

# The Study of Teachers' Effectiveness in Using ICT for Online Chinese Class at an International School in Bangkok

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## Abstract

With the growing global demand for Chinese language learning, Information and Communication Technology (ICT) has become a vital tool in language education. This study examined the integration of ICT in online Chinese teaching at an international school in Bangkok, Thailand, focusing on the technical, pedagogical, and motivational challenges teachers faced. Using a qualitative research approach, it employed semi-structured interviews with eight native Chinese-speaking teachers to analyze key barriers to ICT effectiveness. The findings revealed that unreliable internet access, insufficient teacher training, and the limited interactivity of existing ICT tools, such as Zoom, Google Classroom, and Quizlet, negatively impacted teaching outcomes. The study proposed enhancing digital infrastructure, providing targeted professional development, and incorporating AI-powered learning tools to address these issues. By offering evidence-based recommendations, this research contributed to a deeper understanding of ICT's role in Chinese language education and presented practical strategies for improving online teaching effectiveness.

Keywords: ICT, Online Chinese Teaching, Bilingual Education, International Schools, Ianguage Learning Technologies

## 1. Introduction

## 1.1 Background

With China's growing influence in the global economy, the demand for Chinese language education has surged, particularly in Southeast Asia. In Thailand alone, the number of students learning Chinese exceeded 2 million by 2022 (Xu et al., 2022). This rapid growth is driven by multiple factors, including China's expanding trade relations, cultural exchange programs, and the increasing number of Thai students seeking higher education and career opportunities in China. As Chinese language proficiency becomes a valuable asset in the job market, Thai educational institutions have responded by integrating Chinese instruction at various levels of education. However, despite the growing emphasis on Chinese language education, the effectiveness of Chinese language instruction in online settings remains a critical issue, particularly regarding the role of Information and Communication Technology (ICT) in supporting teachers' pedagogical effectiveness.

## 1.2 The Role of ICT in Chinese Language Education

Integrating Information and Communication Technology (ICT) in language education has transformed teaching methodologies, providing greater flexibility, real-time interaction, and access to vast online resources (Waluyo, 2020). Digital platforms such as Google Classroom, Zoom, Quizlet, and Nearpod enable educators to create engaging, multimedia-enhanced lessons, facilitating more interactive, student-centered learning experiences. However, despite these benefits, educators face significant challenges in effectively integrating ICT into Chinese language instruction. Poor internet connectivity, insufficient training in ICT pedagogy, and students' varying levels of digital literacy are some of the struggles (Lei & Medwell, 2021). Additionally, inadequate technical support often hinders teachers' ability to maximize ICT's potential

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in the classroom. These limitations directly impact teachers' effectiveness in utilizing ICT, affecting lesson delivery, student engagement, and overall learning outcomes.

## 1.3 Challenges in ICT Adoption for Chinese Language Teaching

While ICT has enhanced English education through AI tutoring, speech recognition, and adaptive learning, its adoption in Chinese instruction faces unique challenges. Unlike English, Chinese requires mastering thousands of characters with distinct meanings, pronunciations, and stroke orders, making traditional online methods less effective for tone differentiation and character recognition. AI-driven tools like HelloChinese and Duolingo offer interactive exercises, yet their impact remains limited due to technological constraints and the lack of instructional design tailored to Chinese learners. Furthermore, existing ICT platforms do not fully support Chinese language pedagogy, particularly in handwriting instruction, pronunciation accuracy, and interactive language practice. Teachers struggle to maintain student motivation and engagement without effective ICT strategies, which further hinders learning outcomes.

## 1.4 The Need for Further Research

This study is guided by Vygotsky's Sociocultural Theory, which emphasizes the role of interaction, tools, and social context in learning. ICT tools function as mediators in the learning process, but their effectiveness depends on how well they align with pedagogical needs and student engagement strategies. Blended Learning Models are also explored, highlighting the combination of online and offline learning to enhance language acquisition and interactive learning experiences.

While ICT has significantly enhanced English language education, its integration into Chinese instruction remains underexplored, especially in the Thai context. Gamification and adaptive learning show potential for engagement, but their effectiveness in Chinese teaching requires further study. Similarly, hybrid learning models have promise, yet their long-term impact on Chinese acquisition is unclear. The core issue in this study is not just whether ICT can support Chinese language education but how effectively it enhances teachers' instructional practices and students' learning experiences.

