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Beyond Technology Adoption: The I-TRACK Model of AI-TPACK Strategy Formation in Chinese Culture Teaching in Thailand

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Abstract

This study develops a practice-grounded model explaining how high school Chinese language teachers in Thailand integrate artificial intelligence, pedagogy, and cultural content knowledge when forming and revising instructional strategies. Semi-structured interviews with 30 teachers were analyzed using grounded theory procedures. Six categories were identified: institutional and personal conditions, teacher judgment and strategic mediation, learner response and strategy revision, pedagogical adaptation for Thai learners, contextual challenges in teaching Chinese culture, and knowledge-driven content transformation. These categories form the I-TRACK model, in which teacher judgment connects contextual and institutional conditions with AI-supported content transformation, localized pedagogy, and feedback-based revision. The model distinguishes AI-TPACK as the professional knowledge base from I-TRACK as the process through which that knowledge is enacted in culturally responsive practice. The study contributes a process-oriented explanation of AI integration and offers implications for teacher development, curriculum design, and educational AI tools in TCSOL.

Keywords: artificial intelligence, AI-TPACK, I-TRACK, Chinese language teachers, intercultural teaching, instructional strategies, Thailand

1. Introduction

The rapid advancement of artificial intelligence (AI) has ushered in a transformative era for global education, particularly in the field of Teaching Chinese to Speakers of Other Languages (TCSOL) (Meng, 2025). Emerging technologies such as generative AI (e.g., ChatGPT), virtual reality (VR), and intelligent tutoring systems are reshaping instructional design, enabling more personalized, interactive, and immersive learning experiences (Celik, 2023). As a result, traditional teacher-centered pedagogies are increasingly being re-evaluated in favor of technology-enhanced and learner-centered approaches.

This transformation is especially significant in Thailand, where Chinese language education has expanded rapidly over the past decade. Thailand currently hosts 17 Confucius Institutes and nearly 40 Confucius Classrooms, ranking among the highest globally (Nukitrangsan, 2024). At the policy level, the Thai Ministry of Education has incorporated Chinese into the national foreign language curriculum, with some public schools piloting mandatory Chinese courses, thereby providing a strong institutional foundation for the sustained development of Chinese language education (Xiao & Tian, 2024). These developments not only highlight the strategic importance of Chinese in Thailand but also call for more effective and innovative approaches to teaching both language and culture.

While language proficiency remains a central goal in TCSOL, the teaching of Chinese culture represents a more complex and abstract challenge. Cultural concepts—such as Confucian values, traditional aesthetics, and social norms—are deeply embedded in historical and philosophical contexts, making them difficult for learners to fully grasp through conventional instructional approaches (Kennedy, 2020; Xue & Chinokul, 2026). This challenge is further intensified in the Thai context, where cultural similarities (e.g., shared Buddhist traditions) coexist with significant

differences in social practices, communication styles, and value systems. Therefore, effective cultural instruction requires not only accurate content delivery but also adaptive, localized, and pedagogically sound teaching strategies.

In this regard, AI offers new possibilities for cultural teaching. Its capabilities in multimodal representation, real-time interaction, and personalized feedback enable abstract cultural knowledge to be visualized, simulated, and contextualized in ways that traditional methods cannot easily achieve (Shadiev et al., 2026). However, the integration of AI into classroom practice is not without challenges. In reality, teachers often encounter issues such as insufficient AI literacy, limited access to pedagogically appropriate tools, superficial or technology-driven rather than pedagogy-driven use of AI, and difficulties in aligning AI-generated content with local cultural contexts and learners' needs (Liu & Zhang, 2024). These challenges suggest that the key issue is not merely the adoption of AI, but the development of effective instructional strategies for its meaningful integration.

Theoretically, the integration of technology into teaching has long been conceptualized through the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes the dynamic interplay among technology, pedagogy, and content (Mishra & Koehler, 2006). With the rapid development of AI technologies, this framework has been extended into the AI-TPACK model, which accounts for the generative, adaptive, and predictive affordances of AI (Eyal, 2025). This extended model includes dimensions such as AI-Content Knowledge (AI-CK), AI-Pedagogical Knowledge (AI-PK), and AI-Technological Knowledge (AI-TK), highlighting the need for teachers to integrate AI into subject-specific teaching in a flexible and context-sensitive manner. For educators in Thailand, achieving AI-TPACK competence entails not only mastering AI tools but also adapting them to the intercultural characteristics and learning preferences of Thai students.

Despite the growing theoretical interest in AI-TPACK, there remains a significant gap in understanding how teachers actually implement AI-based strategies in authentic classroom settings. Existing studies have primarily focused on quantitative assessments of AI literacy or general attitudes toward technology adoption, often overlooking teachers' lived experiences and strategic practices in intercultural teaching contexts (Pei et al., 2025). In particular, little is known about how teachers employ AI to support the teaching of Chinese culture to Thai students, or how they navigate the intersection of technology, pedagogy, and intercultural communication.

To address this gap, this study adopts a grounded theory approach to explore AI-TPACK-based instructional strategies employed by Chinese language teachers in Thailand. Grounded theory is particularly suitable for capturing complex social processes and generating theory grounded in practice, especially in rapidly evolving technological environments. Through semi-structured interviews with experienced educators, this study seeks to answer the following research questions:

- What key contextual and intercultural challenges do high school Chinese language teachers in Thailand encounter when teaching Chinese culture to Thai students?
- How do teachers integrate AI, pedagogy, and cultural content knowledge within the AI-TPACK framework to generate, implement, and adapt instructional strategies for teaching Chinese culture?
- What technological, pedagogical, intercultural, and contextual factors influence the formation, refinement, and effective enactment of these AI-TPACK-based strategies?

2. Literature Review

2.1 AI-TPACK

The technological pedagogical content knowledge framework explains how teachers coordinate technological, pedagogical, and content knowledge rather than treating technology as an isolated competence (Mishra & Koehler, 2006). AI complicates this coordination because generative systems produce probabilistic outputs, adapt to prompts, and introduce concerns about bias, privacy, opacity, and cultural representation. These concerns have prompted AI-specific and human-centered extensions of TPACK, including Intelligent-TPACK, I-TPACK, and the Human-Centric Artificial Intelligence Pedagogy framework (Celik, 2023; Chiu, 2026; Deb & Sofal, 2026). AI-TPACK therefore incorporates the knowledge required to select, interrogate, and ethically use AI-supported tools in subject-specific teaching (Kasneci et al., 2023; Ning et al., 2024; UNESCO, 2023). The extension is especially relevant to cultural instruction, where a fluent AI response can still be historically inaccurate, culturally flattened, or pedagogically unsuitable.

Research on AI-TPACK has clarified several knowledge domains. AI technological knowledge concerns how teachers understand system capabilities and limitations; AI pedagogical knowledge concerns the design of learning, feedback,

and assessment with AI; and AI content knowledge concerns how AI represents or transforms disciplinary material (Aldemir et al., 2025; Celik, 2023). Ethical judgment cuts across these domains because teachers must examine the provenance, accuracy, and consequences of generated content. Empirical work has largely operationalized these domains as competencies or relationships among knowledge elements (Eyal, 2025; Ning et al., 2024). This work identifies what teachers need to know, but it provides less detail about how teachers mobilize that knowledge while responding to particular learners and institutional conditions.

