

# Revolutionizing ESL Teaching with Generative Artificial Intelligence—Take ChatGPT as an Example

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**Abstract:** This study investigates the potential of integrating generative artificial intelligence, specifically ChatGPT, into the learning and practice of non-native English speakers' four language skills: listening, speaking, reading, and writing, in the context of the emergence of generative AI. By means of a case analysis applying the "instruction-reply" method, this study concludes that the combination and utilization of the nine core skills of generative AI, including natural language processing, adaptive learning, attention mechanism, zero-shot learning, pre-training models, speech recognition and synthesis, intelligent recommendation, reinforcement learning, and cross-lingual learning, have significant language learning assistance capabilities for the four skills. Nevertheless, the limitations are reflected in language mechanical phenomena, high usage thresholds, Chinese-English recognition differences, and fuzzy knowledge boundaries as well.

**Keywords:** ESL Learning; Generative Pre-trained Transformer; Four Language skills; ChatGPT

## 1. Introduction

In 2017, the State Council issued the "New Generation Artificial Intelligence Development Plan", which particularly emphasized the need to grasp the major historical opportunities for the development of artificial intelligence. Recently, in the report of the 20th National Congress of the Communist Party of China, it is more clear to "promote the digitalization of education". This plan has been echoed by educational department in various provinces and cities across the country.

Since the end of November 2022, the birth of ChatGPT has become a milestone in the fields of artificial intelligence and IT. Only two months after its launch, registered users exceeded the 200 million, making it the most representative phenomenal event in the history of human science and technology [18]. At the same time, in recent years, artificial intelligence has become the most highly charged and concerned issue in the industry and academia. Due to its ability to automatically generate multi-modal materials such as text, images, and videos, it has shown unexpected cross-field application potential [19], especially in the field of education.

As early as 2019, some scholars predicted that artificial intelligence robots have the ability to change traditional education methods and assist students in different learning environments [1]. Chevalier (2020) further pointed out through empirical research that educational robots can promote the 4Cs (Collaboration) of students to a certain extent. Cooperation; Communication Communication; Creative Thinking Creative thinking; Critical Thinking critical thinking) skills as well as problem-solving, self-efficacy, and even computational programming thinking[5]. Chu (2022:2) in a systematic review of WoS (Web of Science) concluded that most high-quality AIRE (Artificial Intelligence Robots in Education) experiments focused on the following aspects: (1) Measure the attitudes of students and teachers towards the application of artificial intelligence in classroom/after-school activities in AI-assisted teaching (Auerbach et al., 2018) ; (2) The role of AI in inclusive teaching in the field of education: instructor/mentee/tool (Chen, Park & Breazeal, 2020) ; (3) The learning that AI-assisted teaching can bring Changes in approaches, strategies, and habits (Fournier-Viger et al., 2008, 2013)[6][2][4][8][9]. It is worth mentioning that most of the research objects in the existing literature are preschool children, and the sample distribution is not universally representative. In addition, most of the subjects involved have not jumped out of preschool education, programming, mathematics, engineering and other

interdisciplinary domains, and in the broader academic field, the educational significance and application of artificial intelligence have not been further confirmed<sup>[3]</sup>. Foreign language (English as an example) education, as one of the compulsory subjects of traditional school education throughout the year, has only occupied two research volumes so far. As a traditional subject that is mainly benefited and directly affected by generative artificial intelligence GPT, it accepts challenges and transforming opportunities seems to be the "Noah's Ark" of foreign language teaching in this era.

## 2. The era of ChatGPT generative artificial intelligence is coming

ChatGPT, the full name is Generative Pre-training Converter Chatbot (Generative Pre - trained Transformer), officially released by OpenAI at the end of November 2022<sup>[12]</sup>. It is compatible with many pioneering products developed by domestic and foreign artificial intelligence companies, such as ERNIE 3.0, ERNIE - ViLG 2.0, DALL·E 2<sup>[16][10][12]</sup>, and its predecessors. The innovation of GPT -1, GPT-2, GPT-3, and InstructGPT is that it adds more decoders and provides a larger pre-trained natural language model (LLM: Language Learning Mode) corpus. The expansion of the number of parameters makes the resulting ChatGPT have a more anthropomorphic dialogue mode and provide a more realistic human-computer interaction experience. In multi-round dialogues, GPT is equipped with reinforcement learning technology based on human feedback (RLHF: Reinforcement Learning Human Feedback) to fine-tune and learn the dialogue text, using the proximal optimization strategy (PPO: Proximal Policy Optimization) boosts the generation of natural interactive texts that the interlocutor is satisfied with and meets expectations, making it "think" and answer like a "human"<sup>[13]</sup>.