Thus, this study examines key challenges, analyzes teachers' experiences, and offers practical recommendations to optimize ICT in Chinese language instruction, particularly in Thailand. Doing so aims to bridge the gap between ICT potential and actual classroom effectiveness, ensuring that teachers can integrate ICT more efficiently to improve online Chinese teaching.

## 1.5 Conceptual Framework

Figure 1 presents the conceptual framework of this study, illustrating the interplay between technical, pedagogical, and motivational factors in ICT-based Chinese language teaching. This framework highlights how technological infrastructure, teacher training, and student engagement influence ICT's effectiveness in online Chinese instruction. A clearer understanding of these relationships can inform strategies for enhancing digital learning experiences in Chinese education.

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Figure 1 Conceptual Framework

## 1.6 Research Objectives

This study aimed to explore the integration of Information and Communication Technology (ICT) in online Chinese language teaching and assess its effectiveness in the educational context of Thailand. Given the increasing adoption of ICT in language education, this study is particularly significant for the Thai educational system, where the demand for Chinese language learning has surged due to economic and cultural ties with China. This research provides valuable insights for educators, policymakers, and institutions seeking to optimize ICT implementation in online language education.:

1. To evaluate how technical, teaching, and motivation issues affected teachers' effectiveness in using ICT for online Chinese classes at an International School in Bangkok, Thailand.

2. To identify specific technical, teaching, and motivation factors that created these challenges and analyze their impact on ICT use in online Chinese teaching.

3. To propose practical solutions and strategies to address these issues and improve the use of ICT in online Chinese classes based on the study findings, offering insights that can be applied across similar educational contexts in Thailand and beyond.

# 2. Literature Review

## 2.1 ICT in Language Education

2.1.1 The Role of ICT in Foreign Language Education

ICT has revolutionized language education by enhancing accessibility, engagement, and interactivity. Online platforms enable real-time communication between teachers and students, while AI-driven tools provide personalized feedback (Waluyo, 2020). Additionally, video conferencing tools, interactive whiteboards, and cloud-based platforms allow teachers to create collaborative and immersive learning experiences (Garlinska et al., 2023).

Research in Thailand indicates that ICT adoption in foreign language education has expanded significantly, particularly following the shift to online learning during the COVID-19 pandemic. However, disparities in digital literacy and access to reliable technology continue to pose challenges for teachers and students in Thai schools (Quaicoe & Pata, 2020). While private international schools have greater access to ICT resources, public schools face infrastructure and teacher training limitations, leading to inconsistent ICT integration.

2.1.2 The Effectiveness of AI-Assisted Tools in Language Learning

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AI-driven tools such as automated speech recognition (ASR), intelligent tutoring systems, and adaptive learning platforms have significantly improved language learning experiences (Tsegay et al., 2022). AI chatbots and virtual assistants provide real-time corrective feedback, making language learning more interactive and personalized (Yamada et al., 2023). Studies show that AI-assisted pronunciation correction tools enhance oral fluency and tone accuracy, particularly in tonal languages like Chinese (Zhang et al., 2023). However, despite these advantages, current AI systems still struggle with contextual nuances, particularly in informal communication and cultural interpretation (Liu, 2024).

2.1.3 The Impact of Hybrid Learning on Engagement

Hybrid learning, combining ICT tools with face-to-face instruction, has improved student engagement and retention (Singh et al., 2021). Students in hybrid learning environments exhibit higher motivation and better academic outcomes than fully online or traditional offline settings. In Thailand, hybrid learning has increasingly been adopted in foreign language education, with digital platforms supplementing classroom instruction (Sitthitham, 2024). However, the effectiveness of hybrid learning largely depends on the availability of resources and teachers' digital competencies (Basilotta-Gómez-Pablos et al., 2022).

Recent case studies in Southeast Asia highlight successful implementations of hybrid models. For example, a study in Vietnam found that integrating gamified digital tools with in-person instruction significantly improved student engagement in English language learning (Lasekan et al., 2024). Similarly, research in Malaysia showed that university students using blended learning platforms outperformed their peers in traditional classroom settings (Ali et al., 2023). These findings suggest Southeast Asian educational contexts, including Thailand, could benefit from similar hybrid learning approaches.

