teachers' intention to use DeepSeek and strengthen their teaching self-efficacy?**

Participant G:

The model supports teachers' intention to adopt DeepSeek through recognition, peer reinforcement, and perceived usefulness. Recognition is crucial—teachers are more motivated when AI-based syllabus design is factored into evaluations and promotions. At our university, once AI adoption was included in appraisal systems, enthusiasm grew. Peer reinforcement also matters greatly. Colleagues' successes influence teachers. For instance, when one staff member designed a basketball unit using DeepSeek and showcased positive results, others quickly followed. This reflects the TAM notion of social influence shaping intention. Perceived usefulness is perhaps the strongest driver of this behavior. Teachers save time, improve lesson clarity, and better address the diverse needs of students. Positive outcomes with students, such as increased engagement and comprehension, reinforce their belief in their teaching competence. This feedback loop strengthens self-efficacy: teachers who experience success are more confident about future tasks. In sum, the model promotes a virtuous cycle of intention, successful practice, and reinforced efficacy.

◆ **Q4. What institutional support (e.g., policies, training, technical resources) is essential for teachers to benefit from the model fully?**

Participant G:

Institutional support is the foundation of sustainable adoption. Policies should clearly state that AI-assisted lesson design is recognized as part of official teaching responsibilities. Without this, teachers may view AI as an additional, unpaid workload. Infrastructure is equally important: having a stable internet connection, adequate devices, and timely IT support prevents frustration. In my department, enthusiasm for digital tools dropped sharply whenever technical failures went unresolved. Training should be formalized within faculty development systems, ensuring that all staff gain exposure, regardless of age or digital skill level. Mentorship schemes, where advanced users act as "AI champions," can provide ongoing assistance. Leadership endorsement also makes a difference. When deans or administrators showcase AI use in public forums, it legitimizes adoption and reduces hesitancy. I recall a faculty meeting where the dean presented an AI-generated syllabus; this simple act reassured staff and signaled that adoption was institutionally valued and supported.

◆ **Q5. Considering the moderating role of perceived ease of use, how can the model ensure that DeepSeek is user-friendly for teachers with different digital skills?**

Participant G:

Ease of use is a decisive factor in whether teachers adopt or resist DeepSeek. Staff in my faculty vary greatly in digital literacy. Younger teachers adapt quickly, while veteran staff often feel intimidated. The model should therefore provide tiered functions: simple templates for beginners and advanced tools for experienced users. This ensures both groups find value without feeling excluded. Language accessibility is also key—Chinese-English bilingual interfaces reduce cognitive load for teachers unfamiliar with English terms. Embedding tutorial videos, interactive guides, and pop-up tips within the platform would further reduce barriers. Peer mentoring can complement training by pairing tech-savvy teachers with hesitant colleagues, fostering a culture of collaboration. In practice, when teachers perceive that success is just a few clicks away, their anxiety decreases, their intention strengthens, and their self-efficacy improves. By focusing on usability, the model ensures that adoption is not limited to a digitally privileged minority but is open to all.

◆ **Q6. How scalable and adaptable is the model across different universities or regions? What contextual factors may affect its success?**

Participant G:

Scalability depends on infrastructure, funding, and institutional culture. Larger universities with IT support can adopt the model quickly, while rural institutions will face obstacles without subsidies or shared platforms. Government funding and consortium-based resource sharing could help bridge these gaps. Cultural perceptions also matter. Teachers who view AI as a supportive assistant are more likely to adopt it, while those who fear a loss of autonomy may resist. The model should therefore emphasize partnership rather than replacement. Pilot projects help build trust by demonstrating tangible benefits in local contexts and generating evidence to support wider scaling. Adaptability is another strength. A modular approach allows universities to adopt features gradually, starting with core syllabus design tools and expanding to advanced analytics. This flexibility makes the model relevant across diverse institutions. With proper support and framing, the model has strong potential to scale across Guangxi and even beyond, ensuring that innovation reaches all teachers.

