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An AI-Driven Flipped Classroom Framework for Online Thai Language Instruction: A Case Study of Chinese International Students in Thailand

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Abstract

The rapid development of generative artificial intelligence (GenAI) has created new possibilities for language teaching, particularly in lesson preparation, instructional support, feedback, and learner analysis. However, existing research has paid relatively limited attention to how GenAI can be embedded into a continuous teaching process in online vocational language courses. This study proposes an AI-driven closed-loop flipped classroom framework for online vocational Thai language instruction and examines its implementation with 30 second-year Chinese undergraduate students studying in Thailand. All participants were non-Thai majors with basic Thai conversational proficiency. The course consisted of 30 instructional hours delivered online over 15 weeks. Qianwen was used primarily for pre-class instructional preparation, while Yuanbao, integrated with Tencent Meeting, supported the organization and analysis of classroom records, learner responses, interactions, and feedback. After each class, the instructor recorded individual learner performance and knowledge needs and conducted post-class feedback conversations with approximately five students to inform subsequent lesson planning. Three representative teaching cases were analyzed: teacher-driven preparation for meeting-related Thai expressions, AI-supported diagnosis of lexical confusion during workplace scenario presentations, and continuous curriculum adaptation based on classroom observation and learner feedback. The findings suggest that GenAI can function as a pedagogical support layer rather than a substitute for teacher judgment. The study therefore proposes a closed-loop process of learner needs, AI-assisted preparation, flipped scenario-based performance, AI-supported diagnosis, teacher intervention, learner feedback, and curriculum adaptation. The framework provides a practical model for integrating GenAI into online vocational Thai instruction while maintaining teacher agency and contextual pedagogical judgment.

Keywords: *Online Language Teaching, Flipped Classroom, Generative AI in Education, vocational Thai, Case Study*

1. Introduction

The rapid development of generative artificial intelligence (GenAI) has created new possibilities for language education. Recent research has examined the use of GenAI for language learning, instructional material development, feedback, learner support, and teacher preparation.[11][7]. However, the emerging literature also emphasizes that the pedagogical value of GenAI depends not simply on the availability of AI tools, but on how these tools are integrated into meaningful instructional processes [5][9].

A growing body of research has examined GenAI in language education. Law's (2024) scoping review identifies a rapidly expanding body of research on GenAI applications in language teaching and learning, while a systematic review of the first year of ChatGPT-related research in language education indicates that GenAI has been explored for self-directed learning, content generation, and teacher workflows [7][8]

At the same time, flipped learning has become an established pedagogical approach in second language education. In a meta-analysis of 56 reports involving 61 samples and 4,220 participants, Vitta and Al-Hoorie (2020) found that flipped classrooms generally produced positive effects across language learning outcomes, although substantial heterogeneity was observed across studies. Importantly, their findings suggest that future research should move beyond the general question of whether flipped

learning is effective and examine the conditions and processes through which its effectiveness can be maximized [12].

To bridge the gap between general language knowledge and workplace communication in vocational Thai education, the application of Task-Based Language Teaching (TBLT) is both necessary and feasible. The necessity of TBLT stems from the demand for equipping students with context-specific vocational vocabulary and communicative competence to succeed in the workplace [10]. Meanwhile, its feasibility is demonstrated by TBLT's student-centered methodology; through real-world tasks, it promotes meaningful interactions, enhances learning motivation, and increases overall language proficiency [10].

In online vocational Thai instruction, another challenge is that learners' individual needs may emerge dynamically during classroom interaction. A predetermined lesson plan may therefore be insufficient to address differences in vocabulary needs, communicative strategies, lexical confusion, and workplace scenarios.

GenAI may provide a possible solution by supporting teachers at different stages of instruction. Recent research has examined GenAI as an assistant for lesson planning, instructional design, feedback, and classroom learning support [7][8]. For example, research on GenAI-assisted instruction suggests that AI can support the rapid design and assessment of instructional activities [13], while other studies emphasize that AI-generated materials require teacher evaluation and pedagogical adjustment [5][9].