#### 2.2 ICT in Chinese Language Teaching

2.2.1 Unique Challenges in ICT-Based Chinese Language Instruction

Chinese language learning presents distinct challenges, particularly tone differentiation and character recognition (Chen, 2021). Unlike alphabetic languages, Chinese requires mastery of thousands of characters and associated tones, making ICT tools more difficult to design effectively. Existing ICT platforms often fail to address these specific needs. Many lack robust character recognition capabilities, making it difficult for students to practice writing accurately. Furthermore, AI-driven pronunciation tools struggle to detect subtle tonal differences, critical for meaning differentiation in Chinese.

Key limitations of current ICT platforms in Chinese language learning include:

Character recognition issues: Unlike English spell-checkers, AI tools for Chinese struggle to recognize and correct handwritten character mistakes, mainly when stroke order is incorrect (Wang et al., 2023).

Tone differentiation challenges: While AI can recognize phonemes in English with high accuracy, Chinese tones require fine-grained distinctions, which current algorithms often misinterpret (Mohammadkarimi et al., 2025).

Limited contextual support: Many AI-based learning applications, such as Duolingo and HelloChinese, focus primarily on vocabulary acquisition but lack deep contextual learning (Yang et al., 2021).

More specialized AI-driven pronunciation analyzers are under development but require further refinement to support Chinese learners effectively.

## 2.2.2 The Role of AI in Chinese Language Education

AI-powered tools are increasingly being used in Chinese language instruction, particularly in pronunciation correction and adaptive learning (Vančová, 2023). AI speech recognition systems analyze tone accuracy and provide instant feedback, helping students refine their spoken Chinese. However, studies indicate that AI tools face difficulties processing complex sentence structures and cultural nuances, which are essential for developing communicative competence in Chinese (Allan, 2024). Additionally, AI-driven platforms assist teachers by automating grading and tracking student progress, allowing for more personalized

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instruction. Despite these advancements, significant barriers remain, including the high cost of AI tools, the need for teacher training, and integration challenges within traditional curricula (Ejjami, 2024).

#### 2.2.3 The Effectiveness of Hybrid Learning in Chinese Language Education

Recent studies suggest hybrid learning models integrating ICT tools with in-person instruction can enhance Chinese language acquisition (Singh et al., 2021). Hybrid approaches provide students with digital practice opportunities while ensuring real-time instructor feedback. Research from Taiwan and China indicates hybrid classrooms incorporating ICT-based exercises lead to higher student motivation and better character retention (Chen et al., 2021). However, successful hybrid learning depends on the structure and quality of lesson plans. Without adequate teacher training and curriculum alignment, hybrid instruction can result in fragmented learning experiences (Mojumder et al., 2025). A comparative analysis of hybrid learning models across East Asian countries suggests that schools with dedicated digital literacy training for teachers achieve better ICT integration outcomes. This highlights the importance of systematic professional development programs for Thai educators implementing hybrid Chinese language instruction.

#### 2.3 Comparative Analysis of ICT in English vs. Chinese Language Teaching

Feature	ICT in English Teaching	ICT in Chinese Teaching
Writing System	Alphabetic, easier to implement in ICT	Logographic requires advanced character
	tools	recognition software
Pronunciation Support	AI-driven speech recognition works well	AI struggles with tone differentiation
Grammar Complexity	Predictable syntax, more straightforward	Complex structures require deeper NLP
	for AI to process	(Natural Language Processing)
		capabilities
Gamified Learning	Widely used with high effectiveness	Primarily focused on vocabulary, it lacks
		deep contextual learning
Hybrid Learning	Commonly implemented with strong	still developing, depends on teacher
Adoption	results	training and ICT resources

## Table 1 Comparative Analysis of ICT in English vs. Chinese Language Teaching

This comparison illustrates key differences in ICT adoption for English vs. Chinese language education. While AI tools for English benefit from straightforward phonetic transcription, Chinese requires more sophisticated AI for tone analysis and character recognition, which is still in development.

While ICT tools have been widely adopted for both English and Chinese language learning, the challenges in Chinese education differ significantly due to the tonal nature of the language and the complexity of character writing. AI-driven pronunciation tools such as Speechling and Pinyin Tutor have shown promising results in addressing tone differentiation issues, which are less critical in English learning. Gamification elements, such as character tracing apps (e.g., Skritter), provide an interactive approach to overcoming the difficulty of memorizing and writing Chinese characters.

