Customizing Generative AI for Language Learning: Bridging Gaps in Human-AI Communication

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The emergence of Generative Artificial Intelligence (GenAI) tools, such as ChatGPT and DeepSeek, has introduced a paradigm shift in human-AI communication, triggering profound implications for education and research. These tools, trained on vast amounts of language data, demonstrate remarkable abilities to engage in human-like dialogues and generate coherent responses. However, their general lack of contextual awareness often limits their usefulness in addressing domain-specific needs or nuanced user requirements (Yan et al., 2024). This limitation underscores a critical challenge in leveraging GenAI chatbots for educational purposes: the need to bridge the gap between generic conversational capabilities and context-sensitive applications.

Prompt engineering has gained wide attention as a pivotal skill for optimizing interactions with GenAI systems. Studies have shown that crafting strategic prompts can significantly enhance chatbot outputs, enabling users to extract more relevant and accurate information (Kim & Lu, 2024; Mauro, 2024). However, most research on prompt engineering focuses on user-level prompts, leaving the structural limitations of generic chatbots unaddressed. To overcome these limitations, system-level customization—through the development of tailored system prompts—offers a transformative solution. System prompts set the foundational guidelines that govern a chatbot's behavior, tone, and focus throughout interactions, allowing it to adapt to specific user needs and educational contexts. Recent studies have highlighted the potential of such customization in creating tools that are not only more contextually relevant but also more engaging and effective in meeting domain-specific requirements (Guo & Li, 2024; Wang, 2024).

The contributions in this special issue exemplify how customized chatbots can enhance engagement by offering personalized and interactive learning experiences that align with educational objectives. For instance, Dong demonstrates how a tailored chatbot supports non-native English-speaking researchers by automating note-taking and reducing cognitive load during literature reviews. Guo explores a chatbot designed to improve university students' paraphrasing skills through real-time, personalized feedback and targeted practice. Li and Li employ a chatbot to enhance Mandarin vocabulary acquisition for Cantonese-speaking learners

by integrating cultural elements and providing immediate feedback, fostering both motivation and active engagement. These examples, along with others in this issue, illustrate how system-level customization can transform chatbots into adaptive, context-sensitive tools that address diverse educational needs.

By tapping into the potential of system-level customization, this special issue advances the discourse on human-AI communication. From personalized learning assistants to tailored academic research aids, the contributions demonstrate how customized GenAI tools can create more interactive, engaging, and effective educational environments. Through these insights, we aim to shift the focus from generic, one-size-fits-all systems to adaptive tools that align with the dynamic needs of educators and learners. By emphasizing the transformative potential of system prompt customization, this collection of studies contributes to the broader effort to integrate AI into education in meaningful, equitable, and innovative ways.

Summary of the Contributions to the Special Issue

This special issue begins with *Seven principles for effectively partnering with generative AI for teaching and learning* by Wang, Jhaveri, Law and Cheung (2025), which provides a conceptual basis to optimize the integration of GenAI tools into teaching and learning. Among the seven principles proposed by Wang et al. (2025), Principle 5 emphasizes the importance of customizing AI behaviors through system prompts, a critical step for aligning chatbot outputs with domain-specific requirements. This principle resonates with prior findings that highlight the transformative potential of system-level customization in enhancing the contextual relevance of AI tools (Guo, 2024; Yan et al., 2024). Wang et al.'s (2025) conceptualization encourages researchers and educators to reframe AI from a passive tool to an active collaborator, setting the stage for exploring targeted applications that address diverse educational needs.