From the perspective of foreign language education, the emergence of this technology undoubtedly means that the situation of teachers as the main teaching resource providers has been further broken. Compared with the challenge from Baidu, Wikipedia and other intelligent data corpus information sharing, the emergence of ChatGPT is more like a returning the concept of "search is learning" to the traditional communication learning mode. For English learners, this will directly or indirectly provide an authentic English communication environment, and the other party can not only provide accurate feedback on the user's expression, pronunciation, syntax, grammar and other elementary problems 24 hours a day, and It can even go deep into the advanced stages of semantic logic, emotional processing, context analysis, and sensitive topic avoidance through its language form<sup>[17]</sup>. However, throughout history, the emergence of new technologies has often been accompanied by heated debates in academia. Chomsky, known as the father of linguistics, pointed out that "ChatGPT is fundamentally a high-tech platform for academic plagiarism" and "a way to avoid learning and use the brain through high technology"<sup>[11]</sup>. Educators around the world also have general concerns about sudden technological innovation, most of which focus on the following aspects: 1. Artificial intelligence itself is an algorithmic tool pre-installed with human knowledge, that is, through LLM in massive databases The calculation nearby screens out what it considers "correct" content, which is not innovation in essence, but a connection of knowledge (a scholar once input the command:  $9\ 999+9=?$  in the test room of GPT -2, and the result is 100000. This means that it does not have the normal calculation function of the human brain during the test period), so it does not have the ability to accurately filter data from the existing parameters; 2. The encoding and decoding ability of Chinese is much lower than that of English, which is likely to cause contextual cognitive bias for non-native English users (Lu, 2023:6-7)<sup>[19]</sup>; 3. Out of concerns about teaching evaluation, teachers are worried Students who abuse the information processing function of ChatGPT will increase the probability of academic misconduct. Therefore, the U.S. Bureau of Education, New South Wales, Australia, and even the University of Hong Kong, China, have all issued laws prohibiting the use of ChatGPT for academic fraud<sup>[15]</sup>.

However, the generative artificial intelligence language robot represented by ChatGPT has laid the groundwork of language education automation and personalization. From the perspective of ChatGPT's related technology applications and core competencies, this study will integrate the learning strategies of the four basic skills of English listening, speaking, reading and writing, and combine the existing "AI English Learning Golden Thumb" teaching design on the market to explore Model the possibility of using it to assist non-native English learners.

## 3. Technical and Core Competence Analysis

In order to realize the higher pursuit of text generation and natural language interaction, generative artificial intelligence such as ChatGPT has carried out a series of core technology iterations. Lu (2023:2-3) summarized the following five key technologies:

Transformer model; Transformer-based basic architecture; reinforcement learning based on human feedback (Reinforcement Learning From Human Feedback ); instruction fine-tuning techniques (Instruction Tuning) ; Chain of Thought technology . The above-mentioned related backbone technologies can be screened into the following nine first-level key technologies through the need correlation of English language learning (OpenAI, 2023 )<sup>[12]</sup>:

1) Natural Language Processing: This technology is the basic core technology of generative artificial intelligence, mainly responsible for processing human language. It can analyze, understand and respond to the English/Chinese input by the user.

2) Adaptive Learning: This technology can implement real-time interaction by analyzing user feedback, and provide corresponding personalized customized solutions and suggestions based on the user's current language level and ability.

3) Attention Mechanism: This technology assists the system to better understand the location and logical relationship of different texts in the context when performing natural language processing, thereby improving the accuracy of generated text and predictions.

