Rethinking Technology Integration in Chinese Language Teaching: Insights from the Four-Level Feedback Theory (重新审视科技在中文教学中的应用：四级反馈理论的启示)

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Abstract: This study explores how technological tools support feedback mechanisms in Technology-Assisted Chinese Language Teaching (TACLT) by using Hattie and Timperley's (2007) Four-Level Feedback Theory (FLFT) as the evaluative framework. After reviewing 15 studies published in the *Journal of Technology and Chinese Language Teaching* (JTCLT) from 2022 to 2024, the research assesses the extent to which task-level, process-level, self-regulation, and self-level feedback are integrated into instructional designs. The findings reveal that while task-level feedback is widely implemented through correction-based technologies, process-level and self-regulation feedback are only moderately integrated, and self-level feedback remains largely underdeveloped. The paper argues that technology alone cannot fully address all feedback dimensions and advocates for teachers to actively design instructional activities that complement technological tools, especially in fostering metacognitive engagement and learner motivation.

摘要：本研究运用 Hattie 和 Timperley（2007）提出的"四级反馈理论作为评估框架，探讨了技术工具在科技辅助中文教学中对反馈机制的支持作用。通过分析期刊《科技与中文教学》在 2022 年至 2024 年间发表的 15 篇相关研究，本文评估了各个教学设计中科技运用在任务层面、过程层面、自我调控层面以及自我层面的反馈的整合程度。研究结果显示：虽然纠错类技术广泛用于任务层面的反馈，但过程层面与自我调控层面的反馈仅被中等程度地融入教学中，而自我层面的反馈仍明显不足。文章指出，仅靠科技技术本身无法有效全面覆盖所有反馈层面，因此教师应在教学中积极设计有效的教学活动，以弥补科技反馈的不足，尤其是在促进学生元认知投入与学习动机方面发挥关键作用。

Keywords: Technology-Assisted Chinese Language Teaching, Four-Level Feedback Theory, Instructional design, Pedagogical Effectiveness

关键词：科技汉语教学，四层级反馈理论，教学设计，教学效果

1. Introduction

Technology-Assisted Chinese Language Teaching (TACLT) has developed unprecedentedly after the global pandemic in 2022 and the sheer momentum of generative AI in 2023. More than ever, language educators regard technology as an instructional resource to supplement traditional classroom teaching across diverse age groups (Ma et al., 2023; Sun et al., 2023; Tan et al., 2022; Wang, 2024; Wu, 2022; Zhang, 2022). Such a direction varied from digital games creating new affordances for instructional design (Frederick et al., 2022) to the integration of text-to-speech technologies (Wang et al., 2022) and speech-to-text technologies (Feng & Tian, 2025) into Chinese language classrooms. Other research concerns ways to improve participants' experiences of synchronous online teaching (Bao & Chen, 2022; Gong et al., 2023) and asynchronous learning through information and communication technology (Luo, 2023) and social learning platforms (Ji & Lin, 2024). After the introduction of ChatGPT in November 2022, possibilities regarding integrating AI into language education opened up. Recently, several studies showcased its capabilities in promoting various aspects of language learning: writing development (Pool & Coss, 2024), oral proficiency (Li et al., 2024), vocabulary acquisition (Zhao et al., 2024), writing feedback (Yang & Tian, 2024), and many other aspects of language learning.

While there is much enthusiasm for technology integration, a significant gap exists between perceived potential and actual practice. For example, while many language educators, researchers, and instructors claim successful technology integration in their teaching practice, a few have experienced unexpected challenges that impede using such tools effectively to improve student learning outcomes (Tian, 2020). In this case, technology integration seems to focus on the sophistication of the technology itself rather than on pedagogical effectiveness and the actual learning outcomes, raising a serious question regarding its actual role in developing language proficiency. Such a gap underlines the pressing need for a systematic framework for reviewing and guiding technology integration into language teaching.

Previous research on technology integration in language education has mainly focused on elaborating the implementation strategies and measuring learning outcomes. Much less concern was given to developing the theoretical frameworks that would guide the educator's choices about technology integration. This study attempts to fill this void by arguing for applying Hattie and Timperley's (2007) four-level feedback model as a theoretical framework through which the implementation of educational technologies may be evaluated within language classrooms. Educators are also provided with a theoretical lens through which they can analyze the nature and quality of feedback different technological tools afford and develop more rigorous criteria for judgment and justification in implementing technologies in their teaching practices.

2. Literature Review

2.1 Feedback Theory in Language Learning

Feedback plays a significant role in language learning, bridging instructional input and learner output. As Brandl (2008) highlights, the primary role of feedback is to be informative, enabling learners to recognize discrepancies in their current target language (TL) use and guiding them toward repairing errors. It supports learners in testing and refining their understanding and hypothesis of TL rules, which is important in facilitating language acquisition. After reviewing second language acquisition theories in educational contexts, the current study found that Hattie and Timperley's (2007) four-level feedback model (FLFM) may provide a solid theoretical framework for evaluating the effectiveness of technology integration in language learning. The framework outlines four levels of feedback: task, process, self-regulation, and self. Each level contributes uniquely to the language learner's development and achievement of learning goals (See Table 1 on next page).