Although GenAI shows considerable potential in language education, important research gaps remain. Existing studies have increasingly examined GenAI for language learning, feedback, content generation, and instructional support. However, the literature remains strongly concentrated on English-language and EFL contexts, while comparatively less attention has been given to other languages and authentic vocational language-learning settings. Moreover, much of the existing research has examined individual applications of GenAI rather than how AI can be integrated across interconnected stages of an instructional process.

Accordingly, the key issue is no longer simply whether GenAI can be used in language education, but how it can be meaningfully integrated into authentic, context-specific teaching processes. This study addresses this process-oriented gap by examining the integration of GenAI into an online vocational Thai language course for Chinese undergraduate students in Thailand. Rather than statistically evaluating the effectiveness of AI, the study investigates how AI-supported information can contribute to pre-class instructional preparation, classroom diagnosis, teacher intervention, learner feedback, and subsequent curriculum adaptation. On this basis, the study proposes an AI-driven closed-loop flipped classroom framework that positions GenAI as a pedagogical support layer while maintaining teacher professional judgment at the center of instructional decision-making. Specifically, this study addresses the following research question: How can Generative AI be systematically integrated into an online flipped vocational Thai course to facilitate teacher decision-making and continuous curriculum adaptation?

2. AI-Supported Flipped Classroom Framework

Flipped learning reverses the conventional sequence of instruction by moving initial content exposure outside the classroom and using classroom time for interaction, practice, and problem-solving [1]. Research in second language education has reported generally positive effects of flipped learning while also emphasizing the importance of instructional design and contextual conditions [12]. In vocational language education, this approach can be particularly useful when classroom activities are organized around authentic communicative situations and workplace-related tasks [6][10].

Recent research has increasingly examined the use of generative AI in language education, including content generation, feedback, learner support, and instructional planning [5][7][8]. Generative AI refers to deep learning algorithms capable of learning from existing unstructured data to generate novel, syntactically coherent content—such as text, images, or audio—based on user prompts [2][4]. However, AI should not be viewed as an autonomous teacher. Its pedagogical value depends on how AI-generated information is interpreted and integrated by teachers into specific instructional contexts [5][9].

Based on these perspectives, this study conceptualizes GenAI as a pedagogical support layer within a teacher-led flipped classroom. In the proposed approach, Qianwen supports pre-class instructional preparation, while Yuanbao supports the organization and analysis of classroom responses

and feedback. The teacher remains responsible for interpreting learner information, making pedagogical decisions, and adapting subsequent instruction [2][3][6].

3. Methodology

3.1 Participants and Course Design

The study involved 30 Chinese undergraduate students studying in Thailand. Grounded in Social Constructivism, which asserts that language learning occurs through meaningful social interaction in authentic contexts, the course design prioritized real-world workplace application rather than isolated rote learning. All participants were non-Thai majors with basic Thai conversational proficiency. To support these lower-intermediate learners without causing cognitive overload during complex workplace tasks, the course operationalized Scaffolding Theory by embedding generative AI (GenAI) technologies as adaptive instructional scaffolds. Specifically, Qianwen provided personalized pre-class material preparation, while Yuanbao, integrated with Tencent Meeting, supported synchronous instruction, real-time classroom interaction, and post-class learner analytics. This AI-enhanced closed-loop framework delivered structured, step-by-step supports throughout a 30-hour online vocational Thai language course conducted over 15 weeks (two hours per week) (see Table 1). Aligning with these theoretical and technological foundations, the curriculum systematically focused on workplace vocabulary, practical communication expressions, scenario-based language practice, and authentic workplace communication tasks.