AI-TPACK is used in this study as a sensitizing concept rather than a predetermined coding scheme. It directs attention to the possible intersection of AI, pedagogy, and cultural content, while leaving the process categories to emerge from participants' accounts. This distinction is methodologically important: AI-TPACK supplies a vocabulary for interpreting professional knowledge, whereas the grounded analysis develops an explanation of strategy formation. The resulting I-TRACK model is therefore not a replacement for AI-TPACK. It specifies how AI-TPACK knowledge is enacted through contextual appraisal, teacher mediation, content transformation, pedagogical adaptation, learner response, and revision.

2.2 AI-TPACK in Language Teaching

AI-supported language education research increasingly emphasizes teacher preparation, prompt design, adaptive materials, and critical evaluation of generated output. Reviews of adaptive education and generative AI in language learning identify personalization and rapid material generation as important affordances, while also emphasizing accuracy, digital competence, and pedagogical control (Hariyanto et al., 2025; Kohnke et al., 2023; Law, 2024; Torres & Kahveci, 2025). Professional development framed by Intelligent-TPACK can strengthen teachers' capacity to design AI-enhanced lessons, and intervention evidence suggests that structured preparation improves AI competency (Aldemir et al., 2025; Tan et al., 2025). Work in TESOL similarly stresses that AI integration must remain pedagogically and ethically guided (Kohnke & Zou, 2025). Teachers nevertheless report a recurring tension: they value rapid material generation and personalization but remain concerned about accuracy, overreliance, and alignment with learning goals (Nguyen et al., 2025). Together, these findings support a shift from adoption questions toward the reasoning teachers use before, during, and after AI-supported instruction.

Nevertheless, the literature remains uneven in two respects. Methodologically, much AI-TPACK research relies on competency measures, readiness scales, adoption models, or variable relationships, which are useful for estimating patterns but less able to reconstruct situated decision processes (Pei et al., 2025; Taheri et al., 2025; Xue et al., 2025). Conceptually, studies often treat implementation as the outcome of knowledge or intention, leaving the recursive movement among tool output, teacher judgment, classroom response, and strategy revision underexplored. Qualitative evidence is therefore needed to show how teachers interpret an AI output, decide whether it fits a cultural objective, adapt it for a specific learner group, and revise the activity after observing students.

A further gap concerns intercultural content. Language-teaching studies commonly examine linguistic practice or general lesson design, whereas the teaching of culture requires teachers to manage contestable meanings, culturally situated values, and the risk of simplified representation. Intercultural pedagogy in Chinese as a foreign language calls for comparison, reflection, and negotiation rather than the presentation of culture as a fixed set of facts (Kennedy, 2020). AI can expand the formats through which culture is represented, but its generative capacity does not ensure cultural accuracy or local relevance. This unresolved problem makes teacher mediation central to any account of AI-TPACK in cultural teaching.

2.3 AI and Chinese Language Education in Thailand

Research on Chinese as a foreign language has expanded substantially, but its topics, populations, and national settings remain unevenly distributed (Chan et al., 2022). Recent bibliometric mapping identifies technology-mediated and cross-cultural directions in language education, while machine-learning analysis of digital knowledge transfer shows how online platforms circulate cultural and educational themes (Jiang et al., 2025b, 2025c). Discussions of AI in international Chinese education highlight both ChatGPT-enabled resource generation and AI-supported cultivation of Chinese cultural dissemination, but provide limited process evidence from Thai secondary classrooms (Wang, 2023; Wang, 2025). Thailand is a particularly important setting because Chinese is taught across school levels and because local institutions must translate broad language policies into school-specific curricula and practices. Thailand-focused research shows that Chinese instruction is shaped by curriculum design, teacher preparation, school resources, learning activities, and collaboration with external institutions (Duangmanee & Waluyo, 2024). Learner research likewise indicates that strategy use and sociocultural context influence how Thai students engage with Chinese (Sae-thung & Boonsuk, 2022). Evidence from Confucius Institutes further indicates that facilitating conditions, learning motivation, and satisfaction shape continued use of AI chatbots for Chinese language learning (Jiang et al., 2025a).

The Thailand literature also demonstrates why cultural content cannot simply be transferred from a generic curriculum. Culture-based materials designed for Thai secondary students need deliberate localization and opportunities for comparison if they are to develop cultural awareness (Xue & Chinokul, 2026). More broadly, intercultural Chinese-language pedagogy treats learners as interpreters who compare perspectives rather than passive recipients of cultural facts (Kennedy, 2020). These studies establish the importance of locally responsive content, but they do not explain how teachers evaluate and transform AI-generated cultural materials in day-to-day secondary-school practice.

This limitation is consequential because AI introduces both affordances and new risks. Teachers can use generative tools to create images, dialogues, explanations, and simulations, yet these outputs can reproduce stereotypes, omit historical context, or exceed students' language proficiency. Existing AI-TPACK research explains the professional knowledge needed to recognize such problems, while Thailand-focused TCSOL research explains the need for localization. What remains missing is a process model connecting the two: how teachers move from contextual challenges and institutional conditions to mediated content transformation, pedagogical adaptation, and revision based on learner response.

The present study addresses this gap through three linked questions concerning the challenges teachers encounter, the way they integrate AI, pedagogy, and cultural content, and the factors that shape implementation and refinement. By distinguishing AI-TPACK as a knowledge framework from I-TRACK as an emergent process model, the study avoids treating the theoretical lens as the empirical result. This positioning also permits critical comparison between the categories derived from the interviews and the assumptions of existing AI-TPACK scholarship.

3. Methodology

This study used grounded theory procedures to explain how high school Chinese language teachers in Thailand form, enact, and revise AI-supported cultural teaching strategies. Qualitative inquiry is appropriate when the aim is to explain how participants interpret and enact a process rather than to estimate prevalence or test predefined variable relationships (Lim, 2025). Grounded theory was selected because the research questions concern a process rather than the prevalence of predetermined variables. AI-TPACK served as a sensitizing concept during protocol design and later interpretation, but it was not used as an a priori coding template. Initial coding remained data-near; only after categories and relationships had been developed were they compared with AI-TPACK. This sequencing protected the inductive analysis while allowing the emergent explanation to be positioned against an established knowledge framework (Corbin, 2017).

3.1 Participants and Procedure

Participants were recruited through purposive maximum-variation sampling. Eligibility required current employment as a high school Chinese language teacher in Thailand, experience teaching Chinese cultural content, and experience using AI in instruction. The sample was deliberately balanced across private, public, and international schools (10 teachers from each type) so that the analysis could compare contrasting institutional settings. Because these equal groups were planned in advance, the design is described as stratified purposive sampling rather than classical theoretical sampling. Within the sampling frame, concurrent analysis informed follow-up probes and the aspects explored in later interviews. The final sample comprised 30 teachers, identified only by pseudonymous codes T1–T30 (Table 1).

Semi-structured interviews were conducted online via Zoom or Tencent Meeting from January 2025 to February 2026. Interviews lasted approximately 60–90 minutes and were conducted in Chinese or English according to participant preference. Participants received information about the study, consented before participation, and could withdraw. With permission, interviews were audio-recorded and transcribed verbatim. Data collection and preliminary analysis proceeded concurrently. Sample size alone was not treated as evidence of saturation. Following empirical guidance that distinguishes the appearance of codes from a fuller understanding of their meaning (Guest et al., 2006; Hennink & Kaiser, 2022), the researchers monitored whether later interviews changed the codebook, added category properties, or altered relationships in the developing explanation. The final interviews confirmed the six-category structure without requiring a new major category. This claim is limited to analytic sufficiency for this focused and deliberately balanced sample; it is not a claim that all possible experiences of Chinese language teachers in Thailand were exhausted.