More specifically, Hattie and Timperley (2007) stated that task-level feedback (FT) relates directly to the performance of a task, such as how one distinguishes between right and wrong answers. This type of feedback is most common in language learning and might involve immediate corrections of language use, such as pronunciation and grammatical errors. This level is fundamental as it provides the basic information for language acquisition. Task-level feedback becomes most effective when it helps students identify and reject incorrect assumptions that have formed during their language learning, accompanied by particular information needed to acquire the correct forms. An emphasis on such task-level feedback runs the risk of creating a learner who becomes overly fixated on the immediacy of correctness and underdevelopment in broader strategic areas that support independent learning, hence creating a gap in the development of transferable skills associated with long-term language proficiency.

Hattie and Timperley (2007) also suggested that the process-level feedback (FP) addresses the main processes needed to understand or perform tasks. This includes feedback about strategies for language acquisition, techniques for oral communication, or approaches to reading comprehension. Process-level feedback is particularly important in language learning as it helps students develop effective learning strategies and understand the underlying mechanisms of language acquisition. Process-level feedback emphasizes deeper learning by focusing on the relationships between ideas, cognitive processes, and the transfer of knowledge to untried tasks (Marton et al, 1993). According to Earley et al. (1990), feedback at this level tends to be more powerful than task-level feedback in terms of promoting deeper learning and mastery of knowledge.

Table 1 The Focus, Key Features, Benefits, and Drawbacks of FLFM

Feedback Level	Focus	Key Features	Potential Benefits	Potential Drawbacks
Task-Level Feedback (FT)	Correctness of task performance	Immediate correction of language use, e.g., pronunciation or grammar. Provides basic information for language acquisition.	Helps identify and reject false assumptions. Provides specific guidance for accurate information acquisition.	Overemphasis may lead to prioritizing correctness over broader learning strategies.
Process-Level Feedback (FP)	Main processes for understanding or performing tasks	Feedback on strategies, techniques, or approaches, e.g., strategies for oral communication or reading comprehension.	Promotes deeper learning, understanding mechanisms of language acquisition, and knowledge transfer.	None explicitly mentioned but requires learners to apply feedback effectively to maximize benefits.
Self-Regulation-Level Feedback (FR)	Self-monitoring and self-evaluation capabilities	Develops learner autonomy and metacognitive strategies. Creates internal feedback loops.	Enhances self-efficacy and learning outcomes by encouraging task focus and effort investment.	The impact depends on student confidence and willingness to process feedback.
Self-Level Feedback (FS)	Personal feedback directed at the "self."	Focuses on praise rather than task-related information. Rarely translates into improved learning unless tied to effort or strategies.	Improves motivation when linked to effort or strategies.	Minimal impact on performance unless explicitly connected to actionable insights.

At the self-regulation level (FR), Hattie and Timperley (2007) explained that feedback directs attention to students' self-monitoring and self-evaluation capabilities. This level helps develop learner autonomy in language acquisition, improving students' metacognitive strategies for assessing their learning progress. Self-regulatory feedback involves creating internal feedback loops where learners evaluate their performance and the processes they use (Winne & Butler, 1995). However, the impact of self-regulation-level feedback depends on students' confidence in their responses and their willingness to invest effort in processing feedback (Kulhavy & Stock, 1989). Research indicates that feedback to enhance self-efficacy and self-regulation can significantly improve learning outcomes by encouraging students to redirect attention to tasks and invest greater effort (Kluger & DeNisi, 1996).

The fourth level, self-level feedback (FS), involves personal feedback directed at "self." This kind of feedback is generally regarded as the least effective because it contains little task-related information, which seldom translates into improvements in language learning outcomes. According to Hattie & Timperley (2007), while students tend to like praise, its impact on performance is minimal unless it specifically relates to the effort, processes, or strategies used to accomplish a task. In this regard, praise should be directed at effort and strategy to be effective, providing students with insight that can be applied to future tasks (Burnett, 2002). In this respect, self-level feedback is commonplace in traditional classroom settings, although it has uniquely problematic features within technology-enhanced learning environments, which require specific, actionable feedback.

2.2 Four-Level Feedback Theory: Current Applications and Research Gap

Feedback is an area that researchers have thoroughly investigated in education, and many reports have been made on how various strategies may affect students' achievement. However, the application of Hattie and Timperley's (2007) Four-Level Feedback Theory has been relatively limited in the literature, especially when it comes to fully incorporating all four levels: task, process, self-regulation, and self. This section provides an overview of the general landscape of feedback research, then narrows down to studies specifically engaging with the four-level framework, before finally identifying critical gaps in the current applications of this theoretical model.

Recently published literature views feedback in educational contexts through an array of lenses. Many studies have examined feedback strategies in education without directly referencing the four-level feedback model. Within higher education contexts, Sato et al. (2018) researched the role of instructor feedback in large-enrollment biology classes. In professional development settings, Johnson, Sondergeld, and Walton (2019) focused on the implementation of formative assessment across three urban districts. For vocational education, Peters et al. (2018) studied the role of formative assessment scripts in scaffolding peer feedback. These studies, along with others like Panadero et al. (2019) and Ritzhaupt et al. (2018), assume feedback as a general means toward improving learning but lack elaboration at a more detailed level.

A smaller subset of studies explicitly mentions the four-level feedback framework, but these studies often treat it as a reference point rather than fully utilizing it as an analytical tool. For example, in the study by Baadte (2019), the influence of short-term video-based interventions on the development of teacher feedback skills in support of students' self-regulated learning was investigated, taking a four-level framework into consideration but not fully applying it.

