

The Effects of ICTE Robot on Students' English-Speaking Skills: A Mixed-Methods Study on Non-English Majors at Nguyen Tat Thanh University

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ABSTRACT

Keywords: ICTE robot, AI Chatbots, speaking, feedback

Amid Vietnam's growing emphasis on English as a second language, educators continue exploring AI-powered tools to help learners speak accurately, naturally, and fluently. While prior studies have examined well-known chatbots such as ELSA, Google Assistant, and ChatGPT, few have investigated a customized chatbot within a mixed-methods design. This study addressed that gap by examining the impact of the ICTE robot, a custom-built AI chatbot, on the speaking performance and perceptions of 24 non-English-major students at Nguyen Tat Thanh University. Pre- and post-tests adapted from the PET speaking rubric assessed vocabulary, grammar, pronunciation, and discourse management, while semi-structured interviews with nine participants explored their experiences. Paired-samples t-tests revealed significant gains in vocabulary, pronunciation, and discourse management, though grammar showed no significant improvement. Interviews indicated that students valued the ICTE robot's voice-based and multimodal features, reporting greater confidence, stronger vocabulary retention, and improved pronunciation, while also noting technical issues such as speech-recognition errors and connectivity problems. These results suggest customized AI chatbots can meaningfully support EFL speaking development, highlighting the need for improved feedback accuracy and expanded grammar practice.

Introduction

Artificial Intelligence (AI) is undoubtedly assumed to impact all sectors, including education. Numerous educators are currently adopting AI-powered tools for speech cognition, such as ChatGPT and Gemini, as well as customized AI chatbots developed by scholars, which have enhanced second-language help and increased the effectiveness of teaching and learning. In particular, the emergence of AI chatbots such as the well-known ChatGPT, Gemini, and customized AI chatbots developed by scholars has boosted second-language acquisition. Martin (2025) asserted that the most pivotal feature of AI chatbots lies in Natural Language Processing

(NLP), which stimulates human-like communicative functions. Meanwhile, Halimah, Budianto, Hoesny, Cabuquin, and Ulfa (2025) identified 14 AI-based chatbots, including prominent ones such as Duolingo, Alice, and Elsa Speak, after screening 374 studies. Those previously mentioned chatbots are considered supportive tools for speaking skills.

Mastering oral communication is a multi-faceted challenge that extends far beyond a simple grasp of linguistic rules. Research by Heriansyah (2012) highlights that students confront both language-based hurdles, such as limited vocabulary and poor pronunciation, and psychological barriers like anxiety and shyness. Vietnam-based studies by Nguyen and Tran (2015) reveal that despite years of formal education, high school students often fail to achieve fluency due to performance pressure, knowledge gaps on topical issues, and fear of criticism. These observations are reflected in the author's experience at Nguyen Tat Thanh University, where even English majors struggle with in-depth discussions and instead offer brief responses. A primary factor is the inadequate opportunities to be immersed in an English-speaking environment.

In Vietnam, Decision 2371/QĐ-TTg was approved by the Prime Minister to make English a second language, posing a great challenge for both English instructors and learners. It means that English communicative competence, particularly English-speaking competence, should be highly regarded. Moreover, through observations of several general English classes, one of the two researchers realized that non-English majors were weak in pronunciation, vocabulary, grammar, and fluency. Regarding studies on the impact of AI chatbots on students' speaking skills, international and Vietnamese scholars employed various research designs, including experimental designs, surveys, and systematic reviews, but few conducted mixed-methods studies. Besides, they researched well-known AI chatbots rather than a customized chatbot like the ICTE robot.

Hence, an empirical study on the effectiveness of an AI-driven chatbot (a so-called ICTE robot) for oral improvement was conducted with the participation of non-English majors. The ICTE robot was invented to help students improve their vocabulary, grammar, pronunciation, and the four English skills. The competitive advantage of this chatbot is its voice feature, which helps students maximize their English learning.

The study was conducted to examine the impact of the ICTE robot on NTTU non-English-major students' vocabulary, grammar, pronunciation, and discourse management, as well as their perceptions of its use.

Literature Review

Definition of AI chatbots

An AI chatbot is a computer program that imitates human-user dialogues (Lexico Dictionaries, n.d, as cited in Adamopoulou & Moussiades, 2020). Altarif and Al Mubarak (2022) specifically described it as an AI tool that communicates with humans via messaging apps, mobile apps, and websites. AI chatbots have been defined by numerous scholars; however, in the realm of teaching and learning, chatbots are considered conversational agents that provide content via digital platforms (Bosch & Kruger, 2024).

