

**Para Chatbox:**

**A Customized Paraphrasing AI for Enhancing Academic Writings among University Students**

Nancy Songdan Guo, Rainbow Wing Yan Ng

<sup>1</sup> Language Centre, Hong Kong Baptist University

<sup>2</sup> Department of Geography, Hong Kong Baptist University

**Author Note**

I declare no conflicts of interest.

Correspondence concerning this article should be addressed to name, institution, postal address. Email: [nancyguo@hkbu.edu.hk](mailto:nancyguo@hkbu.edu.hk)

The emergence of Generative AI has ushered in new possibilities in educational technology, particularly in the realm of language learning. As university educators in Hong Kong, Dr. Guo, an English language instructor teaching the "University English I" course to a diverse group of students, joins us in our interest in exploring how AI can enhance teaching practices and support students' learning experiences. Despite having learned English since childhood, many students in Hong Kong still consider English a significant barrier during their university studies. This challenge is especially pronounced for those who matriculated from secondary schools where Chinese is the medium of instruction (MOL). These students often experience educational precarities when transitioning to an entirely English-speaking environment. One of our students shared an experience of hearing a classmate sighing in frustration during a lesson. To address these challenges, "University English I" is a mandatory course for all first-year students at a publicly funded university. The course primarily aims to enhance students' proficiency in English, focusing on academic writing skills, with a particular focus on mastering paraphrasing—a vital skill for reconstructing from what students have read, and an engaged act as essential as inferential thinking and decision making (Hirvela & Du, 2013; Yamada, 2003).

Effective paraphrasing in academic writing requires not only the ability to alter sentence structures but also a deep comprehension of the original texts, the use of appropriate academic vocabulary, and the preservation of the original meaning without falling into plagiarism (Hirvela & Du, 2013). However, the diverse backgrounds of students create significant challenges, especially for those who need additional support in developing strong paraphrasing skills. The traditional teaching model often struggles to meet these needs, particularly due to the limited availability of instructors who can provide personalized feedback on paraphrasing exercises (Tran & Nguyen, 2022).

To address these challenges, the customization of learning experiences through Generative AI presents a promising solution. By incorporating a tailored Generative AI chatbot into the learning environment, we can offer real-time, personalized feedback and demonstrations on effective paraphrasing techniques. This approach not only caters to the individual needs of students but also

reduces the burden on instructors by minimizing the need for manual reviews of each student's work, thereby enhancing the overall efficiency and effectiveness of the learning process (Kostka & Toncelli, 2023).

The potential of Generative AI in education, particularly through tools like ChatGPT, has been widely recognized for its ability to transform educational environments by providing personalized learning experiences and fostering greater engagement and comprehension among students (Kostka & Toncelli, 2023). This paper examines the development and implementation of a custom chatbot, which we named "Para Chatbox" designed to facilitate the teaching of paraphrasing within an academic context. It explores how this AI technology not only supports students' learning but also aligns seamlessly with pedagogical objectives. Ultimately, Para Chatbox acts as an active agent in reducing university students' educational precarities (Ng, 2021) and contributes to a more dynamic and responsive educational landscape.

### **How Can a Customized Chatbot Help?**

Integrating a customized chatbot (i.e., Para Chatbox) into the "University English I" course holds transformative potential for addressing the diverse needs of students in developing paraphrasing skills. Using Generative AI, this chatbot is designed to provide immediate, personalized, and interactive educational support to enhance students' understanding and application of paraphrasing techniques, including the following four strategies:

- 1) Using synonyms and antonyms (data sourced from Merriam-Webster <https://www.merriam-webster.com> and Thesaurus Plus <https://thesaurus.plus>);
- 2) Changing the parts of speech and sentence structures;
- 3) Adopting a more macro/global perspective (data sourced from National Geographic <https://www.nationalgeographic.org/society/>)
- 4) Use all the strategies above

**Personalized Learning Experience:** The chatbot offers a menu-based interaction where students can choose to practice one of the above four paraphrasing strategies using buttons. This allows for tailored educational experiences that meet individual learning paces and styles. By engaging with the chatbot, students can repeatedly practice paraphrasing, receive instant feedback, refine their skills and reduce the need for typing instructions to Para Chatbox, all without the pressure of classroom constraints.

**Immediate and Constructive Feedback:** Upon receiving students' paraphrased texts, the chatbot evaluates them against high-quality standards derived from its big data sources (suggested links listed above). It provides constructive feedback within 20 seconds for each submission, pointing out specific areas of improvement such as sentence structure alterations and more effective vocabulary usage. This immediate response not only reinforces learning but also encourages students to critically analyze and revise their work, fostering a deeper understanding of academic writing.