4) Zero-shot Learning: This technology enables the system to predict and give feedback on the user's new English learning requirements and feedback without any pre-training data, generalize the scope of application and provide users with more resources and help.

5) Pre-trained Models: This technology is designed to store pre-trained corpora, and can help users dispatch trained model parameters from related blockchains to facilitate human-machine pair training and interaction.

6) Speech Synthesis and Speech Recognition: This technology is equipped with speech synthesis technology, which can realize the conversion of voice and text through a simple web page plug-in, making AI oral practice possible.

7) Reinforcement Learning: This technology can impose rewards and punishments on the progress of learning during the learning process to stimulate learning and provide learning challenges of stepped difficulty.

8) Intelligent Recommendation: This technology can provide the user's interests and topics, prioritize and select suitable learning content for the target language, and better understand the background culture and related knowledge of the language

9) Cross-lingual learning: This technology can help users compare the differences between different languages and background cultures, so as to understand the grammar, culture, and vocabulary of different languages. Metacognition helps users reduce cognitive load.

#### 4. A Case Study of Generative Artificial Intelligence Applied in ESL

Based on the current analysis of the core technology of the ChatGPT system for English learning, the above nine abilities can assist the four skills of listening, speaking, reading, and writing, and provide many possibilities for language training and education. The specific classification is as follows (Figure 1):

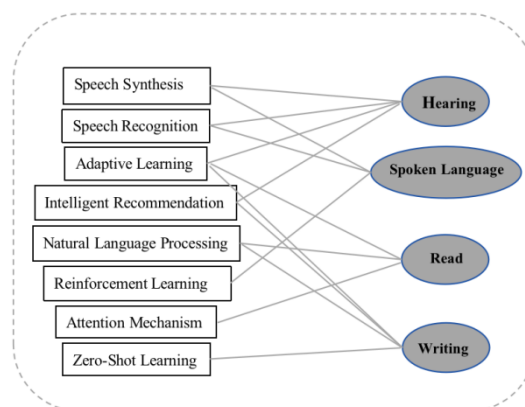


Figure 1: Correspondence between ChatGPT core competencies and four English competencies

This study analyzes the successful cases of generative artificial intelligence (using ChatGPT as the exemplified system) in the process of assisting language learning and its immaturity from the four language dimensions of listening, speaking, reading and writing.

#### 4.1 Listening

In order to better activate the speech synthesis and speech recognition functions of ChatGPT, the human-computer pair training of listening and speaking needs to be installed in Google Chrome control for ChatGPT. As shown in Table 1, when users/students/teachers give corresponding instructions, the system will automatically generate topics and related information that are related to the instruction requirements and conform to the preset situation.

*Table 1: Examples of listening practice instructions and responses*

<i>User 's prompts</i>	<i>ChatGPT 's outputs (Partly scripted)</i>
<i>C an you give me a listening script at the intermediate level?</i>	Certainly ! Here is a listening script at the intermediate level: S speaker1: Hi, thank you for coming in today. Can you tell me a little bit about your work experience? Speaker2 : ... ...
<i>C an you give me some recommendations for Listening materials? Like podcast or TED talk at intermediate level?</i>	Sure , here are some recommendations: 1. TED Talks: “The Power of Vulnerability,” “The Surprising Science of Happiness” by Dan Gilbert, and “The Art of Being Yourself” by Caroline McHugh. 2. ...
<i>C an we do a mock listening test of IELTS?</i>	Certainly , I can. Please find the script below: Section 1 Questions 1-6 A accommodation officer: Good morning. How can I help you today? Student: ... ...
<i>C an you tell me how to practice my listening skill?</i>	Certainly ! Here are some ways to practice: 1. L istening to English-language media: this can include news broadcasts, podcasts, audio books, TV shows.... 2. U se subtitles or transcripts.... 3. Practice active listening... 4. ...