Table 1. Information on Teacher Interviewees

Interviewees	Gender	Experience in Using AI (years)	School Type
T1	Female	3	
T2	Female	4	
T3	Male	5	
T4	Female	3	
T5	Female	6	Private
T6	Male	4	
T7	Female	5	
T8	Female	3	
T9	Male	4	
T10	Female	6	
T11	Female	3	
T12	Female	4	
T13	Male	5	
T14	Female	3	
T15	Female	6	Public
T16	Female	4	
T17	Male	5	
T18	Female	3	
T19	Female	4	
T20	Male	6	
T21	Female	3	
T22	Female	5	
T23	Male	4	
T24	Female	6	
T25	Female	3	International
T26	Male	5	
T27	Female	4	
T28	Female	3	
T29	Male	3	
T30	Female	4	

3.2 Interview Protocol

The semi-structured protocol was developed from the research questions and contained 12 open-ended questions (Appendix 1). It addressed teachers' understanding of AI-TPACK, AI use in lesson preparation, transformation of complex cultural concepts, pedagogical adaptation, intercultural comparison, assessment, AI hallucinations and cultural bias, institutional constraints, and professional-development needs. Follow-up prompts invited concrete classroom episodes and explanations of why a strategy was retained or revised. The protocol was a qualitative elicitation guide rather than a psychometric scale; consequently, internal-consistency reliability coefficients are not applicable. Its methodological adequacy rests on transparent alignment with the research questions, consistent coverage of core topics, flexible probing, verbatim transcription, and the analytic procedures described below (Husband, 2020).

3.3 Data Analysis

Coding assigned concise labels to segments of interview text and progressively related those labels to higher-order concepts. The analysis combined line-by-line examination, constant comparison across participants and school types, and analytic memo writing (Corbin, 2017).

The analysis proceeded through open, axial, and selective coding. During open coding, transcript segments were labeled in data-near terms without forcing them into AI-TPACK domains. During axial coding, codes were compared for conditions, actions, interactions, and consequences, producing six major categories. Selective coding then identified teacher judgment and strategic mediation as the core category that connected the others. Analytic memos documented category definitions and changes in the developing storyline. Recent comparisons of expert and LLM-based inductive annotation underscore the importance of making coding stages and category-development logic transparent (Parfenova et al., 2025). After the grounded structure had been established, the categories were compared with AI-TPACK to clarify which findings concerned teachers' knowledge and which concerned the process through which that knowledge was enacted. This staged procedure addressed the risk that a deductive framework could predetermine a theory intended to emerge from the data. Quotations from Chinese-language interviews are presented in English translation; participant codes and school types are retained, while identifying details are omitted.

4. Results

4.1 Open Coding

Open coding involved line-by-line examination of the interview transcripts to identify concepts that remained close to participants' accounts (Glaser, 2016). The purpose was to fragment the data analytically without assigning responses to predetermined AI-TPACK domains. Action-oriented labels captured what teachers did with AI output, including checking a cultural claim, removing an inappropriate comparison, simplifying language, changing a prompt, monitoring confusion, and redesigning interaction.

Descriptions of difficulty explaining Confucianism generated codes such as "abstract cultural content" and "philosophical complexity," while accounts of unreliable or culturally distorted output generated "AI hallucination," "mixed cultural symbols," and "cultural bias." Accounts of instructional action produced codes such as "teacher verification," "language-level adjustment," "multimodal conversion," "group-task redesign," and "prompt revision." Learner-facing incidents produced "passive viewing," "student questioning," "hands-on confusion," "cross-cultural negotiation," and "feedback-led revision." Institutional accounts produced "unstable connectivity," "limited free-tool functions," "school encouragement," and "resource-enabled experimentation."

Constant comparison was conducted within and across private, public, and international schools. For example, weak connectivity in a public school and mechanical feedback from a free tool initially appeared as separate technical problems. Comparison showed that both required teachers to reorganize the mode of instruction rather than simply accept or reject AI. Likewise, inaccurate clothing in an image, confusion between festival foods, and conflation of ritual practices were compared as instances of representational risk. These comparisons refined the codes before axial coding and prevented single quotations from defining a category on their own (Figure 1).

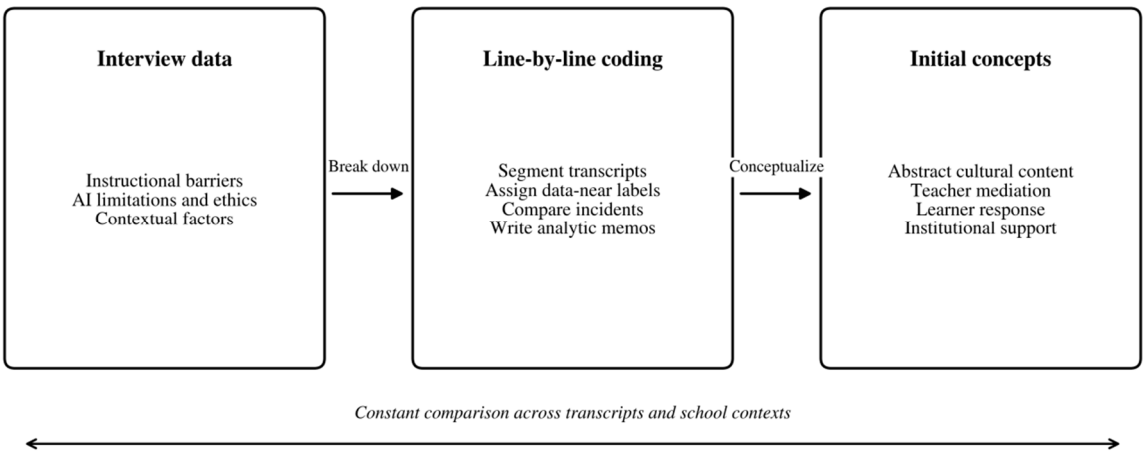


Figure 1. Open Coding and Constant-Comparison Process

4.2 Axial Coding

Axial coding reassembled related codes into broader categories by examining their conditions, actions, interactions,

and consequences (Kendall, 1999). Six categories were developed. The expanded quotations below show how category properties appeared in concrete instructional episodes. They are illustrative excerpts from the wider corpus; category definitions and relationships were established through comparison across all 30 interviews rather than from the quoted participants alone.

4.2.1 Institutional and Personal Conditions (I)

Institutional and personal conditions shaped whether AI-supported instruction was feasible and what form it took. School encouragement, peer exchange, access to paid platforms, and teacher familiarity supported experimentation. Unstable connectivity, limited free-tool functions, and insufficient professional development restricted synchronous interaction and increased the preparation burden. These conditions did not produce uniform effects because teachers interpreted them in relation to a particular cultural topic and classroom goal.