3.2 AI-Supported Teaching Process

Table 1. AI-Supported Teaching Process

Stage	Main Activity	AI-Supported Function	Teacher Role
Pre-class	Lesson preparation	Qianwen: instructional suggestions and scenario generation	Evaluate and adapt
In-class	Scenario presentation	Yuanbao: organize classroom responses and feedback	Diagnose and intervene
Post-class	Observation and feedback	AI-supported information organization	Record needs and adapt in next lesson

3.3 Data Collection and Analysis

Data included classroom observation records, individual learner performance records, student presentations, post-class learner feedback, and qualitative feedback conversations with approximately five students after each class. The data were analyzed using thematic analysis following Braun and Clarke [3] to systematically identify, analyze, and report patterns within the qualitative dataset. This method is particularly suited for this study as it offers the flexibility needed to interpret diverse qualitative data sources and capture the dynamic, iterative nature of online language instruction. Through an inductive coding process, the analysis focused on identifying recurring patterns across four core dimensions: evolving learner needs, synchronous classroom difficulties, pedagogical teacher interventions, and subsequent curriculum adaptations. This analytical approach yields a granular, evidence-based understanding of how GenAI tools function as adaptive scaffolds in practice, ultimately generating an actionable, closed-loop pedagogical framework for AI-driven online vocational language instruction.

4. Findings and Discussion

4.1 AI-Assisted Preparation: Facilitating Human-AI Co-Design and Learner-Driven Instruction

The first case focused on workplace communication related to scenario-based meeting communication. Grounded in Social Constructivism, which emphasizes learning through authentic social interaction, the activity engaged students prior to the lesson in identifying the vocabulary and communicative situations they considered necessary for workplace interaction. Based on this learner

input, teaching objectives, and contextual materials, Qianwen was utilized to generate targeted suggestions for vocabulary preparation, scenario design, and classroom organization.

To operationalize Scaffolding Theory and ensure these AI-generated materials remained pedagogically appropriate, the instructor evaluated, refined, and contextualized these suggestions prior to implementing them in the flipped classroom. Students subsequently prepared relevant expressions and presented their understanding through simulated workplace interactions. Based on their performance, the instructor identified individual gaps in vocabulary knowledge and communicative competence, providing timely supplementation and consolidation.

This process aligns closely with the foundational principles of flipped learning, which reallocates classroom time from passive knowledge delivery to active interaction, practice, and problem-solving [1]. While previous research highlights the positive outcomes of flipped learning in second language education alongside the need for careful instructional design [12], this case demonstrates how GenAI can be effectively embedded into the pre-class preparation stage as a dynamic digital scaffold to enrich this process.

Crucially, Qianwen's role extends beyond automated lesson plan generation. Its true pedagogical value lies in enabling seamless Human-AI collaboration, where the technology empowers the instructor to dynamically reorganize instructional possibilities around real-time learner needs and professional contexts. This shifts AI-assisted lesson planning from static content generation toward an interactive, adaptive process. In this collaborative ecosystem, GenAI acts as a responsive cognitive co-pilot, while the instructor maintains essential pedagogical agency—contextualizing, refining, and applying AI-generated insights.

Furthermore, the case underscores the necessity of authentic communicative contexts in vocational language education. Rather than acquiring workplace terminology as isolated linguistic items, students applied knowledge within simulated professional scenarios. This approach accords with Situated Learning Theory, which posits that language acquisition is deeply tied to participation in meaningful social practices [10]. Ultimately, the strength of this approach lies in the synergy between GenAI's generative capabilities and the teacher's contextual judgment, establishing a sustainable model for teacher-AI co-design in online vocational education.

4.2 AI-Supported Real-Time Diagnosis: Complementing Teacher Expertise in Synchronous Instruction

The second case illustrates the pivotal role of GenAI during live, synchronous classroom interactions. During students' workplace scenario presentations, several learners exhibited confusion between Thai near-synonyms and phonetically similar vocabulary. The instructor first identified this linguistic challenge through direct observation and learner responses. To process real-time learner data efficiently, Yuanbao was integrated into the live Tencent Meeting session, leveraging its Natural Language Processing (NLP) and real-time text analytics to aggregate, categorize, and synthesize unstructured chat-box responses and student interaction data. Rather than acting as an autonomous teacher, Yuanbao functioned as a real-time diagnostic engine, converting high-volume, fragmented interaction data into synthesized insights that helped identify recurring learning bottlenecks across the class. Combining this AI-organized information with domain expertise in Thai pedagogy, the instructor subsequently provided targeted explanations, contextualized examples, and vocabulary expansions.