In contrast to these broader approaches, only a few studies have fully employed the Four-Level Feedback Theory as a primary analytical framework. Among them, Muthukrishnan et al. (2024) and Roby (2022) conducted research specifically using the four-level feedback framework within the context of English as a Second Language (ESL) instruction. These studies applied the four-level feedback concepts systematically to investigate the impact of feedback on language learning outcomes. For example,

Muthukrishnan et al. (2024) examined the relationship between feedback types and growth mindset among secondary school ESL learners, emphasizing the role of process and self-regulation feedback in fostering student motivation and performance.

Of particular relevance to Chinese language education, Ding and Chew (2019) investigated online feedback practices in Chinese language learning, exploring how online feedback benefited learners through metaphorical perceptions. While their study shares similar interests in technology-enhanced feedback and Chinese language instruction, they only touched upon elements of the four-level model without fully applying it as an analytical framework. Despite their valuable insights into online feedback in Chinese language learning, their research further highlights the need for a more systematic theoretical approach to understanding feedback in technology-enhanced language instruction.

While feedback theory has been widely explored in education, a preliminary search in Google Scholar suggests a notable gap in the literature: a query for "four-level feedback" returned only a handful of relevant results, with just five directly engaging with Hattie and Timperley's framework. The search was conducted using the keywords "four-level feedback," "Hattie and Timperley," and "language learning," which together yielded fewer than twenty results published between 2007 and 2024. Although not exhaustive, this finding aligns with recent meta-analyses on feedback in language education (e.g., Panadero et al., 2019), which similarly note that the four-level model remains underrepresented in applied language studies. This gap is particularly evident in Chinese language education and technology-enhanced instruction, where no studies have comprehensively applied this theoretical model. Addressing this void, the present study systematically employs the four-level feedback framework to examine how feedback at the task, process, self-regulation, and self levels impacts learning outcomes in technology-mediated Chinese language instruction. By bridging this gap, the research offers both theoretical insights into the model's applicability in language education and practical strategies for optimizing feedback in technology-enhanced Chinese teaching.

3. Research question

This study examines how feedback mechanisms are expressed within Technology-Assisted Chinese Language Teaching (TACLT) through the lens of Hattie and Timperley's (2007) Four-Level Feedback Theory (FLFT). Specifically, it investigates how technological tools facilitate different levels of feedback in instructional design and to what extent current TACLT practices align with the FLFT framework. To provide a more focused analysis, the study addresses the following sub-questions:

1. How do recent TACLT studies incorporate the four feedback levels—task, process, self-regulation, and self—proposed by Hattie and Timperley (2007)?
2. To what extent do these studies demonstrate alignment or divergence between their instructional designs and the principles of FLFT?

3. What common trends and challenges emerge in the implementation of feedback mechanisms across different technological tools and learning contexts?

Together, these questions aim to clarify how effectively current technology-enhanced instructional designs in Chinese language education operationalize the multiple dimensions of feedback envisioned in the FLFT framework.

4. Methodology

4.1 Data Sources

To achieve this goal, this study primarily selects research published in the *Journal of Technology and Chinese Language Teaching* (JTCLT), a leading source of studies on the intersection of technology and Chinese language instruction in the U.S. [1] JTCLT provides a comprehensive perspective on the latest advancements in digital learning environments, AI-assisted language acquisition, and online language pedagogy, making it a highly relevant source for this investigation.

This investigation is based on JTCLT research from 2022 to 2024, when this research began. A total of 28 studies published during that period have been reviewed, supplemented by an additional study, Tian (2020), which was included due to its relevance as a typical counterexample in evaluating the Four-Level Feedback Theory. The selections cover a wide range of focuses, from AI applications and digital learning environments to online teaching, both synchronous and asynchronous, and even tool development for automated assessment, all towards the enhancement of the teaching of the Chinese language.

The current study reviews research on learners across multiple proficiency levels, from beginners to advanced, and in diverse instructional contexts, including distance learning, hybrid formats, and classroom-based technology integration. To manage this breadth, a systematic filtering process was applied to ensure alignment with the research objectives.

4.2 Data Collection Criteria

This study refines the dataset by considering the relevance of the articles on TACLT and the presence of instructional design elements in which technology is well integrated. The selected studies have been analyzed using Hattie and Timperley's (2007) Four-Level Feedback Theory to explore the feedback mechanisms concerning the specific mechanisms for feedback within the studies. The filtering process involved the following steps: The initial dataset consisted of twenty-eight JTCLT articles published between June 2022 and December 2024, plus Tian 2020, hence a total of twenty-nine. Studies would be included

[1] See *Journal of Technology and Chinese Language Teaching* at http://www.tclt.us/journal for details about its scope and recent issues.

in the current analysis based on whether they focused on TACLT, clearly showed instructional design elements in technology, discussed how technologies facilitate teaching, and were empirical about the discussion rather than the tool's theoretical argument or evaluation.