Note: Use short instruction to interact with ChatGPT for simple listening exercises

In the above table, the user can automatically generate text and audio to interact with the AI robot by entering the instructions on the left. The table shows 4 relevant cases of English listening, which correspond to the adaptation mechanisms of the four core competencies of ChatGPT: (1) The corresponding level of speech synthesis and recognition and adaptive learning function auxiliary generation ( At Intermediate Level ) English listening texts for listening debate and follow-up reading; (2) Intelligent recommendation technology helps it recommend corresponding English audio and video (TED Talk, Podcast); (3) The pre-training model enables it to store listening test-related materials in a large database, and the time-limited mock test of listening can be realized through audio plug-ins; (4) RLHF technology can give private orders by continuously adding details of the learning stage custom metalinguistic learning strategies. The proximal optimization technology of the system can help to accurately understand the user's "denotation" and "connotation" so as to generate expected search/dialogue results.

#### 4.2 Spoken English

Likewise, the Voice Control for ChatGPT needs to be pre-installed in Google Chrome. As shown in Table 2, when prompts such as spoken language practice, suggestion, mock test, word recognition, and error feedback are given, the following system feedback and responses (audio and text modes) will be obtained.

This case study attempts to test the six impact indicators of spoken English, namely pronunciation, grammar, vocabulary, fluency, comprehension, and task (Brown, 2004). Guided by the practice instructions on the left side of Table 2, the system has demonstrated its excellent "business capabilities":

(1) Speech synthesis and recognition technology assists the system to judge whether the pronunciation is accurate through the voice input by the user. It is also possible to obtain the knowledge of speech organs and phonetics of pronunciation by inquiring about the pronunciation and minimal phoneme pairs of AI words, such as " Sheep" and " Ship". Knowledge to ensure the accuracy of pronunciation to the greatest extent. (2) The attention mechanism can help AI accurately detect grammatical errors in the input sample audio, and try to understand the contextual logic relationship in the original audio context, and try to give the corresponding corrected version, for example: "Haven said..." is corrected as "Having said...". And it can also give relevant correction reasons and relevant knowledge through the LLM dialogue model in subsequent dialogues. (3) The achievement of the three indicators of vocabulary, fluency and tasks can be retrieved through the database pre-trained by ChatGPT. For example, in the last instruction, ChatGPT is required to take a complete speaking mock test as the examiner and order it to score according to the scoring standard of IELTS speaking. And the reinforcement learning technology can complete the practice mode of "gradually increasing difficulty coefficient", for example, the difficult level was elevated from the part one to the part three of IELTS speaking test.

*Table 2: Examples of oral practice instructions and responses*

<i>User's prompts</i>	<i>ChatGPT's outputs (Partly scripted)</i>
<i>Can you tell me the pronunciation difference between "sheep" and "ship"?</i>	Sure, I'd be happy to help you with that! "Sheep" is pronounced with a long "ee" sound and a voiceless "sh" sound at the beginning. "Ship"...
<i>Can you help to detect the wrong grammar in the following audios?</i>	Yes, of course! I would be happy to help you correct your pronunciation.
<i>Q 1: Haven said that I don't want to go outside for a party</i>	A1: Sure, here's a corrected version: Having said that, I don't want to go outside for a party. ...
<i>Q 2: Why?</i>	A 2: "Haven said that" is incorrect because "haven" is not a word that is used in this context. "I don't want to" by itself is not grammatically correct, because "want" is a transitive verb that requires an object. ...
<i>Can we do a mock oral IELTS test?</i>	yes
<i>Please be an IELTS speaking test examiner, and conduct The exam strictly based on the IELTS examination procedures. Now you could start by asking a part one question. After the procedures, please give me the grades in terms of IELTS scoring criterion.</i>	Okay! Let's get started. ... First Q: Do you work or study? ... ... Overall, I would give you a score of 6.5 on a 9-point scale. Your fluency was good but...