**Demonstration and Guidance:** Alongside personalized feedback, the chatbot offers demonstrations of effective paraphrasing techniques. These examples are crucial for visual learners who benefit from observing practical applications of theoretical concepts. By illustrating how to transform texts while maintaining original meanings, the chatbot serves as an ongoing learning facilitator. John, one of our students, discussed how Para ChatBox could benefit him:

John: In one of Dr. Ng's courses, we were required to write an essay about a chosen cultural site. I selected the Blue House Cluster in Wan Chai and had some great ideas about this landscape. However, my vocabulary was too limited. I wanted to express that the redevelopment of the Cluster was very successful because it "saved houses and saved people" (留屋留人). All I could think of was "saving houses and saving people", but that did not fully convey my ideas about this fantastic cultural conversation. I think Para ChatBox greatly helped me in expressing my thoughts. It used some synonyms, polished, and edited my sentence to "the revitalization of the Blue House Cluster out shone other projects by preserving homes and retaining people". Wow! This was exactly what I wanted to express and argue; it immediately "leveled up" my essay. In addition, when I read some academic

literature with extremely difficult terms, Para ChatBox can provide simpler terms to facilitate my understanding. Umm... when I use those concepts to write an essay, I can also use those simpler synonyms to avoid plagiarism.

**Educational Outcomes and Performance:** By interacting with the chatbot, students are expected to show improvement in their paraphrasing skills, which are vital for academic integrity and success in higher education. The chatbot's role in providing customized and immediate feedback is instrumental in helping students achieve higher academic performance and greater confidence in their writing abilities.

### **Revising system prompts iteratively**

The system prompts have undergone multiple revisions to enhance their effectiveness in teaching. Initially, we did not incorporate demonstrations; however, demonstrations are crucial for reinforcing students' understanding of the material covered during lectures. Specifically, demonstrations illustrate how to employ four distinct paraphrasing strategies when rephrasing provided texts. Furthermore, earlier iterations of the prompts did not adequately direct students' attention to a specific paraphrasing strategy, which hindered their ability to focus and practice the necessary skills effectively. In contrast, the revised prompts facilitate a step-by-step approach to learning paraphrasing, significantly aiding students in the gradual development of their paraphrasing abilities.

Here are the revised prompts:

*You are an experienced academic English teacher. Your job is to guide the student to practice paraphrasing using one of the following strategies*

*option 1: Using synonyms and antonyms;*

*option 2: Changing the parts of speech and sentence structures;*

*option 3: Adopting a more macro/global perspective*

*option 4: use all the strategies above*

*Once the user select the strategy, you should provide a sentence in academic style on face recognition technologies and illustrate how to paraphrase using the selected strategy. You should then provide another sentence on one of the SDGs and ask the student to paraphrase using the selected strategy. To guide the student, you should break the task into smaller steps and provide instructions for the student. After the student paraphrase, you should then provide feedback.*

### Preliminary results

The welcome prompt will allow students to select one of the paraphrasing strategies on which they wish to concentrate. The subsequent screenshot illustrates the AI-generated instructions that will be provided if students opt to practice the final strategy: employing all of the aforementioned strategies.

#### Paraphrasing - paraphrase\_practice - Session 2

Great choice! Using all the strategies will provide a robust understanding of paraphrasing. Let's begin with an example sentence on face recognition technologies:

**Original Sentence:** "Recent advancements in face recognition technology have significantly enhanced the security systems of numerous organizations."

**Paraphrased Sentence Using All Strategies:** "Modern improvements in facial recognition systems have markedly improved the protective measures within a wide range of institutions."

**Breakdown:**

- Using synonyms and antonyms:**
  - "advancements" to "improvements"
  - "enhanced" to "improved"
  - "security systems" to "protective measures"
  - "organizations" to "institutions"
- Changing parts of speech and sentence structures:**
  - The structure remains relatively similar but note the subtle shift from "have enhanced" to "have improved."
- Adopting a more macro/global perspective:**
  - "numerous organizations" is broadened to "a wide range of institutions," suggesting a more extensive scope.

Now, it's your turn to practice. Here's another sentence, this time related to one of the Sustainable Development Goals (SDGs):

**Original Sentence:** "Eradicating poverty is essential for sustainable development and is one of the primary goals globally."

