Developing a Customized Meta-Chatbot to Support the Development of Customized Chatbots for Language Learning

Junxin Huang

Language Centre, Hong Kong Baptist University

Author Note

I have no conflict of interest to disclose.

Correspondence concerning this article should be addressed to huangjunxin@life.hkbu.edu.hk

With the growing integration of artificial intelligence (AI) in education, specifically the use of generative AI models like GPT, the potential for transforming language teaching is vast. However, as powerful as tools like ChatGPT are, they often require fine-tuning and a specific set of skills in prompt engineering to be truly effective. Many educators face challenges due to a lack of expertise in working with generative AI, limiting the ability of these tools to cater to diverse student needs (Noroozi et al., 2024). This paper explores the development of a customized meta-chatbot designed to facilitate the iterative design and customization of other chatbots for language teaching, making this process more accessible to language educators who may not have backgrounds in AI or software engineering.

Chatbots are increasingly being used in language learning applications to provide personalized support, quick responses, and interactive dialogues. Extensive research highlights the potential of AI-powered tools like ChatGPT to assist educators in reshaping their methodologies and improving classroom interactions (Dhananjaya et al., 2024). Moreover, ChatGPT has proven helpful in foreign language education by providing personalized feedback and support to students, significantly assisting in writing, translation, and conversational capabilities (Çobanoğulları, 2024). However, it remains challenging for educators to customize these models for their unique contexts and teaching objectives (Noroozi et al., 2024).

This paper demonstrates a layered approach, wherein one AI-driven chatbot helps educators customize a secondary chatbot tailored specifically for language learning contexts. By doing so, the development cycle is supported by real-time guidance and feedback from a meta-chatbot, resulting in more effective and flexible customized chatbot development for both educators and students.

How a Customized Chatbot Supports Educators

In the traditional method of designing and deploying chatbots for language learning, significant complexities arise—defining prompts, training the model, adjusting language complexity levels, and ensuring the chatbot aligns with specific pedagogical principles. For educators untrained in AI technologies, this process can be intimidating. A customized "meta-chatbot" (i.e., a chatbot to

help build other chatbots) allows teachers to break the cycle of inefficiency by supporting them throughout the chatbot development process via guidance, optimized suggestions, and real-time troubleshooting.

1. **Providing Guidance in Prompt Design:** A customized meta-chatbot can provide adaptive support in framing effective prompts necessary for chatbot development. It can suggest prompts that educators might implement depending on the level of their students, target language skills, educational objectives, and pedagogical aims.

2. **Optimizing Language and Context:** Human language is dynamic and constantly evolving. A chatbot may not be sensitive to the specific nuances of formal versus informal registers, dialects, or idiomatic expressions, but a customized meta-chatbot can suggest how to integrate these aspects into the chatbot being developed.

3. **Reducing Technical Barriers:** The sophisticated inner workings of modern language models, though powerful, are largely hidden from the average user. Through the conversational interface of a meta-chatbot, educators can access advanced customization options without needing deep expertise in natural language processing (NLP).

4. **Real-Time Feedback Loops:** A highly valuable feature of a meta-chatbot is the ability to test scenarios and offer alternatives iteratively, ensuring that the educator is able to revise and improve the chatbot they are building before student-facing deployment.

Revising System Prompts Iteratively

The process of systematically revising system prompts is foundational for a chatbot whose role is to assist users in building or customizing another chatbot. In this case, the goal of the meta-chatbot is to iteratively ask the user (typically an educator) targeted questions, guiding them step-by-step through the development process of their own customized chatbot. This ensures that the

output chatbot will be pedagogically sound and tailored to its intended learning objectives and audience.

The meta-chatbot achieves this by continuously clarifying user intentions, adapting to context, and offering suggestions that align with various pedagogical scenarios. The following stages are typical in this iterative process:

1. **Initial Inquiry and Goal Setting:**

   – The meta-chatbot begins by asking high-level questions about the educator's objectives. Sample prompts include:

     • "What are the key learning outcomes you want your student-facing chatbot to target (e.g., grammar, conversational fluency, vocabulary building)?"