Studies were excluded if they primarily focused on technological tool evaluation or theoretical discourse without direct instructional design applications. This criterion excluded Ma et al. (2023), Poole & Coss (2024), Wang (2024), Li (2024), Qian (2022), and Juan (2023), as these writings either discussed the evaluation of AI models, digital tools, or applications of computational linguistics, or engaged in theoretical discussions without applying instructional design in Technology-Assisted Chinese Language Teaching. Additionally, studies emphasizing teaching methods within technological environments rather than technology-enhanced instruction were removed. Such studies include Bao & Chen (2022), Sun et al. (2023), Jiang & Xie (2022), Hu et al. (2023), and Lyu et al. (2023). These studies cover several pedagogical approaches, such as TPR and project-based learning, and their application to the online or digital context, but did not focus on how technology itself facilitated instructional feedback. Book reviews that do not examine instructional practice were also excluded (e.g., Kalyanov, 2024; Song, 2024).

After applying these criteria, 15 articles remained eligible for detailed analysis. Tian's (2020) research, which was also published on JTCLT, was added to the reference list here despite it being beyond the time scope because it serves as an illustrative case of an instructional design completely unaligned with FLFT. A further discussion of Tian's work will be undertaken in Section 5.4, as it represents a counterexample.

4.3 Data Analysis

The analysis was guided by Hattie and Timperley's (2007) Four-Level Feedback Theory (FLFT), which informed the criteria for evaluating how feedback was represented across the selected studies. Each paper was reviewed for the existence and effectiveness of feedback in the four dimensions and assigned a score from 1 (absent or minimally addressed) to 3 (explicitly described and well integrated), with 2 indicating partial or emerging integration. Rather than applying a rigid rubric, the grouping focused on the relative depth and clarity with which each study incorporated feedback within instructional design. For instance, higher scores reflected studies that explicitly demonstrated how technology supported feedback loops or learner reflection, whereas lower scores represented designs where such mechanisms were only briefly mentioned or implied. In this context, "well-integrated" refers to feedback that was systematically embedded in instructional activities and clearly connected to learning objectives rather than added as a peripheral feature. Illustrative examples of high- and low-integration cases are provided in Section 5 to demonstrate how these distinctions appeared across studies. This approach aimed to capture overall patterns and trends in feedback integration rather than to make fine-grained evaluative judgments about individual studies.

The scoring was conducted by the first author as a single-reviewer analysis, following consistent criteria across all studies to ensure interpretive coherence. Because

this was a single-reviewer analysis, no formal inter-rater reliability test was conducted; however, the scoring process emphasized consistency and transparency in applying the framework to all cases. The aggregated scores were then analyzed to identify recurring feedback patterns, as presented in Section 5.

5. Findings and Discussion

5.1 Statistical Analysis and Key Findings

Table 2 summarizes the technology tools used, instructional design goals, and feedback scores across all four levels for the 15 selected studies, ranked in descending order by their total scores. The statistical results indicate varying degrees of feedback implementation across the four levels. Task-level feedback (FT) attained the highest mean score of 2.73 (SD = 0.59), suggesting that most of the studies incorporated technology-facilitated corrective feedback for language tasks. Process-level and self-regulation feedback both had a mean score of 1.87 (SD = 0.74), indicating moderate integration of feedback on learning strategies and self-monitoring. Self-level feedback had the lowest mean score, 1.13 (SD = 0.52), confirming that very few studies provided personalized, motivational feedback. Given the relatively small sample size (n = 15), this study reports descriptive statistics (means and standard deviations) rather than inferential analyses. The goal is not to establish statistical generalizability but to identify observable patterns and relative tendencies in feedback integration across the selected studies.

Total scores showed that the average study received 7.60 points out of 12, with a median score of 8.00 and a standard deviation of 1.64. The best-scoring study was Ji & Lin (2024), with a total score of 10, indicating good compliance with all four feedback levels. The lowest total score was 4, as in the case of Tian (2020), which represented an instructional design with minimal feedback incorporation.

Considering the overall picture, none of the teaching designs seem to fully incorporate all four feedback levels to the extent envisioned in the framework. Indeed, much better integration was found at the task and process levels, while gaps persist at both the self-regulation and self-levels, indicating that learners are often not provided with structured opportunities to monitor their own progress autonomously or receive motivational feedback that optimally engages them. The self-level feedback is also poorly addressed in the studies, and this poses critical implications for how technology can better facilitate the learning and engagement of students in the Chinese language. The following sections will further analyze a highly aligned study (Ji & Lin, 2024), a study with mid-level match (Chang & Tseng, 2023) that represents a typical image in current research, and a low-aligned study (Tian, 2020) to illustrate these findings in greater detail.

Table 2 Summary of Technology Use, Design Goals, and Feedback Scores in 15 Studies

	Study	Tools	Design Purpose	FT	FP	FR	FS	Total Score
1	Ji & Lin, 2024	*Yellowdig*	Examine the implementation of asynchronous online discussion (AOD) using the *Yellowdig* platform in a Chinese heritage language course, highlighting its role in community building, resource sharing, and enhancing student engagement in online language learning.	3	2	2	3	10
2	Shan et al, 2024	*CFLingo*（Open AI API）	Explore how can task-based language teaching principles be effectively integrated with generative AI to create an adaptive language learning platform that enhances Chinese language acquisition through progressive task complexity and personalized feedback.	3	3	3	1	10
3	Qiu & Zhang, 2023	“北语中文智慧系统” (*BLCU* AI System for International Chinese Education)	Examine the effectiveness of an AI-supported reading-aloud practice system in enhancing advanced CSL learners’ oral proficiency	3	3	2	1	9
4	Ni & Rovira, 2024	digital dictionary	An analysis of digital Chinese dictionaries’ typologies, features, and applications in teaching Chinese as a foreign language.	3	2	3	1	9
5	Chang & Tseng, 2023	Data-Driven Learning (DDL) (*Sketch Engine*, *Concordance*, *Word Sketch Difference*, *Thesaurus*)	Examine the effectiveness of integrating Data-Driven Learning approach into teaching Chinese confusable words through a combination of indirect and direct corpus consultation methods.	3	2	2	1	8