# 3. Research Methodology

## 3.1 Participant Selection

## 3.1.1 Selection Criteria

Participants were selected based on their experience in online Chinese instruction, ensuring a balanced representation of junior and senior educators. Eight teachers were chosen following qualitative research standards (Creswell, 2014), with the sample size determined by data saturation, as no significant new themes emerged after eight interviews. Factors such as prior ICT training, familiarity with blended

[65]



learning, and institutional support access were considered, capturing insights from proficient ICT users and those still adapting to digital tools to ensure diverse perspectives.

## 3.1.2 Diversity in Teaching Backgrounds

Participants were drawn from diverse educational settings, including international schools, language centers, and online tutoring platforms, ensuring a comprehensive understanding of ICT usage across institutions. Including junior and senior teachers enabled a comparative analysis of ICT challenges, with junior teachers offering insights into digital fluency and engagement strategies. In contrast, senior teachers highlighted long-term pedagogical shifts and structural barriers. To further refine this analysis, participants were categorized by ICT proficiency levels (beginner, intermediate, and advanced), allowing for a deeper examination of how experience influences technical challenges and instructional effectiveness.

3.1.3 Recruitment Process and Ethical Considerations

Recruitment was conducted through professional teacher networks, social media groups focused on Chinese language instruction, and referrals from educational institutions. This approach ensured that participants were actively engaged in the field and had relevant experiences to contribute. Ethical guidelines were strictly followed, with voluntary participants received a clear overview of the study objectives before the interview, ensuring transparency and informed decision-making.

## 3.2 Data Collection and Analysis

## 3.2.1 Interview Process

Interviews were conducted via Zoom, allowing for real-time interaction and flexibility for participants. This approach facilitated open discussions, enabling teachers to express their experiences comfortably.

Each interview lasted 45-60 minutes, covering key topics such as:

- 1. ICT usage in teaching
- 2. Challenges and technical barriers
- 3. Student engagement strategies
- 4. Institutional support and training availability
- Pilot Interview Implementation

To ensure the reliability and effectiveness of the interview process, a pilot interview was conducted before the formal data collection phase. This preliminary step was designed to refine the interview protocol and identify potential areas for improvement in question clarity, structure, and data collection methods.

Sampling Method and Sample Group

The sampling method used for the pilot interview was purposive sampling, selecting two native Chinese-speaking teachers who met the same selection criteria as the primary study participants. These teachers were experienced in online Chinese teaching at an international school in Bangkok and had prior exposure to ICT tools in their teaching. The pilot participants were not included in the final sample of eight teachers but played a crucial role in testing and refining the interview framework.

Objectives of the Pilot Interview





The pilot interview was conducted to:

1. Refine interview questions to eliminate ambiguous wording and ensure participants fully understand each question.

2. Ensure clarity and logical flow of topics, ensuring that discussions naturally progress from general ICT usage to specific challenges and solutions.

3. Test the recording and transcription process to verify the effectiveness of data collection methods and address any technical difficulties before the formal study.

Pilot Interview Execution & Revisions Made

Each pilot interview lasted approximately 40 – 45 minutes and was conducted in Chinese (the participants' native language). The sessions were audio-recorded with participant consent and later transcribed for review. Feedback from the two pilot participants highlighted key areas for improvement, leading to the following modifications in the interview guide:

1. Rewording specific questions – Some questions contained technical terminology that teachers found confusing. These were simplified or clarified to improve participant comprehension.

2. Adjusting the sequence of questions – The original question order was revised to ensure a more natural flow of discussion from general experiences with ICT to specific technical, pedagogical, and motivational challenges.

3. Adding follow-up prompts - Additional prompts were included to encourage participants to elaborate on specific ICT challenges and provide detailed examples based on their experiences.

After refining the interview protocol, the primary data collection phase proceeded with the eight selected teachers, using semi-structured interviews to explore their experiences, challenges, and solutions related to ICT in online Chinese teaching.