     • "What is the proficiency level of your students (e.g., beginners, intermediate, advanced)?"

     • "In what teaching environment will this chatbot be used (e.g., classroom reinforcement, self-study, formative assessment)?"

   Based on these initial inputs, the meta-chatbot tailors subsequent instruction or prompts that align with these goals.

2. **Pedagogical Scenario Selection:**

   – After understanding the basic goals, the chatbot introduces pedagogical scenarios. These are designed to provide a relevant, context-aware framework for further customization. Example scenarios might include:

     • "Would you like your chatbot to simulate a real-world conversational environment, where the focus is natural language usage?"

- "Do you want to focus more on corrective feedback during conversations, or allow for more fluent dialogue flow initially?"

  By allowing users to choose scenarios that match their educational needs, the chatbot begins narrowing down the customization options to fit specific teaching environments.

3. **System Prompt Optimization:**

   – Once the pedagogical scenario is settled, the meta-chatbot presents suggestions for system prompts that would govern the behavior of the student-facing chatbot. To refine these, the meta-chatbot engages in interactive feedback loops:

   - **Meta-Chatbot:** *"For conversation practice, I would suggest a system prompt such as, 'You are a friendly conversational partner who provides subtle corrections for grammar mistakes only after the learner has completed their response. Do you think this strikes the balance you want between fluency and feedback?"*
   - **Educator:** *"I would like more immediate corrections during the conversation."*
   - **Meta-Chatbot:** *"Great! How about this revision: 'You are a language coach who provides immediate corrections during conversation, but offer encouragement and positive reinforcement for fluency.' Does this suit your needs?"*

   These sample dialogues are inspired by interactions with AI language models, demonstrating how iterative refinement can lead to more effective system prompts (OpenAI, 2023).

4. **Scenario-Expanded Iterations:**

– As educators experiment with various configurations for their chatbots (e.g., focusing on grammar drills, interactive scenarios, or text-based comprehension exercises), the meta-chatbot responds with adjusted system prompts to ensure alignment with learning goals.

  For text-based comprehension or specific skill development, the conversation might look like this:

  - **Meta-Chatbot:** *"Should the chatbot engage your students with more question-and-answer exchanges to test comprehension, or would you prefer it to guide them through longer text passages, where they would need to respond with inferences or summaries?"*

By iterating with educators using thoughtful, scenario-based questions, the meta-chatbot ensures that complex language teaching principles are integrated seamlessly into the chatbot design.

Preliminary Results: System Prompt for the Meta-Chatbot

To demonstrate the effectiveness of this iterative design process, here is an example of a **system prompt for the meta-chatbot** that guides users through building their own chatbot. This system prompt is crafted to enable the meta-chatbot to act as a knowledgeable guide, educatively customizing the chatbot creation process for teachers or content developers:

Meta-Chatbot System Prompt Example:

"You are a professional language teaching assistant who specializes in helping educators create custom chatbots for their students. Your role is to lead the user step-by-step in crafting a personalized chatbot that reflects the educator's pedagogical style, student needs, and teaching goals. Begin by asking the educator what the core focus of their chatbot will be (e.g., grammar correction, conversation practice). Then, engage in a conversation where you deeply customize one learning scenario while offering justifications rooted in language pedagogy. Finally, based on the

responses submitted by the educator regarding various questions, generate corresponding system prompts for the customized chatbot.

At key decision points, present 2-3 options for the user to choose from, explaining the pros and cons of each option based on contemporary language teaching theories. For example, if the educator chooses conversation practice, ask whether feedback should be immediate or post-dialogue, offering suggestions for how each would affect learner engagement.