T15 described how poor connectivity changed the mode of use rather than ending it: "Our public school's network is weak and often cannot connect to large models. I used AI at home to turn the steps of Chinese paper-cutting into a short animation and simplified the explanation into Chinese suitable for Thai high school students. I could not let students interact with AI in real time, but the visual guide helped them understand the paper-cutting much faster" (public school teacher, 6 years' experience). T12 reported the combined effect of encouragement and unreliable access: "The school encourages us to use AI, but the classroom Wi-Fi often disconnects, and free tools frequently generate inaccurate cultural details. In one comparison of the Dragon Boat Festival and Songkran, AI even presented zongzi as mooncakes" (public school teacher, 4 years' experience). In both cases, infrastructure shaped timing and format, while the teacher retained responsibility for accuracy and continuity.

4.2.2 Teacher Judgment and Strategic Mediation (T)

Teacher judgment was the core mechanism connecting AI resources to classroom use. Participants filtered claims and images, checked cultural boundaries, adjusted language, selected an interactional form, and decided how to respond when an error became visible. Mediation therefore included epistemic judgment about accuracy, intercultural judgment about representation, and pedagogical judgment about suitability. Generated content entered instruction only after teachers had interpreted it against these criteria.

T3 described this layered process when teaching filial piety: "I used ChatGPT to generate dialogues comparing Chinese and Thai family ethics, but some Chinese expressions were old-fashioned, and the images mixed ancient Chinese clothing with Japanese dress. I first filtered and corrected the material, lowered the language to HSK Level 3, and then added a cartoon style and small-group discussion" (private-school teacher, 5 years' experience). T27 expressed the same responsibility as cultural gatekeeping: "I tried using AI to generate a cross-cultural dialogue about Chinese ancestor worship and the Thai wai gesture, but it mixed the two contexts and created serious cultural bias. As the teacher, I had to act as a filter and guard the cultural boundary" (international-school teacher, 4 years' experience). Importantly, T27 then used the error as discussion material, moving verification from private correction to explicit critical AI literacy.

4.2.3 Learner Response and Strategy Revision (R)

Learner response provided evidence for subsequent revision. Teachers attended to questions, visible confusion, participation, boredom, comprehension, and performance during tasks. These responses indicated whether a representation was accessible and whether the activity supported the intended cultural interpretation. Feedback was therefore part of strategy formation rather than a final evaluation separated from design.

T8 used AI-generated scenarios to assess understanding of the Mid-Autumn Festival but found that the free tool supplied generic feedback: "It could not provide a personalized explanation of why a student's choice was wrong. I rewrote the prompt and added an explanation logic that suited Thai students' way of understanding, so the assessment achieved the effect I expected" (private-school teacher, 3 years' experience). T15 similarly revised the next prompt after observing confusion during the hands-on paper-cutting stage. T21 used behavioral evidence to change the task itself: "If students only looked at the Silk Road virtual scene, they quickly became bored. When I saw their expressions or noticed them using their phones, I knew the strategy was not working, so I assigned them roles as traders and asked them to negotiate across cultures in groups" (international-school teacher, 3 years' experience). These accounts show revision at the levels of feedback, prompt design, and classroom interaction.

4.2.4 Pedagogical Adaptation for Thai Learners (A)

Pedagogical adaptation involved redesigning AI-supported materials for students' language proficiency, cultural background, and preferred modes of participation. Teachers emphasized visual explanation, bilingual support,

collaborative inquiry, role play, and production tasks. Adaptation did not mean making content merely entertaining. Teachers selected a format because it reduced a specific barrier, created a comparison, or enabled learners to express interpretation.

T1 used a flawed AI comparison as the starting point for a stronger activity: "When teaching differences between Chinese and Thai tea-drinking customs, I asked Claude to generate an interactive script. The content followed Thai customs too closely and ignored distinctive Han Chinese tea practices. I manually removed those biased parts and redesigned it as a cultural-detective group task. Students discussed it enthusiastically in both Thai and Chinese" (private-school teacher, 3 years' experience). T21's revision from passive viewing to role-based Silk Road negotiation followed the same logic. In both episodes, the teacher changed the learner's role from recipient to interpreter, making interaction part of cultural understanding.

4.2.5 Contextual Challenges in Teaching Chinese Culture (C)

Contextual challenges defined the problem space for strategy formation. Participants referred to abstract philosophical concepts, historically embedded narratives, variation in Chinese proficiency, and differences between Chinese and Thai practices. AI introduced an additional challenge because it could produce culturally blended material whose surface fluency concealed inaccuracies. Cultural proximity therefore did not eliminate distance; it sometimes made mistaken equivalence more persuasive.

T3 explained that Thai learners struggled with Confucian filial piety and that AI-generated dialogue and imagery required substantial correction before they supported comparison. T27 encountered a similar problem when AI blended the social meanings and settings of Chinese ancestor worship and the Thai wai gesture. T12's festival lesson exposed a more concrete error when the system confused zongzi with mooncakes. Student questions made the mistake visible during class, and T12 stopped using the original slides. Across these incidents, the challenge was not simply factual inaccuracy. Teachers had to protect distinctions among cultural symbols, practices, historical contexts, and values while keeping the content accessible to learners.

4.2.6 Knowledge-Driven Content Transformation (K)

Knowledge-driven transformation concerned the conversion of complex cultural information into accessible multimodal forms. Teachers used AI to generate images, dialogues, simplified narratives, animation, songs, and virtual environments. Transformation involved selection and reconstruction because the generated format could alter the meaning of the source content. Teachers therefore checked whether visual details, narrative emphasis, and linguistic simplification preserved the intended cultural concept.