Participant J: Sports Education Policy Maker

◆ **Q1. How do you evaluate the innovation of integrating DeepSeek into PE pedagogy design and its potential impact on improving teachers' self-efficacy?**

Participant J:

From a policymaking perspective, the innovation lies not only in the technology itself but also in its alignment with national education modernization strategies. Physical education has historically lagged other disciplines in adopting digital tools. By introducing DeepSeek, universities can ensure that PE teachers also benefit from AI-driven teaching design, thereby narrowing the digital gap across subjects. Teachers' self-efficacy improves when they perceive that their work is part of a larger innovation agenda. In policy terms, this is significant because teacher motivation and confidence are crucial to the success of reform. A teacher who feels competent with AI tools is more likely to embrace curriculum reforms and contribute positively to student outcomes. The model also introduces a sense of professional legitimacy; teachers recognize that policy priorities support their use of DeepSeek. However, the challenge is to ensure that teachers do not feel pressured into adoption solely for compliance. If innovation is framed as a top-down requirement without adequate support, it may increase resistance rather than build confidence.

◆ **Q2. Do you think the proposed model effectively addresses the challenges PE teachers face (e.g., AI anxiety, lack of training, resource constraints)?**

Participant J:

The model demonstrates awareness of teachers' practical barriers, which is commendable. AI anxiety is widespread among older teachers who have limited exposure to digital technologies. The model's phased training and mentoring approach helps to reduce this anxiety by providing safe opportunities for hands-on practice. However, training must be continuous and embedded in institutional routines; otherwise, early enthusiasm may fade. From a policy standpoint, this requires budgetary commitments to fund ongoing professional development rather than one-off workshops. Resource constraints represent an even greater policy challenge. Many universities, particularly in rural areas, cannot afford the necessary infrastructure. Without government subsidies or shared resource platforms, adoption will be uneven. Equity is a significant concern—if only well-funded universities can implement DeepSeek effectively, disparities between institutions will grow. Therefore, while the model acknowledges constraints, policy frameworks must provide explicit mechanisms for redistribution of resources, such as provincial funding schemes or cross-institutional collaborations.

◆ **Q3. In what ways does the model support PE teachers' intention to use DeepSeek and strengthen their teaching self-efficacy?**

Participant J:

Teachers' intention to adopt DeepSeek depends heavily on perceived legitimacy, which is shaped by policy signals. When official guidelines prioritize the adoption of AI and

integrate it into teacher evaluation frameworks, teachers are more motivated to engage. The model supports intention by demonstrating clear benefits, including reduced workload, structured lesson plans, and enhanced student engagement. Self-efficacy is reinforced through mastery experiences—when teachers successfully use DeepSeek to deliver a course and observe better student outcomes, they internalize a stronger sense of competence. Peer learning further amplifies this effect. Pilot projects in one institution can serve as evidence for others, creating a diffusion effect across the sector. Policies play a crucial role in disseminating success stories and providing platforms for knowledge sharing and exchange. In summary, the model promotes intention and efficacy by aligning individual teacher experiences with broader institutional and policy frameworks, ensuring that adoption is both meaningful and sustainable.

♦ **Q4. What institutional support (e.g., policies, training, technical resources) is essential for teachers to benefit from the model fully?**

Participant J:

Institutional support must be systemic, not ad hoc. Teachers need assurance that their time spent learning and applying DeepSeek is recognized as legitimate professional development. This requires explicit inclusion of AI training within faculty development programs, backed by institutional policies. Technical resources such as reliable internet, adequate devices, and prompt IT support are essential. From a policymaker's perspective, the challenge is ensuring these supports are distributed equitably across institutions. This is where provincial or national frameworks come in. For example, establishing regional training centers that provide pooled resources can reduce costs and improve access. Incentives also matter. Teachers are more motivated when they know their efforts will be recognized through credits, awards, or career advancement opportunities. Without these institutional reinforcements, teachers may view AI adoption as optional or burdensome. Thus, policies must create an environment where AI use is not only feasible but also professionally rewarding.