Throughout the process, if the user appears unsure, offer thoughtful guidance based on published research. Provide iterative feedback loops to improve the chatbot's system prompt, and make final adjustments that reflect the educator's unique classroom context and student proficiency level."

This system prompt encapsulates the meta-chatbot's intended role, guiding educators through pedagogical decisions while fine-tuning the chatbot they're creating. Key features embedded include the ability to present multiple pedagogical strategies, adaptive feedback following user input, and grounding responses in language acquisition theory.

In the context of Hong Kong, educators can readily implement this meta-chatbot approach using existing resources to overcome technological and pedagogical barriers. A practical recommendation is to leverage platforms like Poe.com, which allows users to construct chatbots based on personalized system prompts and sophisticated large language models (such as GPT-4o). The process starts with entering the above-provided system prompt for the meta-chatbot into Poe.com to create an initial customized meta-chatbot. This meta-chatbot will then guide educators step-by-step in designing system prompts of customized chatbots that align explicitly with their teaching objectives and student profiles.

Reflection and Next Steps

While the meta-chatbot presents a significant advancement in supporting educators in creating customized chatbots through step-by-step iteration, there are areas where it could benefit from refinement:

1. **Complex Pedagogical Scenarios**:

   – Right now, the meta-chatbot is limited by the predefined language teaching options it presents to educators. While options such as “conversation practice” or “grammar correction” are useful, some educators face more complex pedagogical situations that may not fit neatly into these categories. For instance, task-based teaching or multi-modal language learning (reading, writing, speaking) may require more nuanced guidance than the meta-chatbot currently offers.

   – Future iterations should prioritize expanding these pedagogical options and allow for more complex user scenarios, providing greater flexibility for educators with advanced teaching methodologies.

2. **Context-Awareness and User Customization**:

   – Although the meta-chatbot performs well in generating system prompts via iterative feedback, it may not be fully attuned to the specific classroom environment in practice (student age, cultural background, etc.). Adaptive learning technologies are best when grounded in real-world data that reflects students' learning progress and responses.

   – As a next step, practical classroom inputs such as learner profiles, behavior analytics, and individual student progress indicators could allow the meta-chatbot to

dynamically adjust its recommendations based on real-world classroom data—making the process even more personalized and context-aware.

3. **Scalability to Different Languages**:

   – While English has been the primary focus of these tests, expanding the range of languages that the meta-chatbot supports is essential. Each language carries its own pedagogical demands, feedback methods, and teaching strategies.

   – Future iterations could prioritize building multi-language libraries and chatbot-specific prompts that account for the differences in grammar, syntax, and orthography when operating in non-English contexts.

In summary, the meta-chatbot is a powerful tool for lowering the barriers between educators and chatbot design, offering educational guidance through ongoing feedback loops. However, ensuring that it can accommodate more varied pedagogical contexts, integrate more personalized classroom data, and expand to multiple languages will be key to enhancing its future usability across diverse educational environments.

References

Çobanoğulları, F. (2024). Learning and teaching with ChatGPT: Potentials and applications in foreign language education. *The EuroCALL Review, 31*(1), 4-15. https://doi.org/10.4995/eurocall.2024.19957

Dhananjaya, G. M., Goudar, R. H., Govindaraja, K., Kaliwal, R. B., Rathod, V. K., Deshpande, S. L., Kulkarni, A., & Hukkeri, G. S. (2024). Enhancing education with ChatGPT: Revolutionizing personalized learning and teacher support. *EAI Endorsed Transactions on Internet of Things, 10.* https://doi.org/10.4108/eetiot.6998

Noroozi, O., Soleimani, S., Farrokhnia, M., & Banihashem, S. K. (2024). Generative AI in education: Pedagogical, theoretical, and methodological perspectives. *International Journal of Technology in Education (IJTE), 7*(3), 373-385. https://doi.org/10.46328/ijte.845

OpenAI. (2023). *ChatGPT [Large language model]*. https://openai.com/blog/chatgpt/