This case highlights a critical theoretical distinction between AI-supported diagnosis and autonomous AI diagnosis. Recent literature has extensively documented the potential of GenAI in providing instructional support and feedback [5][7]. However, the present findings reveal that the pedagogical efficacy of such support remains strictly dependent on teacher interpretation. Yuanbao did not independently diagnose the underlying cognitive causes of students' linguistic errors, nor did it prescribe pedagogical interventions. Instead, it served as an intelligent information-sorting and diagnostic mechanism that complemented the teacher's direct observations and pedagogical intuition.

This finding directly reinforces the human-in-the-loop and teacher-centered stance of the proposed framework. As Luckin, R., George, K., & Cukurova, M. (2022) emphasize, the integration of AI into educational contexts does not diminish the primacy of human expertise and professional judgment [9]. In this study, the instructor retained essential pedagogical agency and sole responsibility for evaluating whether an observed language error warranted intervention, diagnosing its root causes, and selecting an appropriate pedagogical strategy. AI therefore operated as a real-time cognitive-support layer rather than an autonomous instructional agent.

Furthermore, the case demonstrates a key operational advantage of integrating AI into synchronous online language teaching: cognitive load reduction. In conventional online environments, instructors often experience severe cognitive overload as they simultaneously monitor student participation, track chat-box activities, identify linguistic errors, and deliver real-time explanations. The AI-driven organization of classroom data alleviates this burden by managing real-time feedback processing. Crucially, this does not imply that AI replaces teacher observation; rather, AI and teacher expertise operate at synergistic and complementary levels—AI processes, structures, and reduces the dimension of complex data, whereas the teacher interprets meaning, exercises contextual judgment, and executes pedagogical decisions.

4.3 Continuous Adaptation: From Classroom Feedback to the Next Lesson

The third case concerns the post-class stage of the instructional cycle. After each lesson, the instructor recorded individual student performance, knowledge needs, and classroom feedback. The instructor also conducted post-class feedback conversations with approximately five students to obtain more direct information about their learning needs. These observations and feedback were then considered in preparing subsequent lessons, with Qianwen supporting lesson planning and Yuanbao supporting the organization of classroom information. In this way, information generated in one lesson became an input for the design of the next lesson.

This process extends the use of GenAI beyond individual classroom tasks toward continuous instructional adaptation. Previous research has highlighted the potential of GenAI to support teachers in instructional preparation and educational decision-making [5][7]. The present study further suggests that the pedagogical value of AI can emerge from its position within a repeated instructional cycle rather than from any single AI-generated output.

Importantly, classroom observations and student feedback indicated a continuing trend of improvement in students' classroom participation, learning engagement, performance, and subsequent knowledge mastery during the teaching process. These observations should be interpreted cautiously, however, because the study did not employ standardized pre- and post-tests or a control group. Therefore, the findings do not establish a causal effect of AI on learning outcomes. Instead, they provide qualitative evidence of how AI-supported information, teacher observation, and learner feedback were incorporated into an ongoing process of instructional adjustment.

Taken together, the three cases reveal a progressive integration of AI into different stages of teaching. In the first case, Qianwen supported pre-class instructional preparation; in the second, Yuanbao supported classroom information organization and diagnosis; and in the third, classroom records and learner feedback informed subsequent instructional adaptation. Thus, the significance of AI in this study lies less in individual AI-generated outputs than in its integration into a continuous teacher-led process.

4.4 The AI-Driven Closed-Loop Framework

The findings across the three cases culminate in a comprehensive framework for GenAI integration (see Figure. 1).