♦ **Q5. Considering the moderating role of perceived ease of use, how can the model ensure that DeepSeek is user-friendly for teachers with different digital skills?**

Participant J:

Ease of use is not simply a technical issue—it is also a policy concern. Regulations should require AI platforms to meet accessibility standards, ensuring inclusivity for teachers with varying levels of digital competence. The model addresses this by proposing tiered training and user interfaces; however, policies must enforce these standards to prevent exclusion. For example, interfaces should provide bilingual support and intuitive navigation to reduce cognitive load. Government-funded mentoring programs can further support teachers who lack confidence. By pairing

digitally fluent staff with less experienced colleagues, adoption becomes more inclusive. From a policy perspective, this aligns with the principle of equity: ensuring that innovation benefits all teachers, not just those who are technologically skilled. If teachers perceive DeepSeek as manageable and user-friendly, their intention to adopt increases, their anxiety decreases, and their sense of professional efficacy improves. Policy must therefore guarantee that ease of use is systematically prioritized in platform design and teacher support structures.

♦ **Q6. How scalable and adaptable is the model across different universities or regions? What contextual factors may affect its success?**

Participant J:

Scalability depends on harmonizing diverse institutional contexts under a flexible policy framework. Larger urban universities with better resources can scale quickly, while rural universities may struggle without targeted subsidies. A modular adoption strategy is therefore essential; institutions can begin with basic functions, such as syllabus design, and gradually add advanced features as their capacity grows. Cultural perceptions also influence scalability. Teachers in some regions may view AI as a threat to their autonomy, while others see it as an opportunity. Policymakers must carefully shape the discourse, framing DeepSeek as a supportive partner rather than a replacement for existing systems. Pilot programs play a crucial role in this process. By implementing small-scale projects, collecting evidence, and communicating results across institutions, policymakers can build trust and reduce resistance. Ultimately, scalability requires alignment between institutional readiness, cultural acceptance, and policy support. With these elements in place, the model can adapt successfully across Guangxi and serve as a template for national expansion.

APPENDIX J: Case Validation

Application of DeepSeek in the Basketball Pedagogy Design at Guangxi Normal University

G.1 Background of the Case

This case study illustrates how the DeepSeek-Integrated Physical Education (PE) Pedagogy Design Model can be applied in an authentic teaching environment. The case was implemented in an intermediate-level basketball course at Guangxi Normal University involving one PE teacher and 24 second-year undergraduate students majoring in physical education.

The teaching unit focused on developing students' transition offense skills through an AI-supported pedagogical process. The primary aim was to demonstrate how integrating DeepSeek into four key teaching phases—lesson planning, instruction, assessment, and reflection—could enhance the teacher's Teaching Self-Efficacy (TSE) by increasing task clarity, instructional control, evaluation capability, and reflective confidence.

This case serves as a practice-based illustration, not a statistical validation of the structural model, offering a concrete example of how DeepSeek can support PE teachers' professional growth.