Validity Testing & Reliability Measures

To ensure the validity and reliability of the interview questions, the study employed content validity testing using an Item-Objective Congruence (IOC) Index. The validation process followed these steps:

1. Expert Review Panel - The interview guide was reviewed by three academic experts in ICT integration in education and qualitative research methodology. The panel consisted of:

• Asst. Prof. Chuleekorn Nuansomsri (College of Digital Innovation Technology)

• Asst. Prof. Dr. Nudee Nupairoj (Rangsit University International College)

• Ajarn Amporn Puapradit (Rangsit University International College)

2. Evaluation Criteria – The experts assessed the interview questions for content relevance, clarity, and alignment with research objectives. They rated each question using the following scale:

• +1 = Clearly relevant and aligned with research objectives

• 0 = Needs modification or lacks complete alignment

• -1 = Not relevant or does not match research objectives

3. IOC Calculation – The scores from the three experts were analyzed, and questions with an IOC score of 0.50 or higher were retained, indicating strong alignment with the study' s objectives. Questions with lower scores were revised or removed to enhance clarity and relevance.

4. Reliability Measures -

• Consistency: All interviews followed a standardized semi-structured format, ensuring that each teacher answered core questions while allowing for natural elaboration.

• Transcription Accuracy: Verbatim transcription was conducted, and transcripts were reviewed by a second researcher to ensure data accuracy.



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• Thematic Consistency: The finalized questions ensured that data collected could be reliably categorized into technical, teaching, and motivational themes using thematic coding in NVivo 12.

By implementing pilot testing, expert validation, and structured reliability measures, this study ensured that the interview protocol was effective, clear, and capable of generating meaningful insights into ICT integration in online Chinese teaching.

3.2.2 Thematic Analysis and Coding Framework

All interviews were transcribed and analyzed using thematic analysis, following Braun & Clarke's (2006) framework. Responses were categorized into key themes:

The analysis focused on key areas, including technical issues like internet instability and software limitations, student engagement strategies like gamification and AI-assisted learning, and teaching methodologies involving hybrid learning and real-time feedback tools. NVivo software was used for data coding and validation, ensuring a systematic categorization of responses. The coding framework followed a hybrid approach, combining inductive coding, where emerging themes were identified directly from interview data, and deductive coding, which applied predefined themes from existing ICT literature to analyze response patterns. This iterative process refined recurring themes and aligned findings with research objectives, enhancing reliability and validity.

3.2.3 Triangulation and Cross-Validation

Triangulation was applied, cross-validating findings with:

- 1. Institutional reports on ICT use in education
- 2. Training materials and lesson plans
- 3. Teacher feedback reports

Document analysis of teacher training programs and ICT policies supplemented interview data, ensuring a broader perspective on ICT integration. By integrating multiple data sources, the study strengthened the credibility of its findings and provided a comprehensive understanding of ICT adoption in online Chinese language teaching.

## 3.3 Comparative Analysis and Regional Context

3.3.1 Cross-Regional Analysis Participant responses were compared with similar studies in other regions, identifying patterns and variations in ICT adoption. The cross-regional analysis included:

- 1. Japan & South Korea: Advanced government-funded ICT training programs for teachers.
- 2. Thailand: Institutional disparities in ICT support.

The study highlighted best practices that could be adapted for Thailand, including:

- 1. AI-powered pronunciation tools used in Japan
- 2. Blended learning strategies implemented in South Korea

This comparison helped identify scalable ICT strategies for Thai educators.

3.3.2 Institutional Support and Policy Implications

Key differences in institutional support, teacher training programs, and technological infrastructure were examined.

Findings revealed that:

- 1. Some institutions provided structured professional development programs
- 2. Others lacked formal ICT policies, resulting in inconsistent implementation
- The study provided actionable recommendations, including:
- 1. Policy reforms to integrate ICT more effectively
- 2. Increased investment in teacher training programs
- 3. Enhanced technological support within educational institutions 3.3.3 Future Research Directions

[68]

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The study suggests expanding the scope of data collection to include more diverse educational institutions, allowing future research to examine how different institutional settings influence ICT adoption and its effectiveness in language education. Additionally, conducting longitudinal studies could provide insights into the long-term impact of technological advancements on teaching practices. Furthermore, investigating ICT policy development across different regions could help refine strategic approaches for integrating ICT into Chinese language instruction, ensuring that educators are equipped with the necessary tools and support to maximize its potential in language learning.

#### 4. Findings and Discussion

## 4.1 Technical Challenges

## 4.1.1 Unstable Internet Connection

Frequent connectivity issues disrupt live teaching sessions, causing delays, reducing student interaction, and making real-time assessments difficult (Wu & Zhang, 2022). Variations in internet speed across different regions exacerbate these issues, leading to teacher and student frustration. Poor connectivity also limits multimedia-based teaching, restricting videos, interactive exercises, and live demonstrations.