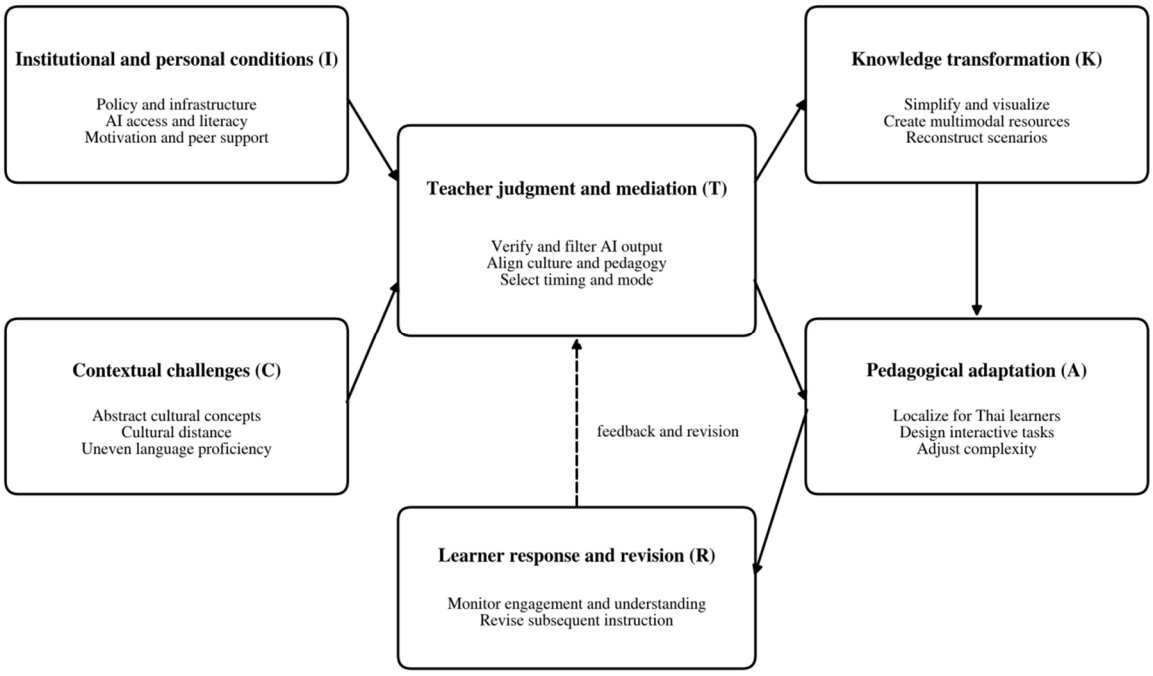


Figure 2. Categories and Relationships in the I-TRACK Model

T24 described this tension in a lesson on Romance of the Three Kingdoms: "The original language was rather obscure, so I used Suno and an AI drawing tool to create a bilingual story rap with frame-by-frame illustrations. The first generated image of Guan Yu mixed Chinese and Japanese clothing, which did not fit the cultural meaning we wanted to convey. I repeatedly adjusted the prompt before correcting the image" (international-school teacher, 6 years' experience). Students responded positively to the multimodal version and used AI tools to create their own sequels. T15's offline paper-cutting animation illustrates the same category under tighter resource conditions. In each case, transformation combined disciplinary selection, linguistic adjustment, and control of representation rather than simple conversion from text to media.

Figure 2 summarizes the six categories and their relationships. Institutional and personal conditions and contextual challenges shape the problem and opportunity structure. Teacher judgment mediates knowledge transformation and pedagogical adaptation. Learner response returns evidence for strategy revision. The additional episodes show that a single incident can involve several categories while still having one dominant analytic function.

4.3 Selective Coding

Selective coding integrated the six categories around teacher judgment and strategic mediation. This core category explains why the same AI capability produced different instructional practices. Teachers interpreted contextual demands, evaluated output, and decided how, when, and whether it should be used. Their work connected institutional conditions, cultural knowledge, pedagogical design, classroom enactment, and revision.

AI-TPACK and I-TRACK operate at different explanatory levels. AI-TPACK describes the integrated knowledge teachers draw upon when working with AI, pedagogy, and cultural content. I-TRACK explains how that knowledge becomes action over time. Its name represents the six emergent categories: institutional and personal conditions (I), teacher judgment and strategic mediation (T), learner response and strategy revision (R), pedagogical adaptation (A), contextual challenges (C), and knowledge-driven content transformation (K). Teacher judgment is central because it coordinates the remaining categories rather than functioning as one parallel factor among them.

The storyline begins with contextual challenges and the institutional and personal conditions under which teachers work. These conditions define the constraints and resources that teachers must interpret. Teachers then transform cultural content and adapt pedagogy for Thai learners, using AI-TPACK knowledge to verify representations, select formats, and align activities with learning goals. Implementation generates learner responses that inform later changes to materials, task complexity, explanations, prompts, and interactional modes.

The corpus shows this sequence in varied forms. T15 moved from weak connectivity to advance preparation, visual transformation, classroom observation, and prompt revision. T24 moved from obscure historical text to multimodal generation, detected a visual error, revised the prompt, and supported student production. T21 moved from an immersive scene to evidence of disengagement and then to role-based negotiation. These variations support a recursive process rather than a fixed instructional formula. I-TRACK does not claim that the six categories exhaust all conditions of AI-supported TCSOL; it offers a grounded explanation of how teachers in the present sample connected professional knowledge with culturally responsive action.

4.3.1 Contextual and Intercultural Challenges

In response to RQ1, teachers encountered four connected challenges. Chinese cultural content was often abstract, historically embedded, and difficult to translate into accessible classroom experiences. Cultural proximity between Thailand and China did not eliminate differences in social practices, communication, or values, which created risks of partial understanding and false equivalence. Uneven Chinese proficiency and preferences for visual and collaborative learning required pedagogical adjustment. These challenges were compounded by unreliable output, blended cultural symbols, limited AI literacy, connectivity, and school resources. The incidents involving filial piety, festival foods, clothing, and ritual practices show that cultural teaching required mediated interpretation rather than straightforward transmission.

4.3.2 Integrating AI-TPACK to Form and Revise Instructional Strategies

In response to RQ2, teachers integrated AI-TPACK through an iterative sequence of content transformation, pedagogical adaptation, mediation, implementation, and revision. They used AI to simplify and visualize cultural knowledge, then redesigned the output for students' language proficiency and cultural background. Before or during classroom use, they evaluated factual accuracy, cultural representation, and pedagogical suitability. Learner response subsequently informed changes to materials and activities. AI-TPACK supplied the knowledge needed for action, while I-TRACK captured the process through which that knowledge was enacted and updated. The same sequence appeared in assessment design, cultural comparison, multimodal storytelling, craft instruction, and role-based learning.

4.3.3 Factors Shaping Strategy Formation and Enactment

In response to RQ3, technological, pedagogical, intercultural, and contextual factors operated jointly. Tool access, teacher familiarity, and output reliability influenced technological feasibility. Teaching experience, knowledge of learners, and the capacity to redesign materials shaped pedagogical enactment. Chinese-Thai similarities and differences shaped content selection and explanation. School policy, facilities, internet access, time, collaboration, and professional development affected whether strategies could be sustained. Their influence was visible in different responses to constraint: advance preparation under weak connectivity, manual explanation when automated feedback was generic, repeated prompting when images were culturally inaccurate, and task redesign when students disengaged. I-TRACK treats these factors as conditions interpreted through teacher judgment rather than independent determinants of adoption.

4.3.4 Cross-School Variation and Common Process

Comparison across school types showed variation in resources and instructional possibilities without producing three separate process models. Public-school episodes made infrastructure and free-tool limitations especially visible. T15 prepared an offline animation because real-time access was unreliable, while T12 interrupted a lesson when an inaccurate festival comparison appeared in class. Private-school episodes highlighted intensive teacher reconstruction of generated dialogue, assessment, and comparison. T1, T3, and T8 removed bias, adjusted language, rewrote feedback logic, and converted generated material into group tasks. International-school episodes involved a wider range of image, music, and virtual-environment tools, but T21, T24, and T27 still encountered disengagement and cultural distortion. Greater access expanded the available formats; it did not remove the need for mediation.

The comparison therefore identified a common mechanism beneath contextual variation. Conditions influenced the starting point, available tools, and feasible interactional mode, while teacher judgment connected those conditions to a cultural and pedagogical response. This pattern supports the placement of institutional and personal conditions at the input side of I-TRACK rather than treating school type as a direct predictor of instructional quality. The evidence does not support ranking the three school sectors, because the excerpts illustrate processes rather than comparative frequencies or outcomes. It instead shows how the same recursive logic can operate through offline preparation, prompt reconstruction, multimodal production, or critical discussion under different institutional arrangements.

4.4 The I-TRACK Process Model

Figure 3 presents the process model. AI-TPACK forms the professional knowledge base; I-TRACK explains how that knowledge is enacted. Contextual challenges and institutional or personal conditions prompt and constrain teacher mediation. Teacher judgment guides knowledge transformation and pedagogical adaptation. Learner response then feeds back into subsequent judgment and revision, making strategy formation recursive. The model allows movement between stages when an error or learner response requires reconsideration. For example, a cultural inaccuracy can return the teacher from adaptation to verification, while confusion during implementation can lead to a new representation, prompt, or interactional design.