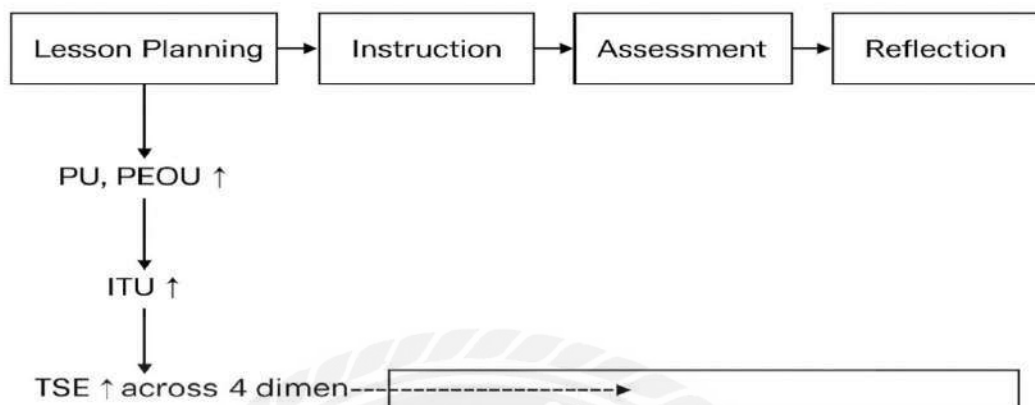
G.2 Case Context and Participants

- Institution: Guangxi Normal University, Faculty of Physical Education and Health
- Course Level: Basketball (Intermediate)
- Instructor: One full-time PE teacher with over five years of experience
- Students: 24 second-year Bachelor of Physical Education students
- Duration: Two consecutive instructional cycles (four weeks total)

G.3 DeepSeek Integration Across Teaching Phases

The basketball module was redesigned based on four AI-enhanced pedagogical phases. Each phase reflects how DeepSeek supports key constructs of the study's model—Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Intention to Use (ITU), and Teaching Self-Efficacy (TSE).

DeepSeek-Integrated Basketball Pedagogy Framework



Phase 1: Lesson Planning

The instructor used DeepSeek to generate structured lesson plans tailored to transition offense skills.

Prompt Example:

“Design a 90-minute basketball lesson to develop transition offense skills for intermediate-level students. Include objectives, drills, coaching cues, and assessment criteria.”

DeepSeek Output:

- Detailed learning objectives (speed, coordination, tactical awareness)
- Differentiated drills for varying ability levels
- Safety reminders and class management notes
- Assessment rubrics for movement execution and tactical decision-making

Outcome:

Higher preparation efficiency, clearer instructional structure, and enhanced confidence in lesson planning. (PU ↑, ITU ↑; TSE–Planning Dimension ↑)

Phase 2: Instruction Implementation

Prior to class, DeepSeek generated motivational scripts, tactical explanations, and scenario-based teaching dialogue. During instruction, the teacher used DeepSeek-generated adaptations for students needing additional support or challenge.

Outcome:

Improved classroom management, increased student engagement, and strengthened teacher control over instructional flow. (TSE–Instructional Strategy Dimension ↑)

Phase 3: Assessment & Feedback

After each class, the instructor uploaded practice recordings for DeepSeek to provide performance analysis. The system generated summaries highlighting:

- Movement accuracy and consistency
- Teamwork frequency
- Transition speed patterns
- Tactical decision-making trends

Outcome:

Greater ability to conduct data-informed assessment and offer specific feedback. (TSE–Assessment Dimension ↑)

Phase 4: Reflection & Redesign

DeepSeek provided reflective prompts and synthesized feedback to support continuous professional growth. The system highlighted motivational progress, instructional challenges, and suggested targeted refinements for subsequent lessons.

Outcome:

Improved reflective depth, enhanced ability to identify pedagogical problems, and greater confidence in instructional innovation. (TSE–Reflection Dimension ↑)

G.4 Observed Outcomes

A mixed evaluation approach—combining teacher self-assessment and observer notes—was used to track changes in teaching self-efficacy across four dimensions.

(Insert Table Here)

G.5 Discussion and Implications

This case operationalizes the DeepSeek-Integrated PE Pedagogy Design Model and demonstrates its practical value in a PE teaching context. DeepSeek served as a cognitive, analytical, and reflective scaffold, supporting the teacher across lesson design, delivery, assessment, and professional reflection.

Key psychological effects observed include:

- Higher perceived usefulness (PU) due to improved efficiency and instructional quality
- Lower perceived difficulty (PEOU) due to intuitive prompts and clear AI-generated outputs
- Stronger intention to continue using AI (ITU) driven by positive classroom results
- Significant gains in teaching self-efficacy (TSE) across all four instructional dimensions

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