Classifications of AI chatbots

According to Altarif and Al Mubarak (2022), AI chatbots are categorized as task-oriented, data-driven, and predictive. The former is merely associated with task fulfillment, whereas the latter seems more complex and collaborative. Task-oriented chatbots provide specific content based

on frequently asked questions, abide by rules, and use Natural Language Processing (NLP). Meanwhile, data-driven chatbots collect and analyze stored data to tailor content based on past performance. They can read texts, follow conversations, and give appropriate responses. The current study delved into task-oriented chatbots, originating from frequent questions to establish conversations with students.

Benefits and drawbacks of AI chatbots in education

AI chatbots are advantageous to both learners and educators; however, this study investigated how they benefit students. Meenakshi & Sharma, Bhavna (2026) noted that this type of technology facilitated personalized learning, enhanced accessibility, provided prompt feedback, and increased student engagement. Likewise, Gökçearslan, Tosun, and Erdemir (2024) agreed with the previous authors and added further positive aspects of AI chatbots, including increased motivation, enhanced language skills, and improved learning performance. Pitts, Marcus, and Motamedi (2025) presented fewer concepts and were geared towards time and cost efficiency, as well as creative support for students' further research. After reviewing them, all the scholars shared the view that, thanks to this type of technology, students can regulate their learning on their own, receive instant feedback without relying on teachers' scaffolding, and actively take on responsibility for learning.

Regarding the downsides of AI chatbots, they are perceived to hinder learners through misinformation, overreliance on technology, and restrictions on human interaction (Gökçearslan, Tosun, & Erdemir, 2024; Pitts, Marcus, & Motamedi, 2025; and Davar, Dewan, & Zhang, 2025). Pitts, Marcus, and Motamedi (2025) particularly raised their concern on academic integrity issue and students' loss of critical thinking skills while Gökçearslan, Tosun, and Erdemir (2024) distinctly presented major challenges which appear to surprisingly align with the current study, including "limitation of personalized feedback, failure to understand complex expressions, outdated responses, and difficulty getting used to technology" (p.25).

Definition of AI chatbots: Speaking and aspects of speaking skills

Definition of speaking

Linguists brought varied perspectives on the notion of speaking. Burns and Joyce (1997) identified it as the negotiation and establishment of meaning through the production and processing of information. Furthermore, depending on different circumstances, participants, and the speaker's intent, different meanings are conveyed. This is partly in line with Chaney and Burk's (1998) view of speaking as the use of verbal and non-verbal symbols to convey meaning. It seems that the previously mentioned scholars defined speaking broadly, leading to measurement issues in assessing it.

In contrast, Thornbury (2005) demonstrated a more systematic framework, regarding speaking as a combination of specific stages—conceptualization (think about discourse type, topic and purpose), formulation (choose discourse, syntax and vocabulary), and articulation (produce sounds)-facilitated by both linguistic knowledge (genre, discourse, pragmatic, grammar, vocabulary, phonology), and extra-linguistic knowledge topic and cultural knowledge, knowledge of the context and familiarity with other speakers. Torky (2006) broadened the concept by illuminating coherence, fluency, and appropriateness. In his view, sharpening speaking skills corresponds with sharpening linguistic, discourse, and pragmatic competencies. From other angles, Harmer (2001) emphasized the role of connected speech and expressive devices in conveying emotion and Kurum (2016) sorted the skill into three main components: mechanics (grammar, vocabulary and pronunciation), functions (the distinction between conveying information and maintaining interaction), and pragmatics (turn taking, rate of

speech, length of pauses of speakers, relative roles of participants). Ultimately, speaking is a complex skill, and defining it is troublesome. The operational definition of Kurum seems coherent, detailed, and measurable, which is used in the current study.

Aspects of speaking skills

There are two primary methodologies for classifying and assessing oral proficiency: the analytic and the synthetic approaches.

Referring to the analytic approach, Husnawati (2017) categorized oral performance into six key components.

Fluency: The capability of speaking at a natural speed with minimal hesitations, pauses, and use of time fillers.

Pronunciation: refers to how to produce utterances and includes pitch, intonation, individual sounds, sounds and spelling, and stress.

Grammar: refers to a system of structural rules which influence the composition of words, phrases, and clauses.