Three transitions organize the model. The first moves from conditions to judgment: teachers interpret the cultural problem, available infrastructure, tool reliability, learner profile, and instructional purpose before deciding whether an AI output is usable. The second moves from judgment to design: verified knowledge is transformed into a representation and an activity, with content transformation and pedagogical adaptation developing in parallel or in sequence. The third moves from enactment back to judgment: learner questions, participation, confusion, and performance indicate whether the strategy should be retained, simplified, expanded, or replaced. The return path is conditional rather than automatic. Revision depends on teachers noticing the evidence, attributing it to a feature of the strategy, and having time or resources to act. This explains why I-TRACK is a process model rather than a checklist of six independent factors.

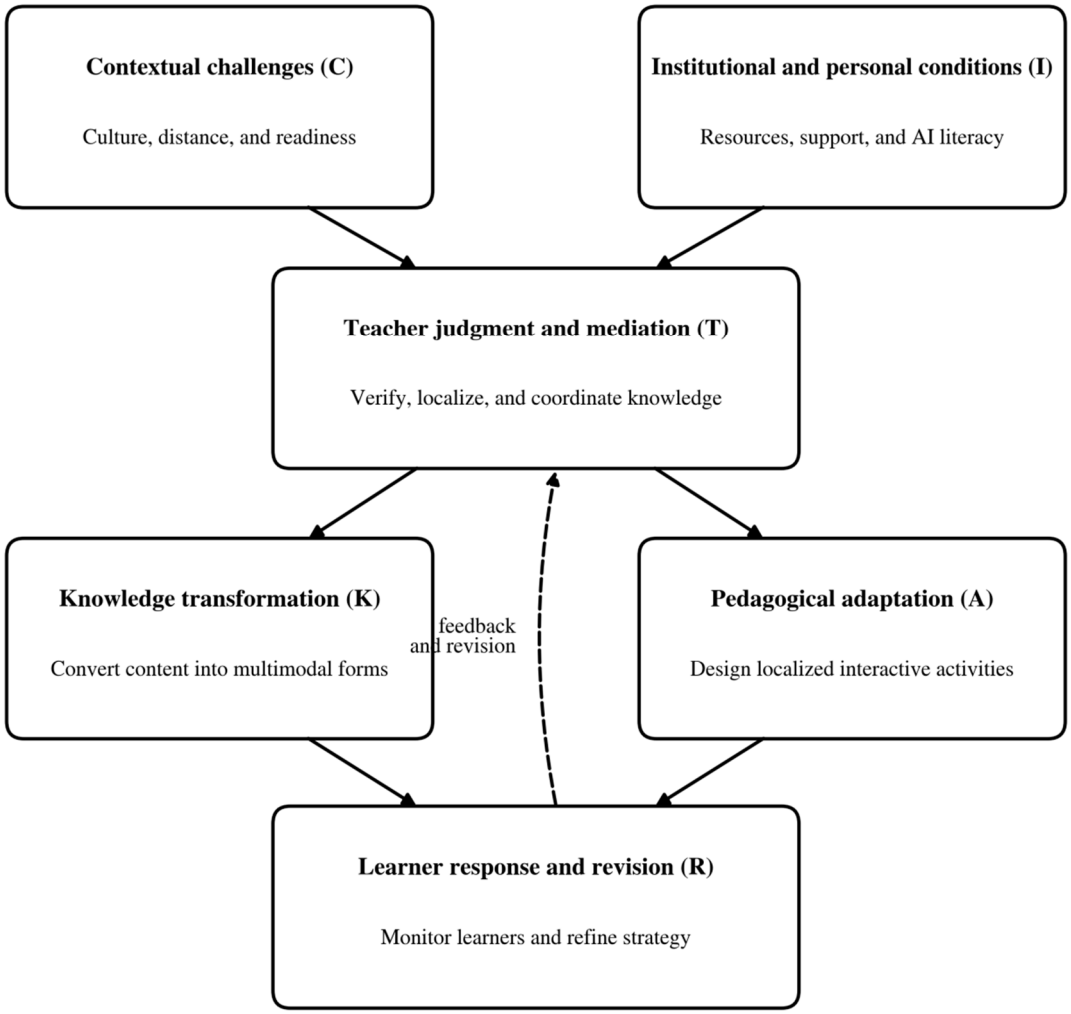


Figure 3. I-TRACK as a Process of Enacted AI-TPACK

5. Discussion

The findings show that AI-supported cultural teaching is organized through mediated adaptation rather than direct delivery of generated content. Teachers evaluated cultural accuracy, transformed representations, localized tasks for Thai learners, observed classroom responses, and revised later instruction. The expanded interview evidence makes this sequence visible across private, public, and international schools. It also clarifies why access to the same tools did not produce equivalent practice: teachers differed in the conditions they faced, the judgments they made, and the classroom evidence available for revision.

5.1 Theoretical Contributions

The first contribution is to distinguish professional knowledge from its enactment. TPACK explains that effective technology integration depends on the interaction of technological, pedagogical, and content knowledge rather than on any component in isolation (Mishra & Koehler, 2006). AI-TPACK research has extended this position by identifying the knowledge teachers require to evaluate, design with, and ethically use artificial intelligence (Celik, 2023; Ning et al., 2024). Those frameworks specify an important knowledge base, but a knowledge map does not by itself explain how teachers move from a culturally problematic AI output to a defensible classroom strategy. I-TRACK supplies that missing process account. It identifies how contextual challenges and institutional conditions enter teacher judgment, how judgment coordinates knowledge transformation and pedagogical adaptation, and how learner response returns evidence to subsequent decisions. The model therefore connects what teachers know with what they do across planning,

enactment, and revision.

This distinction changes how AI-TPACK is interpreted. In the present data, teachers did not simply combine knowledge domains at one planning point. T3 filtered culturally inaccurate images, reduced the language to HSK Level 3, and redesigned interaction after considering the needs of Thai learners. T15 prepared an animation under weak connectivity, then revised the prompt after observing difficulties during paper-cutting practice. T21 converted a passive virtual scene into a negotiation task after learners disengaged. These episodes show that integration is distributed across time. Knowledge is activated repeatedly as teachers encounter generated output, institutional limits, and learner evidence. I-TRACK thus adds a temporal and recursive layer to competency-oriented models without presenting a rival inventory of teacher knowledge.

The second contribution is to theorize teacher judgment as a coordinating mechanism rather than another parallel competency. Intelligent-TPACK emphasizes ethical and evaluative knowledge (Celik, 2023), and critical approaches to AI in teacher education call for scrutiny of generated content rather than tool-centered adoption (Kohnke & Zou, 2025). The current findings specify how such scrutiny operates in culturally sensitive instruction. Teachers checked factual claims, inspected visual symbolism, compared Chinese and Thai practices, adjusted language, selected a mode of interaction, and decided whether an error should be corrected privately or used publicly for critical discussion. T27, for example, treated the AI system's conflation of Chinese ancestor worship and the Thai wai gesture as material for examining the limits of AI-mediated cultural communication. Judgment coordinated epistemic evaluation, cultural interpretation, and pedagogical choice within one decision process.