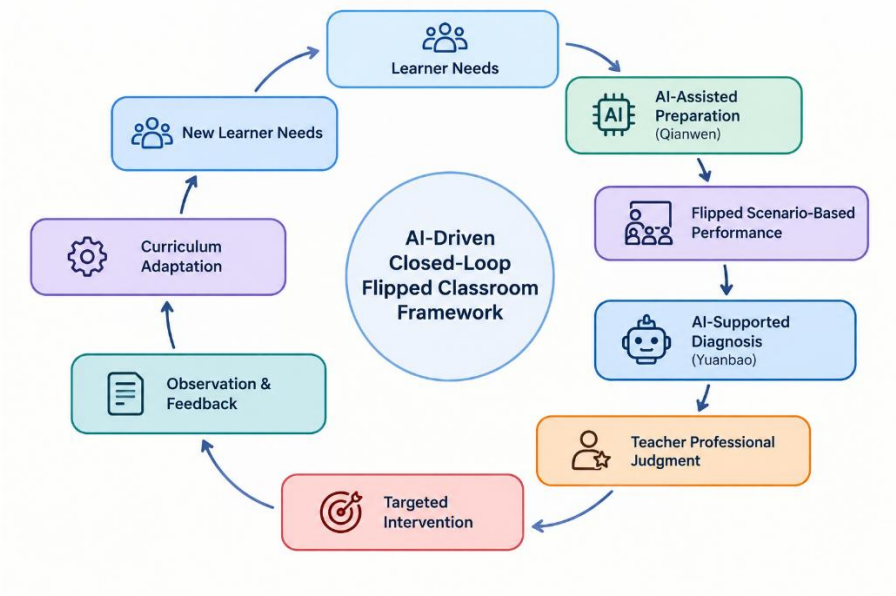


Fig. 1. AI-Driven Closed-Loop Flipped Classroom Framework

The framework integrates AI across three interconnected functions: pre-class preparation, classroom diagnosis, and post-class curriculum adaptation. Specifically, Qianwen primarily supports the first stage by helping the instructor understand learner-driven instructional options and authentic workplace scenarios, while Yuanbao supports the real-time synthesis, categorization, and analysis of classroom responses during synchronous instruction.

Crucially, the teacher remains the central decision-maker throughout the entire cycle. While AI generates instructional options and organizes classroom data, the instructor interprets this information through the lens of learner characteristics, domain-specific language knowledge, and pedagogical objectives. The framework therefore conceptualizes GenAI not as an autonomous instructional agent, but as a dynamic pedagogical support layer embedded within a teacher-led instructional cycle.

This teacher-led, AI-driven closed-loop model is particularly relevant to vocational language education, where learner needs are highly diverse and workplace communication demands deeply contextualized practice. By positioning the teacher as the primary pedagogical decision-maker and AI as a responsive cognitive scaffold, this framework avoids treating AI as an isolated technological intervention. Instead, it seamlessly connects AI-supported preparation, live classroom interaction, learner feedback, and iterative curriculum adaptation into a continuous, evidence-based teaching cycle.

5. Conclusion & Pedagogical Implications

This study examined how Generative AI can be meaningfully integrated into online vocational situated language learning within online vocational Thai language education, shifting the focus from quantifying general AI efficacy to understanding its role within a process-oriented pedagogical workflow. Based on a qualitative case study with 30 Chinese undergraduate students in Thailand, three instructional scenarios demonstrated AI's multi-stage support: Qianwen facilitated pre-class, learner-driven lesson preparation; Yuanbao supported synchronous classroom information organization and real-time diagnosis; and accumulated learner feedback directly informed subsequent curriculum adaptation.

The findings indicate that the primary value of GenAI lies not merely in automated content generation or isolated feedback, but in serving as a pedagogical support layer within a continuous, teacher-led instructional cycle. On this basis, the study proposed a teacher-led AI-driven closed-loop flipped classroom framework that systematically links learner needs, AI-assisted preparation, scenario-based performance, AI-supported diagnosis, teacher professional judgment, feedback, and iterative curriculum adaptation.

By focusing on the under-researched context of situated language learning in online vocational Thai instruction, this study contributes a practical and theoretical model to the emerging literature on GenAI in language teaching. Future research should validate and refine this framework across larger sample

sizes, varied language proficiency levels, and diverse educational settings, complemented by systematic learning-outcome measures.

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