Vocabulary: relates to words, phrases, and expressions that show certain meanings. Firman and Haq (2012) clarified that vocabulary exists in active (words people use) and passive (words people comprehend) forms.

Interactive Communication: means the ability to interact with other people, such as asking and responding appropriately at the expected speed for task fulfillment. It reflects the promptness of learners' responses.

Appropriateness: means that, depending on setting, participant, purpose, and topic, people choose to communicate appropriately in terms of words and expressions.

Conversely, Koizumi (2005) analyzed only three elements: accuracy (the number of errors), fluency (temporal measures such as words per minute), and complexity (the varied and sophisticated use of vocabulary and grammatical structures).

The first classification provides more detail on learners' speaking competence and creates favorable conditions for raters. However, this one is prolonged and tedious for instructors of large classes. The second one is concise and efficient but short of meticulousness. The present study followed Husnawati's classification and examined vocabulary, grammar, pronunciation, and discourse management (equivalent to fluency), which are applicable to non-English majors. Due to the difficulties of online instruction and testing, interactive communication was not measured in this study.

The empirical studies on the impact of AI chatbots in EFL speaking classes and on students' perceptions of chatbot use.

Considering the promising potential of AI chatbots, numerous studies have been conducted both worldwide and nationwide. Aliakbari, Barzan, Allahveysi and Bakhtiarvand (2025) and Aliakbari, Barzan and Sayyadi (2025) concurred in adopting an experimental design, but the second research article had more specific findings that intermediate-level students progressed slightly in pronunciation and had remarkable improvement in fluency, vocabulary, and grammar after 12 weeks of practice with LinguaBot. In addition to pre- and post-tests, other researchers used questionnaires and semi-structured interviews to collect comprehensive data. Zhang (2026) allowed students to experiment with CallAnnie, Google Assistant, and Alexa to evaluate Chinese students' oral proficiency and afterward conducted semi-structured interviews

to gain their perceptions on the use of AI chatbots and willingness to communicate. Having analyzed the ANOVA data and interview responses, the author found that students' oral proficiency improved and that they appreciated "AI chatbots' accessibility, authenticity, and multimodal features, which helped reduce anxiety and boost confidence" (p. 1). Similarly, Grab (2025) explored four AI chatbots, namely Talkpal AI, Gliglish AI, Langotalk, and ChatGPT (voice mode), and administered post-study questionnaires and interviews. The findings revealed that those tools positively impacted students' speaking skills and increased their confidence; personalized feedback and autonomous learning were factors they highlighted after the intervention.

Using another research method- a systematic review, Safitri, Hidayati, and Ciptaningrum (2025); López-Molines (2025) and Rachmadani, Musyafa'ah, Januanto, and Fitriyah (2026) concurred in concluding that AI chatbots were effective tools in speaking instruction. Regarding students' perspectives on the chatbots, López-Molines's findings appeared to be the most meticulous. The author affirmed that thanks to chatbots, students boosted their confidence and performed better in language learning at their own pace. Conversely, they had shortcomings, including incoherent responses, poor speech recognition, and poor sound quality. Safitri, Hidayati, and Ciptaningrum (2025) highlighted the advantages, including increased learner participation and opportunities for practice, and the disadvantages, including response inadequacies. Rachmadani, Musyafa'ah, Januanto, and Fitriyah failed to discuss the drawbacks of the chatbots. In terms of methodology, López-Molines and Safitri, Hidayati, and Ciptaningrum followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, while the remaining authors used the Search, Appraisal, Synthesis, and Analysis (SALSA) framework.

In the Vietnamese context, mixed methods were predominantly employed among the researchers. Tran (2025) engaged 50 private English majors in completing survey forms and, for some, in interviews after learning English with ChatGPT, Elsa Speak, and Duolingo for 6 weeks. Besides the previously mentioned findings, such as automatic mistake identification and correction, concerns about the cost of chatbots are emerging. Le (2025) adopted the identical research method to Tran (2025). Bui, Ngo, and Mai (2025) conducted a large-scale study on the effects of ChatGPT and Character AI on the argumentation skills of English-major students, while Le and Ngo (2025) investigated the effects of Yoodli, Orai, and other AI tools on English-major students' presentation skills. The similarities between the two studies include the use of both quantitative and qualitative methods and the identification of both the pros and cons of chatbots. Particularly referring to the speaking research topic, Duong and Suppasetseree (2024) conducted a quasi-experimental investigation, combined with the use of questionnaires and interviews, to delve into the effectiveness of the Andy English bot in improving oral capabilities and students' attitudes toward this chatbot. The study found that students' accuracy and fluency were improved, and that the comfort and flexibility in practicing with the chatbot were valued.