This coordinating role is especially important because generative AI produces representations that are plausible before they are reliable. A fluent dialogue, attractive image, or bilingual song can conceal historical inaccuracies and misplaced cultural symbols. The teachers' accounts show that professional responsibility cannot be delegated to the system's apparent coherence. In I-TRACK, mediation is therefore the point at which AI output becomes accountable instructional content. This formulation extends the idea of ethical AI knowledge by locating responsibility in observable practices: verification, correction, contextualization, disclosure of errors, and revision. It also explains why technical proficiency alone did not separate effective from ineffective use. Teachers with access to similar systems produced different outcomes depending on whether they recognized cultural risk and reorganized the output around a clear learning purpose.

Teacher mediation also operates in two directions. Toward the AI system, teachers formulate prompts, select outputs, correct errors, and constrain the representation. Toward learners, they explain, sequence, compare, and organize participation. These directions are analytically distinct. Improving a prompt can increase factual or visual fidelity without producing an appropriate classroom task, while an engaging task can still circulate a distorted representation. I-TRACK links the two through judgment: the teacher must make generated content defensible as cultural knowledge and usable as a learning experience. This two-directional account explains why prompt skill is necessary but insufficient and why pedagogical creativity cannot compensate for unresolved cultural error. It also gives teacher judgment a clearer theoretical role than the general claim that teachers remain important when using AI.

The third contribution is to conceptualize localization as interpretive reconstruction. Research on Chinese language education in Thailand has established the importance of curriculum, teacher preparation, local context, and culturally organized learning activities (Duangmanee & Waluyo, 2024; Xue & Chinokul, 2026). Intercultural pedagogy likewise treats cultural learning as comparison and interpretation rather than the accumulation of fixed facts (Kennedy, 2020). The present study extends these arguments to AI-generated materials. Localization involved more than translating Chinese text or substituting familiar Thai examples. Teachers preserved the intended Chinese cultural meaning, identified where a Thai analogy clarified or distorted it, adjusted linguistic demand, and selected a social form through which learners could negotiate the comparison. T1's tea-culture activity and T3's work on filial piety illustrate this reconstruction: generated material became useful only after the teacher removed misleading assumptions and redesigned the task around discussion.

Localization consequently involved a recurring tension between representational fidelity and pedagogical accessibility. Teachers simplified language, used animation, created bilingual music, or introduced familiar Thai reference points because the original material was linguistically or conceptually difficult. Each adaptation also created a possibility of flattening historical meaning or treating two practices as equivalent. The data show that effective adaptation did not maximize simplicity or similarity. Teachers sought a workable level of accessibility while retaining distinctions that mattered to the cultural objective. This finding adds a criterion to culturally responsive AI use: a localized resource is successful when learners can engage with it without losing the boundary between explanation and distortion. The criterion helps explain why teachers repeatedly returned to verification after apparently successful multimodal

generation.

The evidence also identifies an alternative response to AI error. Teachers usually corrected inaccurate output before use, but some errors became pedagogical objects when their source and consequences could be examined safely. T27 used a conflated ritual dialogue to discuss the limits of AI in cultural communication, and T12's students' questions exposed why an apparently polished festival comparison was unreliable. This pattern extends critical AI literacy from evaluating a tool in the abstract to analyzing a concrete representation within subject teaching. An error becomes educationally productive only after the teacher identifies it, prevents it from being accepted as fact, and connects the correction to a cultural learning goal. I-TRACK therefore accommodates both corrective mediation and critical disclosure. The distinction matters because complete removal protects accuracy, whereas guided examination can help learners understand how cultural bias and hallucination are produced and recognized.

The fourth contribution is to place learner response inside the formation of strategy. Much AI integration research evaluates readiness, intention, knowledge, or the quality of a planned artifact (Aldemir et al., 2025; Eyal, 2025; Taheri et al., 2025). I-TRACK identifies classroom response as evidence that reshapes the next instructional move. Engagement, confusion, questions, and participation patterns were not treated as final outcomes detached from design. They indicated whether a representation was intelligible, whether a comparison supported intercultural understanding, and whether the activity demanded revision. T8 revised AI-generated assessment logic when automated feedback could not explain students' errors, while T21 changed a visually impressive Silk Road scene after passive viewing produced boredom. The resulting feedback loop explains how teachers learn from enactment and why competence should include responsive redesign rather than lesson preparation alone.

The fifth contribution concerns context. Adoption studies often model infrastructure, support, literacy, and perceived usefulness as variables that influence whether educators use AI (Xue et al., 2025; Taheri et al., 2025). The qualitative evidence here shows that context also changes the form of use. Weak connectivity led T15 to prepare an offline animation rather than abandon AI. Limited free-tool feedback led T8 to rewrite prompts and supply teacher-authored explanation logic. International-school resources enabled T24 to combine music and image generation, yet access did not remove the need to correct cultural inaccuracies. I-TRACK therefore treats institutional and personal conditions as interpreted constraints and resources. Their effects pass through professional judgment and become visible in choices about timing, mode, complexity, verification, and interaction.

A further theoretical clarification concerns the model's unit of analysis. I-TRACK explains an instructional episode and its revision cycle rather than classifying a teacher as a stable type of AI user. The same teacher can move through the process differently when the cultural topic, tool, learner group, or institutional condition changes. A teacher can accept an accurate visualization with minor language editing in one lesson, reject a culturally blended image in another, and convert an AI error into critical discussion in a third. This episode-level focus prevents teacher competence from being inferred from tool frequency alone. It also defines a boundary condition for the model: I-TRACK is most relevant when AI-generated material requires professional interpretation and when classroom evidence can inform a later decision. It is less informative for purely administrative use or fully standardized tasks that contain no meaningful cultural or pedagogical choice. Stating this boundary strengthens the model's explanatory precision and creates testable questions about when the feedback loop becomes active, abbreviated, or interrupted.

The category relationships also support three propositions for later empirical examination. First, greater representational ambiguity should increase the amount of teacher mediation because culturally blended or historically uncertain output requires more verification and reconstruction. Second, institutional resources should influence instructional quality indirectly through the options available for mediation and adaptation rather than guaranteeing effective use on their own. Third, learner response should improve later strategy only when teachers recognize it as evidence and have enough discretion to revise the next iteration. These propositions remain grounded interpretations rather than tested causal claims. Their value is to convert the qualitative storyline into relationships that can guide observation, longitudinal comparison, and measurement while retaining the model's sequence and feedback loop.

Taken together, these contributions position I-TRACK between a knowledge framework and a context-specific lesson description. It is more processual than AI-TPACK because it specifies ordered transitions and feedback, yet more general than any single classroom episode because the same mechanism appeared across topics, tools, and school settings. Its theoretical claim is deliberately bounded: culturally responsible AI integration depends on repeated professional judgments that connect representation, pedagogy, context, and learner evidence. This claim can be examined without assuming that every lesson follows an identical path or that more AI use constitutes stronger integration.

5.2 Relationship to Prior Research

The findings converge with research showing that generative AI can support language teaching through dialogue, visualization, feedback, and material development (Kohnke et al., 2023; Law, 2024; Torres & Kahveci, 2025). They also confirm recurrent concerns about hallucination, bias, uneven access, and the need for AI literacy (Kasneci et al., 2023; Pei et al., 2025). The contribution lies in showing how these opportunities and risks become connected in practice. Multimodality increased access to abstract cultural content, but it also introduced visual and narrative errors. Personalization supported assessment design, but generic automated feedback required teacher reconstruction. Infrastructure constrained synchronous use, but teachers sometimes adapted by preparing resources in advance. Opportunities and risks were therefore not separate lists; they interacted within the same instructional episode.

