

From Cards to Communication: A Two-Stage, AI-Integrated Game-Based ESP System for Developing University Students' Presentation Literacy for SDGs Communication

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1. Research Overview

This study develops a two-stage, AI-integrated game-based ESP system to enhance university students' presentation literacy. Grounded in multimodal input, constraint-based learning, and generative AI scaffolding, the design supports progression from receptive mastery to productive creation within SDG-themed communication tasks.

2. Purpose of Study

Presentation literacy, which refers to the ability to organize complex ideas into coherent, precisely timed, and rhetorically purposeful communication, is among the most demanding yet systematically underdeveloped competencies in university-level English for Specific Purposes (ESP) instruction. The Pecha Kucha format crystallizes this challenge in a highly concentrated and pedagogically valuable form: twenty slides, twenty seconds each, leaving minimal room for ambiguity. Importantly, this format can serve as an effective and widely applicable template for helping ESL (English as Second Language) or EFL (English as Foreign Language) learners practice maintaining clarity, conciseness, and coherence in communication. To fully benefit from such a format, however, learners require structured and iterative opportunities to internalize both its cognitive architecture and temporal discipline.

Responding to this gap, this study develops and evaluates a two-stage, AI-integrated, game-based ESP learning system designed to scaffold learners' progression from multimodal input engagement to the production of original, coherent presentations. The system is theoretically anchored in three complementary perspectives: multimodal input theory, which underscores the role of cross-channel processing in language acquisition; constraint-based learning, which reconceptualizes limitation as a driver of metacognitive awareness; and generative AI scaffolding, which utilizes Socratic interaction to cultivate deeper communicative competence beyond surface-level fluency. Crucially, the integration of Sustainable Development Goal (SDG) themes situates presentation literacy within authentic, globally relevant discourse, thereby aligning academic communication with real-world communicative purposes.

The study is guided by three research questions:

RQ1: How does multimodal input engagement in Game One relate to learners' structural coherence and pacing control in Game Two presentations?

RQ2: Which types of generative AI coaching interactions, directive or reflective, are most

effective in facilitating iterative improvement in presentation logic and coherence?

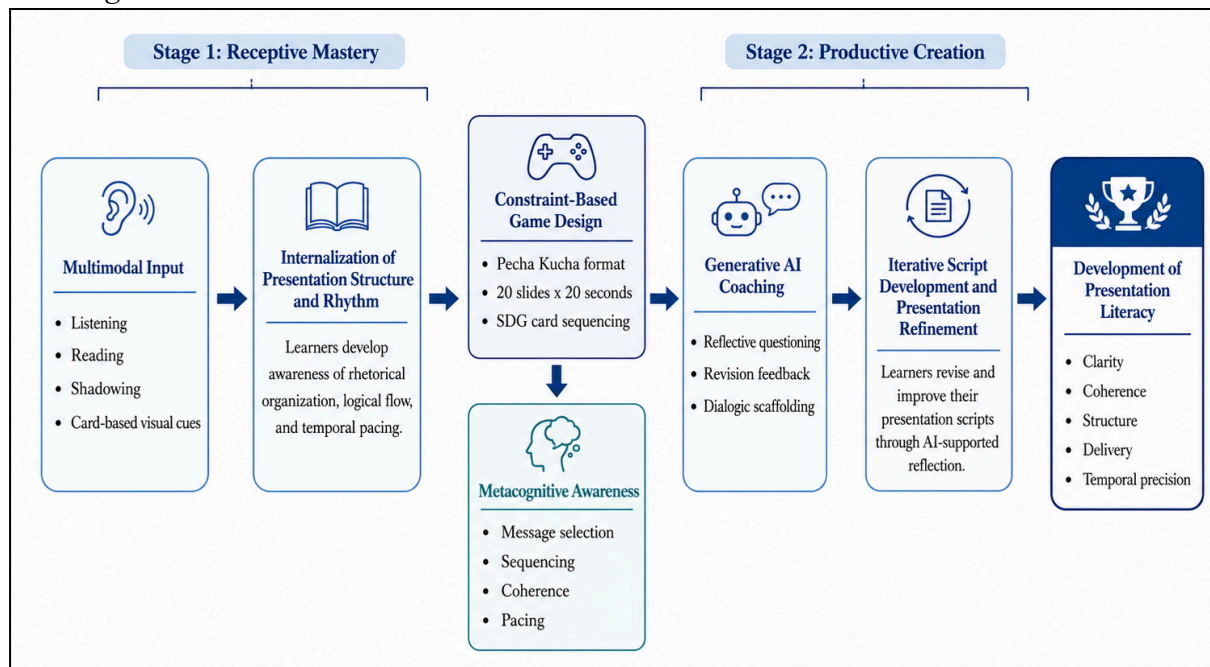
RQ3: To what extent do early learner performance patterns in Game One predict presentation quality outcomes in Game Two, and how might such patterns inform adaptive instructional design?