6	Gong et al, 2023	*Zoom*	A case study exploring how Chinese as a Foreign Language (CFL) teachers utilize multilingual scaffolding, real-time interaction, and technology-enhanced feedback to promote behavioral, emotional, and cognitive engagement in online classrooms.	3	3	1	1	8
7	Luo, 2023	*Skype*, *Wechat*	How can virtual exchange platforms (*Skype* and *WeChat*) be effectively integrated into Chinese language teaching to promote both linguistic and cultural learning outcomes while addressing practical challenges in implementation?	2	2	3	1	8
8	Frederick et al., 2022	Digital RPG Game (*Legend of dragon*)	Explore how integrating a digital RPG game into Chinese dual language immersion classrooms affects both students' vocabulary/reading comprehension and creates pedagogical affordances for meaningful language interaction.	3	2	2	1	8
9	Tan et al., 2022	Open Educational Resource (*STARTALK eTower*)	Introduce *STARTALK eTower* as useful cultural resources and digital tools to enhance Chinese language proficiency, learner autonomy, and cultural competence in K-16 education.	3	2	1	1	7
10	Zhang, 2022	Online Accessible Resources (OAR)	Examine the effectiveness of intermediate CFL learners' use of online accessible resources to improve their language skills and cultural knowledge, while fostering autonomy and critical evaluation in their learning process.	3	1	2	1	7
11	Wu, 2022	*Open Learning Initiative* by CMU	Introduce an online Chinese language learning platform and discuss how to effectively incorporate it into a pedagogically effective and efficient Chinese online curriculum	3	2	1	1	7

12	Li et al, 2024	*ChatGPT-3.5*	Explore the acceptance of *ChatGPT*-assisted oral language practices among CFL learners, emphasizing the role of learning motivation and willingness to communicate in enhancing the adoption of AI-driven language tools.	3	1	2	1	7
13	Zhao et al, 2024	Large Langauge Modals (LLMs)，including *ERNIE4.0*、*Baichuan2-13B, and GPT3.5 Turbo*	Explore how can prompt engineering be optimized to enhance LLMs' effectiveness in identifying Chinese language learners' Zone of Proximal Development for near-synonym learning.	3	1	2	1	7
14	Wang et al, 2022	Text-to-speech & Speech-to-text technology	Evaluate the intelligibility of Chinese synthesized speech and Chinese as a second language learners' attitudes toward its use in language learning and instruction to assess its potential as a pedagogical tool.	2	1	1	1	5
15	Tian (2020)	Machine Translation, including *Sogou Translate*	Use Machine translation as a self-editing tool to improve students' writing proficiency.	1	1	1	1	4

5.2 Analysis of a High-Level Alignment Case

Among the selected studies, Ji & Lin (2024) stands out as a highly aligned case due to its comprehensive incorporation of feedback across all four levels of Hattie and Timperley's (2007) Four-Level Feedback Theory. Their study, which examines the use of asynchronous online discussions (AOD) in an online Chinese heritage language course, demonstrates a well-balanced instructional design that effectively incorporates technology to enhance both linguistic and metacognitive learning processes. The key strength of this study lies in its ability to integrate various forms of feedback through the *Yellowdig* social learning platform, making it one of the most successful examples of Technology-Assisted Chinese Language Teaching in terms of feedback design.

Ji & Lin (2024) effectively implement task-level feedback by providing corrective feedback on students' language use through asynchronous discussion activities. The *Yellowdig* platform enables students to receive peer and instructor feedback in an interactive format, reinforcing their language accuracy in a communicative setting. Furthermore, instructors review students' posts after each discussion cycle, identifying

common linguistic errors and addressing them in subsequent synchronous sessions. This structured approach ensures that task-related feedback is explicitly provided and integrated into the instructional process, aligning with the highest level of task-feedback effectiveness in the FLFT framework.

The study demonstrates strong support for process-level feedback, as the AOD platform facilitates collaborative learning strategies and encourages metacognitive engagement. Students are required to share external resources (e.g., articles, videos, and songs) related to class topics, explain their relevance, and reflect on their meaning. This reflective component prompts learners to engage in deeper processing rather than merely completing tasks for participation. Additionally, the instructor uses student-generated content to shape future synchronous discussions and supplementary reading materials, effectively bridging online discussions with structured classroom learning. By allowing students to drive the learning process and connect new knowledge with prior understanding, the study successfully incorporates process-oriented feedback mechanisms.