#### 4.1.2 Limited ICT Training

Many teachers have not received formal training on using ICT tools for language instruction (Sáez-López et al., 2024). Some educators rely on trial and error or informal peer learning, leading to inconsistent instructional quality. The lack of structured ICT training programs makes teachers unaware of advanced features that could enhance student engagement and learning outcomes.

4.1.3 Limited Functionality of Online Platforms

Existing platforms lack real-time tone correction and character writing practice, which are crucial for Chinese language learners (Liu, 2024). While many language learning applications focus on vocabulary and listening comprehension, they often fail to provide comprehensive writing and pronunciation feedback. Students may develop incorrect pronunciation and writing habits without real-time corrections, making correcting mistakes harder.

4.1.4 Lack of Technical Support

Schools often lack dedicated ICT support staff, leaving teachers to resolve technical issues independently—this lack of assistance results in wasted instructional time and increased teacher workload. Educators unfamiliar with troubleshooting software malfunctions, managing security settings, and integrating additional tools face significant barriers to effectively using ICT. Without reliable technical support, teachers may be discouraged from exploring innovative ICT solutions, reducing the effectiveness of online teaching.

4.1.5 Device Compatibility Issues

Some teachers and students struggle with ICT tools due to device incompatibility. Older hardware may not support advanced features in modern language-learning applications, leading to inconsistent user experiences. Additionally, software updates or licensing restrictions may prevent teachers from fully utilizing online platforms, creating disparities in ICT adoption within institutions.

#### 4.2 Teaching Challenges

4.2.1 Student Engagement Issues

Online classes limit opportunities for interactive activities, reducing student participation and motivation (Xu & Cheng, 2023). The lack of physical classroom presence makes it harder for teachers to gauge student engagement and adjust their teaching. Discussion forums and chat features often fail to replicate the dynamic interactions of face-to-face learning, leading to student distraction, decreased focus, and lower retention rates.

4.2.2 Monitoring Learning Progress

Teachers struggle to effectively assess students' pronunciation and writing skills in virtual environments (Elhaty et al., 2020). Unlike traditional classrooms, online settings often rely on automated

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grading systems, which cannot evaluate nuanced pronunciation and handwriting quality. As a result, students may receive incomplete or inaccurate assessments, hindering their language development.

4.2.3 AI Tools for Pronunciation and Writing Correction

AI-driven platforms offer automated feedback but often lack contextual understanding and the ability to provide tailored guidance based on individual learning needs. Personalized feedback is essential for Chinese language acquisition, particularly for tone accuracy and character structure. While AI-powered pronunciation tools show promise, they require further refinement to assess tonal variations accurately. Similarly, AI-based writing tools must be improved to recognize stroke order and handwritten character accuracy.

4.2.4 Challenges in Collaborative Learning

Online learning has reduced opportunities for collaborative activities such as group discussions, peer exercises, and role-playing, which are essential in language learning. Many ICT platforms lack built-in collaborative tools, making it difficult for students to engage in conversational Chinese practice meaningfully.

4.2.5 Time Zone and Scheduling Conflicts

International schools and institutions with students in different regions face difficulty scheduling live online classes. Time zone differences may prevent students from attending live sessions or participating in real-time interactions. While asynchronous learning materials, such as recorded lectures and pre-set assignments, can partially mitigate this issue, they often lack the immediacy and interactivity of live instruction.

4.2.6 Digital Fatigue and Motivation Loss

Extended screen time in online classes can lead to digital fatigue, reducing students' motivation to engage with learning materials. Unlike traditional classrooms, where face-to-face interactions create a sense of community, online learning can feel isolating for students. This lack of social interaction affects motivation levels, making educators need to implement creative strategies to sustain student interest and engagement.

Table 2 International Comparison and Addressing These Chancinges			
China/Thailand	Japan/Korea		
Limited formal training	Government-funded training		
	programs		
Essential AI tools for pronunciation	Advanced AI voice recognition		
correction	software		
Basic gamification and interactive	VR-assisted immersive learning		
apps			
Unstable internet in some areas	High-speed broadband access		
	China/Thailand         Limited formal training         Essential AI tools for pronunciation correction         Basic gamification and interactive apps         Unstable internet in some areas		

**Table 2** International Comparison and Addressing These Challenges

The comparison in Table 2 highlights key differences in ICT adoption. Japan and Korea offer government-funded training, ensuring teachers receive comprehensive ICT instruction, a model Thailand could adopt through subsidized certification programs. Additionally, Japan's AI-driven pronunciation tools outperform Thailand's gamification-based learning, suggesting potential improvements. Lastly, Japan and Korea benefit from high-speed broadband, while Thailand and China face connectivity issues, emphasizing the need for national broadband investment.