In this issue, Dong (2025) demonstrates how a GPT-4-powered chatbot can assist non-native English-speaking researchers in managing the cognitive demands of a literature review with the article *Customized chatbots to support note-taking for literature review*. By automating note-

taking and summarization, the chatbot reduces cognitive load and enhances research efficiency, aligning with prior educational studies that revealed the importance of effective note-taking for academic success (Siegel et al., 2020; Kasneci et al., 2023). Similarly, Guo (2025) explores the use of an AI chatbot tailored for first-year university students in Hong Kong to improve paraphrasing skills—a critical competency for academic writing—in the article *Enhancing paraphrasing skills in university English courses: A customized AI chatbot approach*. The chatbot provides real-time feedback and enables personalized practice, creating an interactive and adaptive learning environment that is recommended by prior studies such as Kim and Lu (2024). Similarly, in Mainland China, Gao and Yang (2025) present an AI assistant that streamlines assessment design for secondary education, as detailed in *Design and application analysis of AI assistant for high school English exam propositioning*. By generating high-quality multiple-choice questions aligned with curriculum standards, the chatbot reduced teacher workload while maintaining pedagogical rigor.

From supporting academic writing to enhancing curriculum design and assessment, these studies collectively illustrate how GenAI can address challenges in English language teaching and Chinese language education. Li and Li (2025) employed a chatbot to support Mandarin vocabulary acquisition among Cantonese-speaking learners in Hong Kong in their study *The application and exploration of chatbots in Mandarin learning* (聊天機器人 Chatbot 在普通話學習中的應用與探索). By integrating cultural elements and providing immediate feedback, the chatbot facilitated vocabulary learning and enhanced learner motivation, corroborating prior research findings that supported the adoption of interactive tools in engaging multilingual learners (Chan & Hu, 2023). Similarly, Hu (2025) explored how AI could assist university students in preparing for Mandarin debates by simplifying the critical step of defining complex concepts in the article *Using Customized Chatbots to Guide Concept Definition in Mandarin Debates* (original title in Chinese: 利用定制化聊天機器人指導普通話辯論中的概念定義). This innovative adoption of AI supported the debaters' critical thinking and argumentation skills, aligning with the broader

discussion on the potential of AI to scaffold abstract reasoning and academic discourse (Yan et al., 2024).

In addition to these applications, the article *Conversing Towards Success: Utilizing AI-Based Chatbots for Facilitating SMART Goal Setting and Personalized Study Planning Among Engineering Students* by Wen (2025) introduces an AI-based chatbot to guide engineering students in setting SMART goals and personalized study plans in English for Academic and General Purposes. Through iteratively refining system prompts, the study developed a chatbot that could help students develop self-regulated learning skills, a critical component of academic success. The preliminary results of this study showed that students' revised study plans exhibited observable improvement, suggesting the chatbot's effectiveness in facilitating goal setting and study planning. This study showcases the potential of AI in supporting students' metacognitive regulations and underscores the importance of leveraging system prompts to align chatbot functionalities with educational objectives (McCardle et al., 2017; Zimmerman, 2000).

Beyond specific applications, Huang (2025) explores a meta-chatbot framework designed to empower educators in creating customized AI tools for diverse pedagogical scenarios, as detailed in *Developing a customized meta-chatbot to support the development of customized chatbots for language learning*. By focusing on system prompt design and reducing technical barriers, the meta-chatbot enables teachers to adapt AI functionalities for tasks such as grammar correction, conversational practice, and content-specific learning. This framework democratizes access to AI customization, aligning with prior studies that advocate for teacher-centric AI tools to foster innovation in education (Kasneci et al., 2023). The study points to the possibility of scalable and flexible technology integration across contexts.

Concluding Remarks

This special issue highlights the transformative potential of GenAI in language education, demonstrating how customized system prompts can bridge the gaps between generic chatbot functionalities and the specific needs of educators and learners. The contributions showcase

innovative applications, from enhancing academic writing and curriculum design to supporting multilingual and culturally informed learning. While these studies provide compelling evidence regarding the adaptability and contextual relevance of GenAI tools, they remain exploratory in nature. Future research should be conducted to rigorously evaluate the impact of GenAI on student engagement and learning outcomes. As the articles included in the present issue suggest, integrating GenAI into education is an evolving process that demands ongoing refinement, iterations, and careful ethical considerations. Educators and researchers can unlock new possibilities for personalized, inclusive, and effective teaching and learning by reimagining AI as an adaptive partner. This special issue calls on more educators and researchers to join the exciting exploration and experimentation with human-AI collaboration and to march toward a more equitable and innovative future.

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