After reviewing both domestic and overseas studies, it was found that all scholars investigated well-known AI chatbots, and few conducted mixed-methods studies. The present study focused on a customized chatbot developed by one of the two authors, aimed at improving students' vocabulary, grammar, pronunciation, and discourse management, with participation from the participation of non-English majors at a private university.

Research questions

To address those objectives, two research questions were raised:

1. To what extent does the ICTE robot improve NTTU non-English majors' speaking performance, including vocabulary, grammar, pronunciation, and discourse management?
2. What is the perception of NTTU non-English majored students on the adoption of the ICTE robot in speaking class?

Methods

Participants and setting

Twenty-four non-English major students voluntarily participated in this study after obtaining official approval from the Faculty of Foreign Languages. One of the two researchers who directly taught those students obtained the students' consent to participate in the study, including recording the pre- and post-tests, storing screenshots of practice with the ICTE robot, and recording the interviews. Seventeen males and seven females were aged 20-22 and mostly studied automotive engineering technology and information technology engineering. All of them were taught by one of the two researchers in the AVCD4 class. Their English proficiency was determined by the pre-test score. Convenience sampling was chosen to reduce time and expenditure (Golzar et al., 2022). The study's objectives and the students' assignments were clearly explained to them. Every participant was instructed in the use of the ICTE robot and had a pre-intermediate level of English proficiency. After finishing each unit, the students were encouraged to practice using the ICTE robot to consolidate their knowledge and improve their English skills. The study was conducted over 17 sessions, comprising 8 online and 9 offline sessions, in compliance with the University's direction during semester 2 of the 2025-2026 academic year. The participants were taught with the Personal Best B1 coursebook (units 7-12).

Research design and instruments

A mixed- methods study was adopted, combining quantitative and qualitative analyses. According to Creswell (2012), this research method provides comprehensive insights into a phenomenon.

The researchers used pre- and post-tests to assess the ICTE robot's effectiveness in improving students' speaking skills, and semi-structured interviews to explore their perceptions of using it. The pre-test and post-tests were drawn from the sample PET speaking test, using the same format and content to ensure validity. Taking into account the students' English proficiency and time constraints, only Parts 1 and 2 were administered. In Part 1, students were required to answer general questions, and in Part 2, they completed a picture description. The tests were marked by two raters to increase the validity of the data. Both had extensive experience in teaching the speaking module for non-English majors. They also previously administered PET speaking tests. The rubric was adapted from the PET speaking rating rubric to ease the assessment. In the PET speaking rubric, four dimensions of speaking (vocabulary, grammar, pronunciation, discourse management, and interactive communication) are assessed, and students' performance band scores range from 0-5. The raters focused on vocabulary, grammar, pronunciation, and discourse management, using a 0-5 scale for each criterion. Considering students' proficiency and virtual learning mode, the interactive communication criterion was not marked.

The Kappa coefficient indicating the agreement level between the two rater is presented in the table below.

Table 1

The inter-rater reliability

		Value	Asymptotic standard error	Approximate T	Approximate significance
Measure of agreement	Kappa	.03	.13	.28	.78

As described, the Kappa value is 0.03 (<0.6), indicating that there is no significant agreement between the two raters. The final score was determined by the first rater by calculating the average score or marking based on either rater, after carefully reviewing the recorded speaking performance audio.

The ICTE robot was invented by one of the two authors, who used ChatGPT to code. There are eight features, including conversation, vocabulary, grammar, discussion, reading, listening, problem-solving, and progress. The students were encouraged to exploit all the functions to maximize their learning outcomes. The vocabulary, grammar, listening, and reading exercises are standard but the additional tasks in the ICTE robot is conversation (students interact with the robot and are commented on responses); discussion (students use the learned vocabulary and structures to practice writing), problem-solving (students deal with real-world situations), and progress (check the number of completed activities, average score and the number of words used). The notable feature is that students voice chat with the robot like a native speaker rather than merely doing tedious exercises, and they can use the voice function to learn every lesson. The link to access the ICTE robot is <https://i-cte.org/robot>. To help readers understand those features of the ICTE robot, the screenshots in Unit 7 (City living) are as follows.