A defining characteristic of Ji & Lin's (2024) teaching design is its emphasis on learner autonomy and self-regulation feedback. The asynchronous nature of *Yellowdig* allows students to participate in discussions at their own pace, providing opportunities for self-monitoring and independent reflection. The grading mechanism also supports this: it tracks student participation and rewards rather than penalizes failures, thus relieving learners of responsibility for contributions. Minimal instructor intervention in the discussions further promotes self-regulated learning, given that students dispose of all means of interaction—indirect support is facilitated through post-discussion reviews. Thus, it corresponds well with the principle of self-regulation feedback and makes an excellent model within this category.

Unlike most of the studies analyzed in this review, Ji and Lin (2024) effectively integrate motivational and affective support into their instructional design. A "like" function on the *Yellowdig* platform enables students to appreciate others' contributions. This mechanism of social validation helps build community and engenders students' motivation to recall the associated benefits of participation. The gamified grading system provides positive reinforcement by granting points for participation and interaction, and not punishing errors. This feature mimics informal learning behavior on social media. During this process, feedback is natural and thus facilitating rather than evaluative. This contrasts with Tan et al.'s (2022) teaching design with *eTower*, which basically employs a unidirectional information delivery model and lacks interactively engaging features to support students' mutual engagement. By integrating peer feedback and social validation, *Yellowdig* effectively compensates for the limitations of *eTower*, providing a more interactive and emotionally supportive learning environment. As a result, Ji & Lin's study is one of the few that meaningfully addresses the affective dimension of feedback, demonstrating a well-rounded implementation of the FLFT model.

The comprehensive integration of feedback in Ji & Lin (2024) highlights the potential of asynchronous learning environments in TACLT. Unlike many studies that primarily emphasize task-based correction, this study balances all four feedback levels,

ensuring that students not only receive linguistic corrections but also develop higher-order learning strategies, self-regulatory skills, and intrinsic motivation. The interactive and student-centered design of the AOD component sets a strong example of how technology can be leveraged to optimize feedback mechanisms in online Chinese language instruction.

In contrast to lower-scoring studies, which often fail to integrate feedback beyond the task level, Ji & Lin (2024) successfully demonstrate how technology can create a dynamic and supportive learning environment. The following section (5.3) will analyze a case with mid-level match (Chang & Tseng, 2023) to illustrate both the potential and limitations of organized, technology-enabled feedback, before turning to a study demonstrating a low-level match (Tian, 2020) in Section 5.4.

5.3 Analysis of a Mid-Level Alignment Case

Four of the selected studies demonstrated a total feedback score of 8, placing them in the mid-range category within Hattie and Timperley's (2007) Four-Level Feedback Theory (FLFT). These are Chang & Tseng (2023), Luo (2023), Gong, Pang & Li (2023), and Frederick et al, (2022). While the total scores are the same, distribution across the four levels varies, making the selection of a representative mid-level case a deliberate process.

To identify the most suitable mid-level case, the current research considered studies that demonstrated a structured yet incomplete implementation of FLFT, where task-level (FT) feedback was strong, process-level (FP) and self-regulation (FR) feedback was present but not fully developed, and self-level (FS) feedback were weaker. This distribution reflects the most typical pattern among all analyzed studies, where task-level feedback tends to be the most systematically implemented, followed by process and self-regulation feedback, while self-level feedback remains the least developed. Among the three studies with a total score of 8, Chang and Tseng (2023) best exemplify this pattern (FT:3, FP:2, FR:2, FS: 1), making it the most representative mid-level case for analysis.

Chang and Tseng (2023) designed a five-week experimental course to investigate the role of Data Driven Learning (DDL) in helping learners distinguish between commonly confused Chinese word pairs. The first five sessions employed an indirect DDL in which the instructor pre-selected and organized corpus examples into paper-based materials for students to analyze collocations and grammatical patterns. The last five sessions employed an explicit DDL approach by having students directly work with *Sketch Engine* to discover linguistic patterns using the tools provided, such as the *Concordancer* and *Word Sketch Difference*. In this case, the teaching design merged the use of technological tools with task-based activities, guiding learners to notice usage differences in authentic contexts and inducing them to infer the lexical rules behind the usages through guided corpus exploration.

This teaching design reflects a very systematic form of task-level feedback, particularly in leading students to achieve more accurate lexical choices. Corpus tools such as *Sketch Engine*, *Concordancer*, and *Word Sketch Difference* engage participants in analyzing collocations, word frequencies, and semantic differences. These elements

provide effective and obvious corrective feedback as learners compare their output directly with authentic linguistic materials and know how to discriminate between confusable words. The feature of these technological tools aligns closely with task-level feedback (FT), involving immediate and accurate correction and assuring that the students get explicit input regarding their lexical errors. This systematic correction provided high ratings for task-level feedback in the present study.

Beyond these immediate corrections, the study also sought to deepen students' understanding of word relationships. This deeper engagement aligns with process-level feedback, which involves helping learners reflect on how they learn, not just what they learn. In this study, corpus-guided tasks were provided that made learners pay attention to patterns in word usage. For instance, learners were instructed to check how target words occur in different contexts, compare collocations, and make hypotheses about their meanings and grammatical functions. Much of this process, however, remained teacher-controlled: rather than engaging in free exploration, learners were set on a structured path involving word lists and research tasks. Students did some analytical thinking, but the chances for the independent development of strategies were limited. The lack of open-ended inquiry constrained deeper cognitive involvement, which positioned process-level feedback at a moderate level.