3. Research Methods

This study adopts a mixed-methods design integrating learning analytics, performance-based assessment, and qualitative reflective data. Participants are undergraduates enrolled in a semester-long ESP course at a national comprehensive university in southern Taiwan. The learning system unfolds across two sequential stages (see Figure 1).

Figure 1:

From Receptive Mastery to Productive Creation: A Conceptually Grounded Two-Stage Pedagogical Framework for Developing Presentation Literacy in AI-Integrated ESP Learning



In Game One of Receptive Mastery (see Figure 2), students engage with SDG-themed twenty-card decks, in which each card represents one Pecha Kucha slide and is embedded with fluent audio models that support simultaneous listening and reading. An optional speech shadowing component is included to cultivate prosodic awareness and temporal fluency. Students practice sequencing the cards into coherent presentation structures, thereby developing metalinguistic sensitivity to logical flow and the twenty-second temporal constraint.

In Game Two of Productive Creation with AI Coaching (see Figure 3), students compose original presentation scripts based on self-selected SDG topics. A generative AI coaching interface functions as a Socratic thinking partner, guiding iterative script development through reflective questioning. This process prompts learners to examine their own logic, refine their messaging, and enhance slide-level coherence across multiple revision cycles, rather than relying on directive surface-level correction.

Figure 2:
Student–Game System Interaction Flow for Receptive Mastery in Pecha Kucha Learning

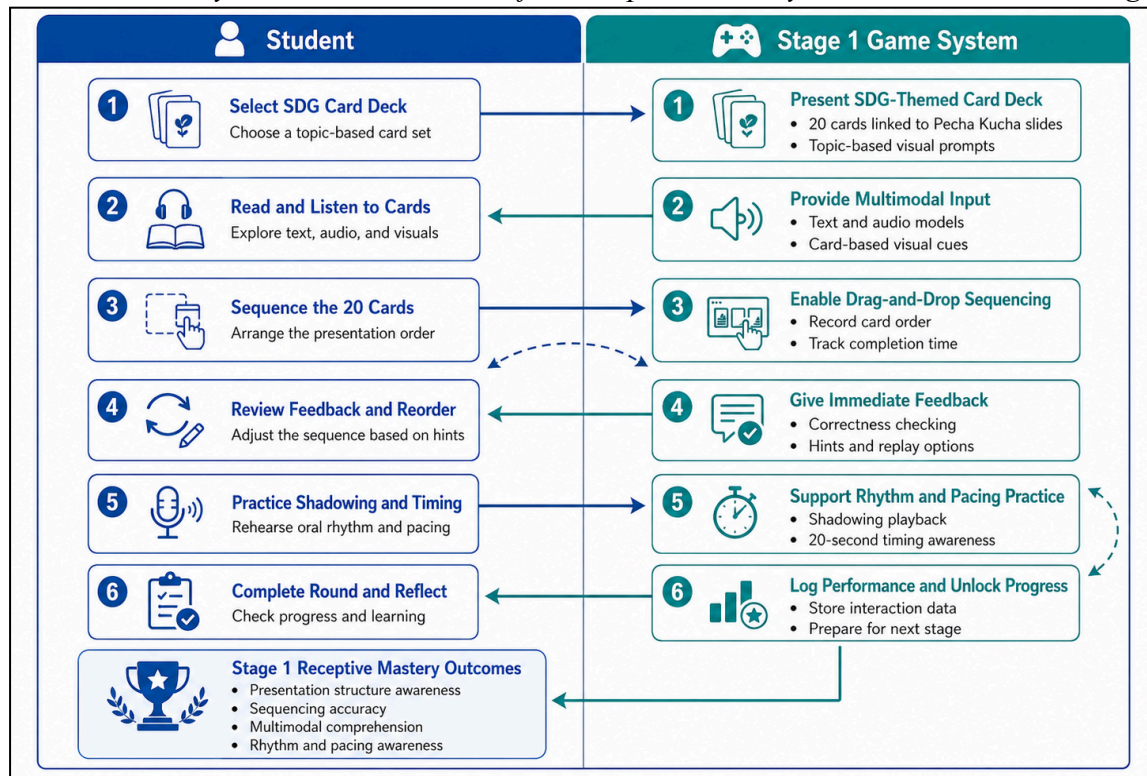
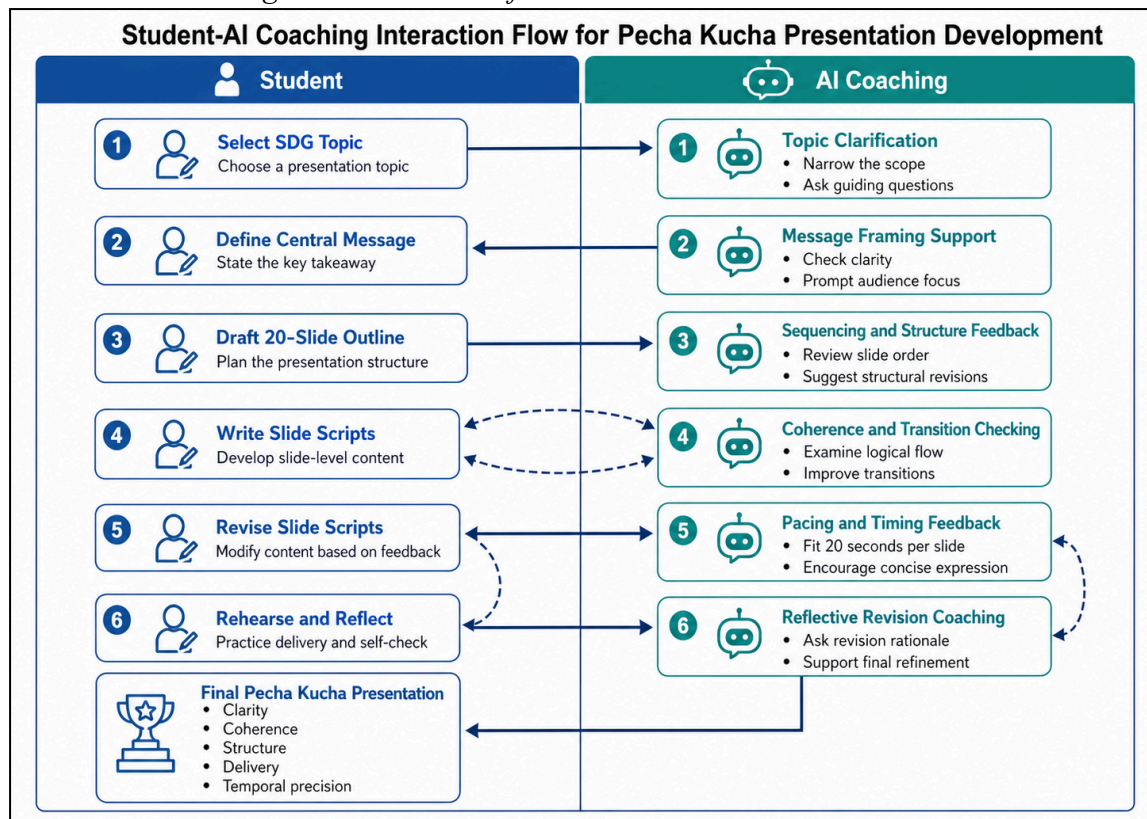