Figure 1

Interface of ICTE robot

The figure displays two screenshots of the ICTE robot interface, specifically Unit 7 — City Living & The Daily Commute. The interface features a green navigation bar with tabs for Conversation, Vocabulary, Grammar, Discussion, Reading, Listening, and Problem-solving. The main content area is divided into sections for practice exercises.

Top Screenshot: Vocabulary Matching + Use It

Unit 7 — City Living & The Daily Commute
Practice present perfect with *yet / already*, city features, commuting vocabulary, and listening for facts & figures.

Mic: Off
Start Voice Stop
Voice (Narrator)
Google US English (en-US)
Tip: If you don't see voices yet, click anywhere once and wait 2–3 seconds.

2) Vocabulary Matching + Use It
Read instructions Reset

Match the words to the meanings, then complete the sentences using the same vocabulary. (City features list :contentReference[oaicite:4](index=4); transportation list :contentReference[oaicite:5](index=5))

A) Matching

1) bike lane
Choose meaning...

2) traffic jam
Choose meaning...

3) platform
Choose meaning...

4) commuter
Choose meaning...

B) Use the words (Fill in the blanks)

1) I always walk on the ___ when the road is busy.
Choose...

2) At the ___, I wait for the train and then get on.
Choose...

3) During ___, the streets are crowded and commuters get delayed.
Choose...

Bottom Screenshot: Grammar — Present perfect with yet / already

Unit 7 — City Living & The Daily Commute
Practice present perfect with *yet / already*, city features, commuting vocabulary, and listening for facts & figures.

Mic: Off
Start Voice Stop
Voice (Narrator)
Google US English (en-US)
Tip: If you don't see voices yet, click anywhere once and wait 2–3 seconds.

3) Grammar — Present perfect with *yet / already*
Read instructions Reset

Rule reminder: Use **already** for something earlier than expected; use **yet** in questions/negatives for something expected before now (present perfect focus :contentReference[oaicite:6](index=6)).

1) Have you found a job ___ ?
Choose...

2) I've ___ been to the theater twice.
Choose...

3) She hasn't arrived ___ .
Choose...

4) I've ___ paid the rent.
Choose...

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Conversation Vocabulary Grammar **Discussion** Reading Listening Problem-solving

Unit 7 — City Living & The Daily Commute

Practice **present perfect** with *yet / already*, city features, commuting vocabulary, and listening for **facts & figures**.

Mic: Off

Start Voice **Stop**

Voice (Narrator)

Google US English (en-US)

Tip: If you don't see voices yet, click anywhere once and wait 2–3 seconds.

4) Discussion (Voice or typing)

Read instructions **Next question**

Answer with reasons. Try to include at least **2 vocabulary items** and at least **one** present perfect sentence using *yet* or *already*.

Click Next question to begin.

Write your answer here...

Check my language **Read question**

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Conversation Vocabulary Grammar Discussion **Reading** Listening Problem-solving

Unit 7 — City Living & The Daily Commute

Practice **present perfect** with *yet / already*, city features, commuting vocabulary, and listening for **facts & figures**.

Mic: Off

Start Voice **Stop**

Voice (Narrator)

Google US English (en-US)

Tip: If you don't see voices yet, click anywhere once and wait 2–3 seconds.

5) Reading Comprehension — “First impressions of city life”

Read instructions **Read the text**

Read the text, then answer the questions. (Source text about Alex & Megan :contentReference[oaicite:7](index=7))

San Francisco — first impressions

- There are so many tech companies here; it's really exciting. I've joined a networking group to meet people from the industry, and I've already been to a couple of events. Have I found a job yet? No ... but I'm sure I will soon!
- In my apartment building, there are people of all nationalities. I haven't met all my neighbors yet, but I love living in a city where everyone is different.
- Whatever you're interested in, there's always something going on. I've already been to the theater twice and I've seen a baseball game, and I only arrived two weeks ago!
- San Francisco is expensive and you need a good salary to live here. I've rented a room in a shared house, but after I've paid the rent, it doesn't leave me with much money for other things.
- The summers wouldn't be as hot as back home. It hasn't been too cold yet, but it can get really foggy, especially when you're near the ocean.

ConversationVocabularyGrammarDiscussionReadingListeningProblem-solving

Unit 7 — City Living & The Daily Commute

Practice present perfect with *yet / already*, city features, commuting vocabulary, and listening for facts & figures.

Mic: Off

Start VoiceStop

Voice (Narrator)

Google US English (en-US)

Tip: If you don't see voices yet, click anywhere once and wait 2–3 seconds.