## 4.3 Survey Analysis





The survey results in Figure 2 highlight significant ICT challenges for teachers, with unstable internet and device compatibility being the most reported barriers, followed by insufficient training and support. Among respondents, 72% cited real technical issues, while 28% mentioned perceived concerns like AI reliability. Students' experiences also impact ICT effectiveness in Chinese learning. While some benefit from AI-driven pronunciation feedback, others struggle with digital character input, lacking handwriting reinforcement. Addressing these challenges through improved infrastructure, teacher training, and better digital accessibility is crucial for optimizing ICT integration.

## 4.4 Addressing These Challenges

Targeted solutions should be implemented, focusing on infrastructure, teacher training, AI-driven tools, and blended learning models. Schools must invest in network stability and device compatibility to prevent disruptions in online learning while providing comprehensive teacher training through regular ICT workshops and certification courses to build educators' confidence in using digital tools effectively. Additionally, developing AI-driven speech recognition software tailored for Chinese tones and handwriting assessment systems can offer students more accurate real-time feedback, improving pronunciation and writing instruction. Expanding blended learning models by integrating online and offline strategies can enhance engagement, reduce digital fatigue, and create a more interactive, student-centered language learning experience.

## 5. Recommendations and Conclusion

ICT has significant potential to enhance Chinese language education, but its success depends on addressing technical, pedagogical, and motivational challenges. Effective implementation requires structured policies, continuous teacher training, and institutional support. Schools must invest in digital infrastructure, professional development, and AI-driven tools tailored to Chinese learning, such as character recognition, tone accuracy, and grammar application. At the policy level, government agencies should subsidize ICT teacher training in Thai international schools to equip educators with essential digital skills. National policies should mandate AI integration in foreign language curricula, ensuring AI-powered tools address Chinese learning challenges. Collaboration between the Ministry of Education and technology developers is vital to refining AI-driven pronunciation tools for tone differentiation and sentence structure analysis. Cost-effective AI solutions like Speechling and Google AI's tone recognition system should be incorporated into teacher training programs, with localized initiatives helping Thai educators enhance ICT skills.



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Institutions must prioritize ICT support by establishing dedicated teams to assist teachers with technical issues and digital integration. Regular workshops should familiarize educators with emerging tools and best practices. Structured hybrid learning programs can balance online and in-person instruction, maximizing the benefits of blended learning models. From a pedagogical perspective, integrating gamified AI tools can enhance student motivation and learning outcomes. AI-powered pronunciation trainers should offer real-time corrective feedback on tone accuracy and fluency. Interactive platforms with customized Chinese character exercises can build literacy skills, while VR applications provide immersive conversational practice.

Future research should examine the long-term impact of AI-driven pronunciation tools on students' oral proficiency, particularly in tone differentiation and fluency. Comparative studies of online and hybrid learning approaches can identify the most effective instructional models. Research on teacher attitudes toward ICT adoption is crucial, as educators' perceptions influence technology integration. Investigating the costeffectiveness and scalability of ICT tools can guide institutions in making informed investment decisions. Additionally, ethical concerns (data privacy, student security, and AI biases) must be addressed through clear guidelines. The integration of ICT in Chinese language education presents both opportunities and challenges. While AI-powered tools and digital platforms offer innovative solutions, their success depends on structured implementation, teacher preparedness, and technological advancements. This study highlights ICT adoption barriers and proposes policy, institutional, and pedagogical strategies. Institutions can enhance Chinese language instruction effectively and sustainably by investing in infrastructure, professional development, and AI-driven solutions. Future research should refine digital tools to better support educators and students in Chinese language acquisition. This study builds upon ICT research in foreign language education by focusing on Chinese instruction in a Thai international school. Unlike studies on English as a foreign language (EFL), it highlights Chinese-specific challenges such as tone differentiation and character memorization. The findings contribute to understanding ICT's role in non-alphabetic language instruction, particularly in Southeast Asia's multilingual education landscape.

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[72]

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25 APRIL 2025

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