**Your Task:** Please paraphrase this sentence using all the strategies mentioned above. To guide you, follow these steps:

- Identify synonyms for key words like "eradicating," "poverty," "essential," "sustainable development," and "primary goals."
- Consider if you can change the structure of the sentence, perhaps by altering the placement of phrases or the forms of verbs and nouns.
- Think about how to convey the idea with a broader perspective, perhaps emphasizing the global impact or the necessity for international cooperation.

Give it a try, and I'll provide feedback on your paraphrasing!

A demonstration of the strategy applied to paraphrase the example text is provided. This breakdown is essential for students to learn the strategies incrementally. After students follow the instructions and attempt to paraphrase, the AI-generated feedback is comprehensive and detailed. The following screenshot illustrates the resulting output.

## Paraphrasing - paraphrase\_practice - Session 2

Well done! You've made a good attempt at paraphrasing the original sentence using all the strategies. Let's break down your response and analyze it step by step:

### 1. Using Synonyms and Antonyms:

- 'Eradicating' was replaced with 'put an end to' — this is a good use of a synonym, though 'eliminating' might sound more academic.
- 'Essential' was paraphrased as 'important' — a valid synonym, though 'crucial' or 'vital' might add more weight in academic writing.
- 'Primary goals' was replaced with 'fundamental objectives' — excellent choice of words.

**Feedback:** You're on the right track here with synonyms, but avoid using 'the poverty,' as 'poverty' is an uncountable noun and doesn't require 'the.'

### 2. Changing Parts of Speech and Sentence Structures:

- You shifted the sentence structure by placing 'It is important to put an end to poverty' at the beginning. This is a good reorganization, but there is room for improvement in sentence fluency.
- 'For sustainable development' was kept as is — consider rephrasing this for more variety.

**Feedback:** While you changed the structure slightly, it could be varied further. For example, you might start with 'Achieving sustainable development requires ending poverty,' which flips the focus.

### 3. Adopting a More Macro/Global Perspective:

- You successfully broadened the phrase by adding 'from a global perspective,' which highlights the wider context.

**Feedback:** This is a good attempt! However, 'from a global perspective' could be rephrased to flow more naturally, such as 'on a global scale' or 'on an international level.'

### Suggested Revision:

"Eliminating poverty is crucial to achieving sustainable development and represents one of the most fundamental objectives on a global scale."

Detailed feedback on students' paraphrasing attempts is provided in a step-by-step format.

Additionally, the chatbox offers recommendations for each step, enabling students to enhance their paraphrased texts. Susan and Joyce reacted to the effectiveness of Para ChatBox:

Susan: I think academic essays are very different from our daily writing. The sentences in academic essays should be more complex. Option 1 and Option 2 help me in smoothing my sentences and making them more sophisticated while maintaining the originality of my writing. Para ChatBox is truly a “gift” to us [university students].

Joyce: Yes, I agree. The Option Buttons can enhance the academic tone of my essay, making it more formal with professional vocabulary. As a result, I feel less panicked about writing and submitting my essays.

### Reflection and next step

The preliminary results indicate that this customized chatbox effectively assists students in several key areas related to paraphrasing. Firstly, it facilitates a comprehensive review of various paraphrasing strategies, allowing students to familiarize themselves with techniques that enhance their writing skills. Secondly, the chatbox enables selective practice with example texts, which helps students apply these strategies in a controlled environment, thereby reinforcing their learning.

Additionally, it provides constructive feedback on students' attempts at paraphrasing, pinpointing specific strengths and areas for improvement, which is crucial for their development as writers.

The process of creating and designing this chatbox involved multiple phases of testing and refinement. Initially, a prototype was developed based on existing pedagogical frameworks and best practices in language instruction. This prototype underwent several iterations, incorporating feedback from educators and a small group of students. Each iteration aimed to enhance user experience, ensure clarity in the feedback provided, and align the chatbox's functionality with educational objectives.

The next phase of this initiative will involve deploying the chatbox to a larger cohort of over 50 students. This will be conducted in a controlled setting to ensure that data collection is systematic and comprehensive. Students will be encouraged to interact with the chatbox over a designated period, after which their feedback will be collected through surveys and interviews. This feedback will focus on various aspects, including the usability of the chatbox, the clarity and helpfulness of the feedback received, and the overall impact on their paraphrasing skills. The insights gained from this phase will be invaluable for further refining the chatbox, ensuring that it effectively meets the diverse educational needs of students and enhances their writing proficiency.



## References

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