6) Listening Comprehension — Commuting around the world

Read instructions

Play listening (TTS)Stop

Click **Play listening**. Listen for **facts and figures**, then complete the gaps. Target answers include: *40 minutes, two hours, 7:30, eight million, push, white, 40 million, cars, argued, big* (answer set :contentReference[oaicite:9](index=9)).

Listening focus: identify numbers/times and key nouns (e.g., *platform, passengers, parking space, public transportation*). (Skill + vocab focus :contentReference[oaicite:10](index=10))

Word bank: 40 minutespush7:30eight millionarguedtwo hoursbigcarswhite40 million

1) The global average commuting time is ____.

Choose...

2) In Bangkok, the average commuting time is ____.

Choose...

VocabularyGrammarDiscussionReadingListeningProblem-solvingProgress

Unit 7 — City Living & The Daily Commute

Practice present perfect with *yet / already*, city features, commuting vocabulary, and listening for facts & figures.

Mic: Off

Start VoiceStop

Voice (Narrator)

Google US English (en-US)

Tip: If you don't see voices yet, click anywhere once and wait 2–3 seconds.

7) Problem-solving (Real-life city scenarios)

Read instructionsReset

Choose the best solution. Then write one sentence using present perfect with *yet or already*.

1) Scenario 1: You start out late and there's a traffic jam at the intersection near the bridge. You must arrive on time. What's the best plan?

Drive faster through the crosswalk to save time.

Take public transportation and walk from the station platform to your office.

Park in a bike lane so you can get out quickly.

Write ONE sentence using present perfect with *yet/already* about what you have done to fix the problem.

Write your sentence here...

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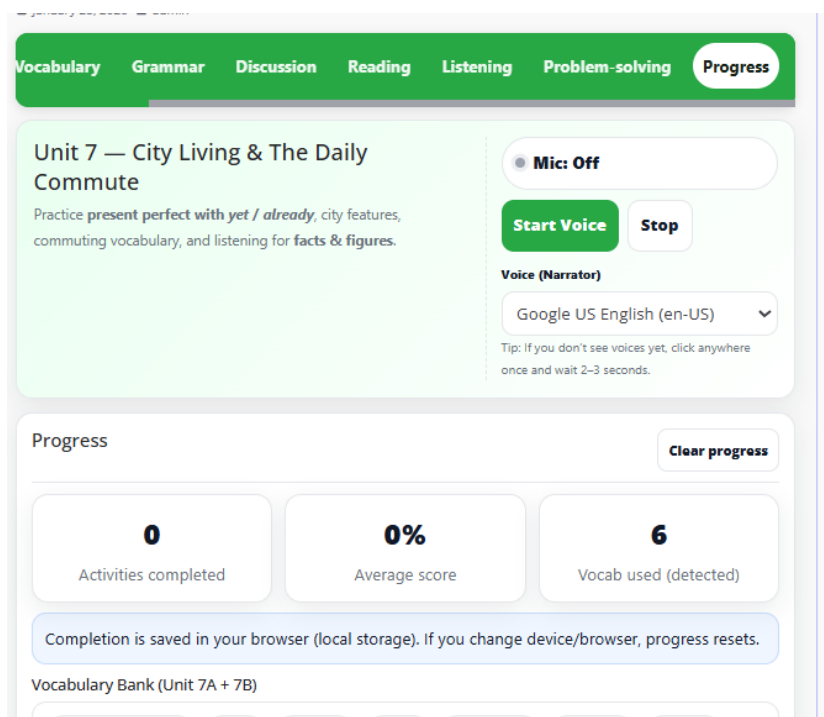
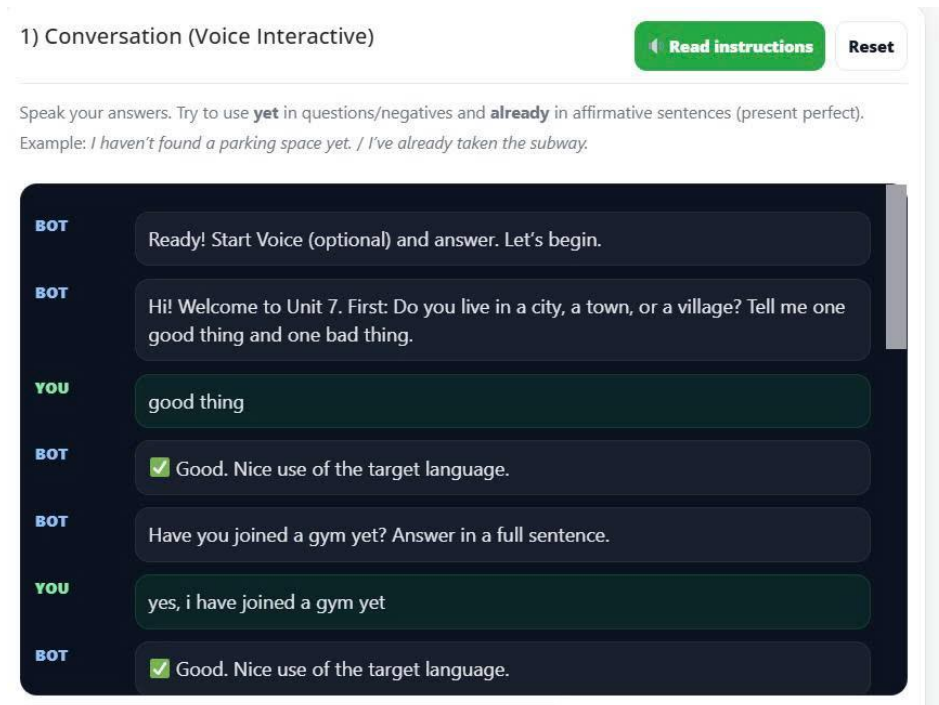