Note: Use short instruction to interact with ChatGPT for simple oral practice

### 4.3 Reading

Wu utthisingchai and Stopps (2018) found in a longitudinal study of non-native English reading teaching that the first six factors that affect English reading comprehension are: text difficulty; reading attitude; reading environment; reading motivation; learning preference; teaching techniques<sup>[14]</sup>. As shown in Table 3, the following interactive instructions for reading practice will be executed from the above six perspectives, and the generative AI system gives the following replies (see Table 3):

The replies displayed by ChatGPT above reflect the role of generative artificial intelligence in English reading training. According to the needs of users, it can be either a "tool role Tool", a "teacher role Tutor", or even a "Student role Tutee" (Chen, Park, and Breazeal, 2020): (1) "A2 level" in the first instruction is based on the Common European Framework of Reference for Languages (CEFR: Common European Framework Reference for Language)<sup>[7]</sup> is set according to the difficulty of the text. Similarly, the grades in the "China English Proficiency Scale" released in June 2018 have been officially benchmarked against the grades in CEFR and the TOEFL IELTS test. Therefore, the adaptive ability and attention mechanism of generative AI can assist users in the process of interacting with the system, collect the user's current English ability level and generate texts of corresponding difficulty level [as a tool]; (2) The training process of reading attitude. It is reflected in the second instruction that it is required to retrieve topics of interest to it, for example: the biography of NBA stars (difficulty factor is maintained at A2). In the LLM language library, relevant content is generated by matching keywords [as a tool]; (3)

The construction of the reading environment requires the cooperation of reality and physics to be realized, so users can ask about specific methods and methods to create a good reading environment. Optimization and zero-sample learning technology analyze the user's environment and give personalized guidance, such as: turn off iPhone, iPad, Mac All electronic devices for learning, etc. [as a teacher]; (4) In terms of learning motivation, AI can provide meta-linguistic strategies, such as reading learning strategies such as "choose the reading materials you are interested in" and "try to build good reading habits" In addition, it can also understand the habits and hobbies of users in natural communication, learn and transform through instructions, and provide reading content that users are really interested in [as a teacher/tool]; (5) Satisfaction of learning preferences and personalized teaching methods It can be realized by the user giving his preferred activity method, such as inputting "select role play After reading training" command, the system selects the text and adopts a role-playing interactive form [as a learning partner].

Table 3: Reading Practice Instructions and Reply Examples

<i>User's prompts</i>	<i>ChatGPT 's outputs (Partly scripted)</i>
<i>Can you provide me with a A2 level English material based on CEFR?</i>	Sure , here is the article based on CEFR: Title: The Benefits of Walking . Walking is a great way to improve our health and fitness.... ...
<i>What about reading material concerning some NBA stars?</i>	Sure , here is an A2 level Reading material based on NBA stars: Title: LeBron James- The King of Basketball....
<i>How can I do an immersive reading with this article? I don't want to be interrupted by others.</i>	1. Find a quiet place. 2. Turn off your devices. 3. Read the article slowly 4. Visualize the information you are reading 5. ...
<i>How to improve my reading motivation?</i>	1. Choose books that interest you 2. Set achievable reading goals 3. Make reading a habit 4. Create a comfortable reading environment 5. ...
<i>Can we do a role play to practice my reading skill?</i>	Sure , we can definitely do a role play to practice. What kind of role play would you like to do? Would you like to practice reading dialogues or reading a script for a play or a movie?
<i>Set me a real-life task and interact with me to figure out the problem</i>	Sure , here is a real-life task: Task: You are planning a road trip from Los Angeles to San Francisco. Your car has been acting up lately, and you want to make sure it's in good condition before you leave... Are you ready to begin?

Note: Use short instruction to interact with ChatGPT for simple reading exercises

#### 4.4 Writing \_

The National Council of Teachers of English (NCTE, 2023) has emphasized six major standards of English writing: grammar, vocabulary, language organization, clarity, revision, and style. The following writing practice instructions will be tested around these several evaluation criteria (see Table 4):