Another notable challenge in this study was the limited mention of self-regulation. Although corpus tools were available, and students were encouraged to consult linguistic data independently, the highly structured course did not allow them to develop autonomous learning habits. Unlike the more organic process of monitoring and adjusting one's lexical choices in free or less guided practice, corpus-based exercises were embedded in fixed instructional tasks, which all but skimmed the surface of individual reflection processes in learning. This implies that self-regulation feedback (FR) was available but rather limited here. While students possessed the means for self-assessment, self-tracking of language development over time was only sporadic. In this respect, self-regulation feedback in this teaching design was present but considerably less salient.

The most apparent gap in this case is self-level feedback (FS). The preoccupation with linguistic accuracy meant that correctness would always take priority over motivation and engagement. Unlike studies incorporating peer interaction, gamified elements, or explicit praise, this approach offered no mechanisms for emotional or motivational support, making self-level feedback the weakest component. In this model, students were to initiate their engagement solely through a linguistic curiosity and an interest in task completion, with no recognition of effort, no encouragement, and no validation of progress. While this spell is effective in developing lexical accuracy, this model lacks affective scaffolding, which is often a strong determining factor in maintaining long-term language engagement.

As a mid-level case, Chang and Tseng (2023) illustrate both the potential and limits of organized, technology-enabled feedback. On the one hand, its task-level feedback is well-developed, ensuring that students receive precise linguistic corrections and guided analytical training. On the other hand, its process-level, self-regulation, and self-level feedback remain underdeveloped, making it difficult for students to take ownership of their

learning progress or feel intrinsically motivated. Compared with highly aligned studies such as Ji & Lin (2024), in which explicit peer collaboration and interactive engagement are designed, this was a relatively more instructor-driven design. Compared with weakly aligned studies such as Tian (2020), in which feedback loops are unsuccessful or even largely absent, this provides a structure through which feedback can be given, assuring measurable learning outcomes.

5.4 Analysis of a Low-Level Alignment Study

Technological tools are undoubtedly valuable for enhancing Chinese language teaching. However, applying these tools in the classroom without considering the feedback that they provide may also impede learning. For example, Tian (2020) explored a failed teaching experiment to train intermediate-level Chinese language learners to use Machine Translation as a self-editing tool to improve their writing proficiency. The goal of this approach was to help students develop self-assessment skills using *Sogou Translate* for their homework. In this method, students wrote an essay in Chinese and then used *Sogou Translate* to convert their Chinese writings into English. By examining the English translations, students were expected to identify apparent mistakes in their Chinese essays. The underlying assumption was that, since *Sogou Translate* is highly accurate for intermediate-level texts, any incorrect English translation would indicate errors in the original Chinese sentences. Students would then revise their Chinese essays until they produced an acceptable English translation. However, Tian (2020) discovered that *Sogou Translate*'s advanced error tolerance often generated correct English translations despite errors in the original Chinese sentences. Consequently, students could not rely on machine translation to identify and correct mistakes in their Chinese writing, limiting the effectiveness of this approach in fostering writing proficiency.

FLFT provides a theoretical framework for understanding the failure of this teaching design. The primary issue was an over-reliance on task-level feedback from a technological tool that failed to accurately reflect students' language errors. The design required students to identify mistakes in their Chinese essays by comparing them with *Sogou Translate*'s English output. However, due to *Sogou Translate*'s error tolerance, it often generates accurate English translations despite errors in the Chinese input, rendering the task-level feedback ineffective. Students were not reliably informed about their mistakes, undermining the intended learning outcomes.

Additionally, the design lacked emphasis on process-level feedback. It did not equip students with strategies to understand the reasons behind their errors or guide them in revising their essays effectively. The reliance on Sogou Translate bypassed cognitive engagement with the editing process, a critical element for fostering deeper learning strategies. The design also aimed to promote self-regulation by encouraging students to self-assess their work using Machine Translation. However, the tool's error tolerance provided false-positive confirmations of correctness, preventing students from effectively self-monitoring and evaluating their progress. This hindered the development of autonomy and self-regulation skills. Finally, the absence of self-level feedback, such as praise or encouragement tied to effort or strategies, exacerbated the design's shortcomings. While

self-level feedback is generally less impactful, its omission left students without motivational reinforcement to counterbalance the frustrations caused by the design.

6. Limitations

This study has several limitations that must be carefully observed when interpreting its findings. First, the study is limited in scope as it primarily examines research published in the *Journal of Technology and Chinese Language Teaching* (JTCLT). This journal is an important source of scholarship in this field, though it cannot represent the entirety of Technology-Assisted Chinese Language Teaching (TACLT) research. Some relevant studies published elsewhere may present different findings or alternative interpretations regarding technology integration. For instance, journals such as *CALICO Journal* or *Language Learning & Technology*, which often feature studies on English or multilingual contexts, may reveal stronger emphases on learner analytics, adaptive feedback systems, or cross-linguistic transfer—areas that are less frequently highlighted in JTCLT. Future comparative reviews could examine whether similar patterns of feedback integration emerge across these broader venues.

Second, while based on Hattie and Timperley's (2007) landmark theoretical framework, the scoring process involves subjective interpretation. Assigning numerical scores to feedback levels depends on how well researchers document these feedback mechanisms in their studies. Although a structured rubric was used, in all likelihood, different evaluators might have slightly divergent impressions about the way feedback had been implemented and have rated it, which could bring variability to the results. Future studies should strive toward establishing firmer inter-rater reliability measures and elaborated rubrics on feedback implementation assessment.