Figure 2 shows evidence of one student's practice with the ICTE robot, in which the student practiced the Conversation section in Unit 7 and received instant feedback from the robot.

Figure 2

Students practiced with the ICTE robot



Eleven interview questions were translated into Vietnamese to facilitate participants' responses.

When do you usually practice speaking English with the chatbot? How long do you practice?

Do you find that practicing with the chatbot helps you speak English more confidently?

Do you find learning English with a chatbot similar to speaking with a native speaker?

Which learning method do you prefer?

Do you find that learning through the chatbot helps you improve your vocabulary, pronunciation, and reflexes?

What aspects of the chatbot do you like?

What difficulties have you encountered when learning with the chatbot outside of class?

Do you have any suggestions for the chatbot?

Do you think the chatbot is a powerful tool to support learning to speak English?

In your experience, what benefits did practicing English speaking with the chatbot during the course bring to you?

Do you think we should continue incorporating this chatbot to supplement the English-speaking practice in the current curriculum?

At first, the researchers intended to choose ten participants for the interview process, but one of them declined. The selection of nine interviewees was based on their performance and engagement in the lesson. All low-, medium-, and high-engagement learners were included. To assess the saturation of the interview codes, the researcher interviewed the first 3 participants, coded the interviews, and realized there was insufficient information about their learning experience with each function of the ICTE robot. Subsequently, the researcher conducted interviews with the next 3 participants, coded, and found that they did not share much about the benefits and challenges of using the ICTE robot. Finally, the remaining participants were interviewed to ensure sufficient data were collected.

Data collection procedure

This procedure underwent two phases: intervention and interview administration. Initially, pre-tests were administered virtually during the first three sessions, and all audio recordings were obtained with students' consent. After completing one unit, the participants practiced English with the ICTE robot to improve English proficiency, focusing on speaking skills. They could freely choose their preferred section in the ICTE robot to practice and learn at their convenience. After that, they took screenshots and sent those images to the teacher as evidence. The detailed learning activities of six units were described below.

Session	Content	Learning activity
1	Unit 7A+B	Have a group discussion about life in the city
2	Unit 7C+D	Ask questions using the structure Have/has + V3
3	Unit 8A+B	Ask questions about the food topic
4	Unit 8C+D	Make a dialogue using the structure Would you like to V
5	Unit 9A+B	Make sentences using the structure Used to V
6	Unit 9C+9D	Have a group discussion about online shopping
7	Unit 10A+10B	Make a short conversation about Sports
8	Unit 10C+10D	Make sentences using the structure reported speech
9	Unit 11A+11B	Ask questions using the structure Gerund/ Infinitive
10	Unit 11C+11D	Make sentences to describe the materials
11	Unit 12A+12B	Make sentences using the relative pronoun
12	Unit 12C+12D	Have a group discussion about the First date

This intervention lasted 12 sessions and was followed by the post-test. Finally, based on the evidence of practice submitted to the teacher, 9 participants (5 females and 4 males) were purposefully selected for the recorded interview process. Females were coded as F and males were coded as M in the qualitative data analysis. Each participant was interviewed separately in 3 sessions. The researcher conducted the interview in Vietnamese to create favorable conditions for them to share their thoughts on the use of the ICTE robot. There was only one coder in the qualitative analysis.