The writing practice instructions around the six major standards in the above table have all received accurate feedback from the ChatGPT system: (1) Based on the instructions and English text given by the user, the system can call the data on the accuracy of English grammar in the pre-trained model to compare the user text Provide diagnostic feedback and objectively give replacement expressions and more relevant content to help understanding (Lu, 2023:6); (2) ChatGPT's ability to assist users in terms of vocabulary and language style is reflected in "Instruction 2". By modifying the application scene and language style in the instruction, for example: "Writing a formal essay", the system's self-adaptive learning function will provide corpus suitable for the current scene, so as to meet the needs of the text to achieve a certain pragmatic purpose. And replaceable vocabulary is also included, through multiple rounds of " Can you provide "more substitutes " instruction, more substitutions will be given; (3) The auxiliary function of language organization is more reflected in metalinguistic cognition, such as "instruction three". Users can first use the system's knowledge base and model Understand what is the problem of writing organization, such as: "Lack of Coherence" and "Poor Transition". Then continue to instruct to enter your

own text and ask the system for feedback on the above organizational problems. Intelligent recommendation can give similar examples to express Imitation writing training; (4) In the same way, after the revision of the article and the clarity of the speech are processed by zero-sample learning and natural language model, diagnosis and replacement can be performed by letting the system present the review results.

Table 4: Examples of writing practice instructions and responses

<i>User's prompts</i>	<i>ChatGPT's outputs (Partly scripted)</i>
<i>Can you help to check my grammatical mistakes in the following article?</i>	Of course, I'd happy to help you check the grammatical errors...
<i>Do you know some collocations to give advice when writing a formal essay?</i>	Yes, there are several collocations: 1. Offer guidance... 2. Provide insight... 3. Give recommendations... 4. Offer tips... 5. Provide feedback...
<i>What are some of organizational problems we often meet in writing an essay?</i>	There are several problems: 1. Lack of structure... 2. Poor transitions... 3. Weak thesis statement... 4. Overuse of quotes... 5. Lack of coherence...
<i>How to write an essay with high clarity?</i>	There involve several key strategies: 1. Develop a Lear thesis statement... 2. Use simple and concise language... 3. Organize your ideas... 4. Use effective transitions... 5. Use examples and evidence...
<i>Can you help to revise my writing below based on the IELTS writing criteria?</i>	Of course, I'd be happy to help. Please share your writing with me and let me know which criteria you'd like me to focus on...

Note: Use short instruction to interact with ChatGPT for simple writing exercises

#### 4.5 Summary of Limitations

However, through further interactive testing of the system, the following predictable problems emerged: (1) As a new generation of generative AI, with the support of the most advanced LLM system, its language interaction expression still has a strong tendency to be mechanized, For example, the system uses "Sure", "Of course" and "There be... sentence patterns" almost 100% of the above four table interaction paradigms for interaction; (2) For users who want to use the ChatGPT system for English practice Said that there is a certain threshold of English proficiency. In other words, users need to be at least comfortable using the basic syntax. From the perspective of English beginners, they do not have the ability to give accurate instructions and communicate freely in English with the system. (3) So far, ChatGPT's recognition of Chinese is not as good as English. If you use Chinese to learn English interactively, the instructions given must be short and effective, and should not contain complex context and twists and turns. (4) Personalized fully automatic AI learning makes complex and difficult-to-find knowledge readily available. Users tend to rely too much on the convenience of artificial intelligence and ignore the boundaries of knowledge and the expressiveness of language. Avoid excessive indulgence leading to academic misconduct and fraud.

#### 5. Summary

The emergence of generative artificial intelligence has undoubtedly brought new ideas and directions to non-native English learning in the new era. The new generation of GPT-4 and Baidu's "Wen Xin Yi Yan" were also launched in the process of writing the article. While marveling at the speed of its change, I also found that the mechanized AI dialogue is also constantly improving. How to conform to the big trend and understand its pros and cons is the main theme.

This study only takes ChatGPT as an example to do a short-term case analysis on the four basic skills of English listening, speaking, reading and writing. The author explores the applicability of its core technology application in English learning through "instruction-reply", and the case shows that generative pre-training artificial intelligence has considerable auxiliary capabilities for the four skills of English ESL learning. Of course, there will inevitably be related limitations, such as language mechanics,

usage thresholds, differences in Chinese-English recognition, and knowledge boundary discussions, etc., all of which need to be considered during the use process. Due to the relatively new topic, there is currently no relevant empirical research that can further prove that the use of generative artificial intelligence can improve the efficiency of English learning. Therefore, I sincerely hope that follow-up researchers can continue to enrich the field of empirical research, and the application research of generative AI to English teaching/learning.

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