The Thailand setting also qualifies claims that cultural proximity simplifies Chinese cultural teaching. Shared regional practices offered comparison points, but resemblance could invite overgeneralization. Teachers had to decide when a Chinese-Thai parallel supported understanding and when it concealed differences in historical meaning, social function, or ritual practice. AI amplified both possibilities because it rapidly assembled comparative text and images without reliably marking the boundaries between traditions. The evidence supports intercultural pedagogy's emphasis on guided interpretation (Kennedy, 2020) and adds that AI literacy in cultural teaching includes the capacity to inspect representational boundaries.

The findings further clarify the role of multimodality. Previous studies identify image, dialogue, simulation, and immersive interaction as affordances for language learning (Law, 2024; Shadiev et al., 2026). In this study, multimodality was valuable when it solved an identified representational or participation problem. Animation made paper-cutting procedures visible under offline conditions; bilingual music and illustrations made an obscure narrative accessible; a virtual scene required role-based negotiation before it generated sustained participation. These cases indicate that multimodality functions through pedagogical orchestration rather than sensory richness alone. The teacher's choice of what learners do with a representation is as important as the representation itself.

5.3 Practical Implications

Teacher development should be organized around complete instructional episodes rather than isolated demonstrations of tools. Programs can ask teachers to evaluate a culturally flawed output, revise it for a defined proficiency level, enact or simulate the activity, examine learner evidence, and document the next revision. This structure develops verification, cultural interpretation, prompt revision, task design, and responsive teaching together. Assessment of AI-TPACK should likewise include the reasoning behind revisions and the teacher's use of learner evidence, not only the quality of the first lesson plan or generated artifact.

Schools need infrastructure and access, but support should also protect time for iterative preparation and peer review. Shared repositories can include source-checked cultural materials, records of common hallucinations, editable prompts, and examples showing how the same topic was adapted for different levels. Curriculum designers should provide comparison questions and criteria for cultural accuracy rather than distribute fixed AI-generated packages. Developers can support professional judgment through source visibility, editable outputs, language-level controls, version history, and clear separation between generated claims and verified reference material.

5.4 Limitations and Future Research

Several limitations delimit the model. The balanced purposive sample strengthened comparison across three school types but was not theoretical sampling in the classical grounded theory sense. The findings rely on teachers' retrospective accounts rather than classroom observation, student interviews, or systematic analysis of the AI artifacts described. The additional quotations increase evidentiary transparency, but selected excerpts still cannot reproduce the full analytic corpus. Translation into English can also reduce culturally specific wording even when the substantive meaning is retained. Finally, the Thai secondary-school setting limits transferability to other national, institutional, and age-group contexts.

Future research should examine I-TRACK through observation, stimulated recall, student evidence, and analysis of successive prompt and artifact versions. Comparative studies can investigate whether the centrality of teacher judgment changes across school systems, language combinations, and cultural topics. Longitudinal work should trace how teachers' verification routines and adaptation strategies change as tools and institutional policies develop. Quantitative and mixed-methods studies can operationalize the six categories and test the proposed relationships, while preserving the temporal feedback structure rather than reducing the model to a one-directional adoption path.

6. Conclusion

This study explains how high school Chinese language teachers in Thailand form, enact, and revise AI-supported strategies for cultural teaching. Analysis of 30 interviews identified six connected categories and organized them into the I-TRACK model: institutional and personal conditions, teacher judgment and strategic mediation, learner response and strategy revision, pedagogical adaptation, contextual challenges, and knowledge-driven content transformation. The expanded corpus shows how these categories interacted in episodes involving tea culture, filial piety, traditional festivals, paper-cutting, historical narratives, ritual comparison, assessment, and virtual environments. Across these topics, AI-generated material became instruction only after teachers checked its accuracy, protected cultural distinctions, adjusted language and interaction, and responded to classroom evidence.

AI-TPACK describes the knowledge teachers need; I-TRACK explains the process through which that knowledge is interpreted and enacted under specific cultural, institutional, and classroom conditions. Teacher judgment occupies the center of this process because it connects contextual appraisal with content transformation, pedagogical adaptation, learner response, and revision. The model's episode-level and recursive structure shifts attention from whether teachers adopt AI to how they make each use culturally and pedagogically defensible. It also shows that access and technical proficiency are insufficient when cultural representations remain unverified or learner feedback does not inform redesign. Future research should evaluate the model through observation, student evidence, artifact histories, comparative samples, and longitudinal designs. Such work can test when the feedback loop is sustained or interrupted and whether I-TRACK transfers beyond Thai secondary-school TCSOL to other forms of culturally sensitive language teaching.

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Appendix 1. Teacher Interview Protocol

No.	Questions
1	In your high school Chinese culture classes, how do you usually understand the integration of AI and the TPACK model?
2	Which AI tools do you use most often when preparing lessons on Chinese culture, and why do you choose them?
3	When teaching complex cultural concepts, such as Confucianism or historical turning points, how does AI help you simplify the content?
4	Can you share a teaching strategy in which AI successfully helped address Thai students' misunderstandings or misinterpretations of Chinese culture?
5	After using AI tools, what specific changes have taken place in your teaching role in the classroom (Pedagogy)?
6	When designing AI-based interactive activities, how do you balance technological engagement with cultural seriousness?
7	Considering the learning habits of Thai high school students, such as their preference for visual and social learning, what specific AI adaptation strategies have you used?
8	What role has AI played in helping students compare Chinese and Thai cultures, such as Songkran Festival versus the Spring Festival?
9	How do you use AI tools to assess students' mastery of cultural knowledge, rather than just their language ability?
10	When implementing these strategies, what teaching obstacles have you encountered due to "AI hallucinations" or cultural bias?
11	How have objective factors, such as Thailand's internet environment and school facilities, affected your ability to apply AI-TPACK effectively?
12	In your opinion, what kind of training is most needed for high school Chinese language teachers in Thailand to improve their AI-TPACK competence in cultural teaching in the future?

Author Statements

Author(s) declared the statement below:

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Author Contributions

Kanokporn Numtong contributed to the study design, theoretical framing, data analysis, original draft preparation, and research supervision. Keran Wang contributed to the conceptualization of the study, literature review, and manuscript revision. Kewalee Petcharatip contributed to methodology refinement and critical review of the manuscript. Ming Li managed data collection, organization, coding, and analysis, and handled correspondence with the journal as the corresponding author. All authors reviewed and approved the final version of the manuscript.

Consent for Publication

All authors have read and approved the published version of the manuscript.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed Consent

Informed consent was obtained from all participants.

Ethics Approval

The study involved voluntary interviews with teachers for academic research purposes. No personally identifiable information is disclosed in the manuscript, and all participants were coded anonymously.

Data Availability Statement

Included in article: All data generated or analyzed during this study are included in this published article and its supplementary materials.

Use of Artificial Intelligence

The authors used ChatGPT solely for language editing and grammar improvement. All AI-assisted revisions were reviewed and verified by the authors, who take full responsibility for the final content of the manuscript.

Supplementary Materials

Appendix 1. Teacher Interview Protocol

Journal Information

The Editorial Board declared the below statement on behalf of the journal and publisher.

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The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

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