Figure 3:
Student–AI Coaching Interaction Flow for Productive Creation in Pecha Kucha Presentation



Data sources include card sequencing accuracy and interaction logs from Game One; AI coaching interaction logs and draft revision trajectories from Game Two; pre- and post-task presentation quality assessments evaluated using a validated rubric measuring coherence, structure, and delivery; and student reflective journals documenting perceived learning development and system experience.

4. Results and Discussion

Findings from the pilot data indicate that students who engaged in a comprehensive multimodal cycle of listening, reading, and shadowing demonstrated greater structural coherence and more effective pacing control in their Game Two presentations than those who relied primarily on reading. This pattern supports multimodal input theory, particularly the role of cross-channel engagement in enhancing communication.

Analysis of AI coaching interaction logs further shows that participation in repeated revision cycles is associated with improved logical coherence in final presentations. In addition, AI prompts that encourage metacognitive reflection, such as asking students to explain sequencing decisions or clarify central messages, appear more effective than directive correction in promoting sustained communicative improvement.

Learning analytics also reveal that early performance indicators in Game One, including sequencing accuracy and time-on-task patterns, are significantly associated with subsequent presentation quality in Game Two. These findings suggest the value of using early learner behaviors to inform adaptive instructional support.

Collectively, these results demonstrate how multimodal game-based design and generative AI coaching can be integrated to support ESP instruction, moving beyond discrete skill development toward holistic and authentic communicative competence. The inclusion of SDG themes further illustrates the alignment between academic language development and global citizenship education within a coherent pedagogical framework.

Keywords:

English for Specific Purpose, Presentation Literacy, Pecha Kucha, AI-Integrated game-based learning, SDG Communication