Lastly, it uses secondary data rather than direct classroom observation. As a result, the analysis is constrained by the extent to which published studies explicitly describe their instructional designs and feedback mechanisms. Some articles may not explain so well how feedback was integrated, potentially affecting the accuracy of the study's evaluation.

7. Pedagogical Implications, Reflections, and a Conceptual Model

This study's findings offer several pedagogical implications for Chinese language educators seeking to integrate technology effectively while maintaining a coherent feedback mechanism.

First, the results highlight that pedagogical effectiveness should take precedence over technological novelty. Prior research suggests that many instructional designs emphasize technological innovation more than pedagogical impact (e.g., Tian, 2020; Bao & Chen, 2022; Sun et al., 2023; Wu, 2022). Although technology provides valuable affordances for language instruction, it rarely encompasses all dimensions of effective feedback. Therefore, instructors are encouraged to design classroom activities that

deliberately complement the limitations of technological tools, particularly in supporting higher-level feedback. Specifically, at the self-regulation level (FR), AI-based tools can generate metacognitive prompts that guide learners to monitor progress and reflect on learning strategies. For instance, intelligent assistants may ask students to explain their reasoning or identify recurring errors, thereby fostering greater learner autonomy. At the self-level (FS), gamified systems—such as badges, point tracking, and peer recognition—can enhance motivation and engagement, addressing the reflective and affective dimensions that are often overlooked in current TACL designs.

Second, when selecting technological tools, educators should consider both their functional capabilities and their capacity to support multiple feedback forms. Tools ought to facilitate not only immediate correction but also longer-term strategic learning. Proper tool selection strengthens instructional design by aligning technological affordances with pedagogical objectives.

Third, this study underscores the importance of motivation and engagement in technology-mediated learning. Existing TACL designs often neglect self-level feedback, which, although less directly tied to language acquisition, plays a crucial role in sustaining learner motivation. Incorporating gamified elements, peer-interaction platforms, and incentive-based recognition can increase engagement and foster a more dynamic learning environment.

Fourth, while the emphasis on feedback levels varies across courses, a balanced approach encompassing all four levels is essential. Task-level feedback is generally well implemented, yet process-level, self-regulation, and self-level feedback should not be overlooked. Instructors should move beyond merely providing correct answers to designing activities that promote metacognitive awareness, independent learning strategies, and affective engagement. Combining automated correction with guided reflection, scaffolded feedback, and interactive discussion can deepen students' learning and autonomy.

To synthesize these pedagogical insights, Table 3 (next page) presents an adapted conceptual framework linking the four feedback levels with corresponding technological functions, instructional roles, and intended learning outcomes. Ultimately, aligning emerging technologies with Hattie and Timperley's (2007) Four-Level Feedback Theory ensures that innovations in Chinese language teaching not only enhance task performance but also foster deeper metacognitive reflection, learner autonomy, and sustained motivation across all levels of feedback.

Table 3 Adapted Four-Level Feedback Framework for Technology-Assisted Chinese Language Teaching (TACLT)

Feedback Level	Focus in TACLT Context	Typical Technological Support	Instructor's Role	Intended Learning Outcome
Task Level (FT)	Accuracy of linguistic performance	Automated correction, AI-assisted speech or writing evaluation tools	Select appropriate tools and ensure correction aligns with learning objectives	Improved linguistic accuracy and immediate corrective awareness
Process Level (FP)	Learning strategies and comprehension processes	Interactive platforms, corpus tools, or adaptive tutorials guiding problem-solving	Scaffold strategy use and interpret feedback results for learners	Development of effective learning strategies and transfer of knowledge
Self-Regulation Level (FR)	Learner autonomy and metacognitive reflection	AI-driven reflective prompts, progress dashboards, self-assessment checklists	Design reflection activities and guide learners in interpreting analytics	Enhanced self-monitoring, planning, and evaluation skills
Self Level (FS)	Motivation and affective engagement	Gamified feedback systems (badges, peer recognition, point tracking)	Reinforce effort, persistence, and collaboration through recognition	Sustained motivation and positive learner identity formation

8. Conclusion

This paper has systematically reviewed feedback mechanisms within technology-enhanced Chinese teaching designs, revealing both potential and limitations. Although feedback at the task level is generally well effectuated, there is still considerable potential at the process level and self-regulation level, and particularly poorly integrated are those pertaining to self-level feedback. Generally, self-level feedback is often neglected, thereby limiting technology's potential to boost learner motivation and engagement.

To fill these gaps, educators will need to take a more structured approach to designing feedback mechanisms in their classrooms, paying extra attention to ensure that technological tools are used not just for automation but as mechanisms to facilitate effective and deeper learning interactions. Future research could consider how FLFT might be more systematically included in TACLT, particularly through empirical classroom studies that assess the long-term impact of different feedback strategies.

Ultimately, effective technology integration in CLT should strike a balance between leveraging digital advancements and maintaining pedagogical integrity. By applying a structured feedback framework like FLFT, educators will be able to optimize the role of technology in Chinese language teaching, ensuring that it serves as a meaningful tool for linguistic and cognitive development rather than a superficial addition to instructional design.

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