One of the researchers conducted the interviews and transcribed the interview audio for analysis. The transcript was not returned to the participants, and the researchers translated only some of the sentences included in the qualitative analysis into English. An expert in English Language Teaching was selected to check the translation. The analysis of qualitative data was therefore easier. The qualitative methodology of this study was adapted from the fundamental steps of thematic analysis by Almedia (2026).

Step 1: in-depth reading of AI chatbot studies on improving students' English, highlighting studies that include interview questions, such as Zhang (2026). Some themes were defined, such as feelings about using AI chatbots outside the classroom, the impacts of AI chatbots on communication in English, the difference between communicating with AI chatbots and communicating with humans, and the challenges of using AI chatbots outside the classroom

Step 2: Adding more themes such as frequency of practice with the ICTE robot, the effects of the ICTE robot on vocabulary, grammar, pronunciation, and discourse management, perceptions of the multimodal features of the ICTE robot, benefits and drawbacks of using the ICTE robot, and the recommendations)

Step 3: Interviewing session 1 and initial coding process (after interviewing the first 3 students, the researcher transcribed and put the codes in each theme)

Step 4: Interviewing session 2 and coding

Step 5: Interviewing session 3 and coding

Step 6: After transcribing the interview audio, the researchers highlighted key points and created a table listing each interviewee and the interview themes.

Results/Findings

Research question 1: To what extent does the ICTE robot improve NTTU non-English majors' speaking performance, including vocabulary, grammar, pronunciation, and discourse management?

Pre-test

Table 2 presents descriptive statistics for pre-test scores in vocabulary, grammar, pronunciation, and discourse management.

Table 2

Descriptive statistics of pre-test scores

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Vocabulary pre-test	24	.5	3.0	1.77	.63
Grammar	24	.0	2.5	1.40	.71
Pronunciation	24	.0	3.0	1.52	.77
Discourse management	24	.0	3.0	1.13	.85
Valid N (listwise)	24				

As described, before learning with the ICTE robot, the mean vocabulary score was the highest at 1.77 (SD=0.63), followed by pronunciation, grammar, and discourse management, respectively. To be specific, prior to treatment, the mean pronunciation score (M=1.52, SD=0.77) was slightly lower than the mean vocabulary score, and the mean discourse management score (M=1.13, SD=0.85) was a bit lower than the mean grammar score (M=1.40, SD=0.71). It means that before being supported by the ICTE robot, the students' ability to use words in speaking was the best, and their fluency was the worst.

Post-test

Table 3 presents the descriptive data of vocabulary, grammar, pronunciation, and discourse management after practicing with the ICTE robot.

Table 3

Descriptive Statistics of post-test scores

	N	Minimum	Maximum	Mean	Std. Deviation
posttest vocabulary	24	1.0	3.5	2.19	.62
posttest grammar	24	.0	3.5	1.54	.90
posttest pronunciation	24	1.0	3.0	2.06	.63
post test discourse management	24	.0	4.0	1.92	1.06
Valid N (listwise)	24				

The table shows that after learning with the ICTE robot, the students continued to perform best in using lexical resources (M=2.19, SD=0.62) and worst in applied grammatical structures (M=1.54, SD=0.90). The mean of pronunciation score (M=2.06, SD=0.63) and discourse management (M=1.92, SD=1.06) were nearly as high as that of vocabulary, indicating that the proficiency in pronunciation and fluency was approximately equal to vocabulary.

Paired samples T-test

The comparison of vocabulary, grammar, pronunciation, and discourse management scores before and after learning with the ICTE robot was shown in Table 4.

Table 4.

Paired samples T-test

	Cohen's d	Mean	Std. Deviation	t	df	95% Confidence Interval of the Difference		Sig. (2-tailed)
						Lower	Upper	
Pre-test vocabulary & post-test vocabulary	.67	-.42	.67	-3.05	23	-.70	-.14	.01
Pre-test grammar & post-test grammar	.85	-.15	.85	-.84	23	-.51	.21	.41
Pre-test pronunciation & post-test pronunciation	.78	-.54	.78	-3.41	23	-.87	-.21	.00
Pre-test discourse management & post-test discourse management	1.25	-.79	1.25	-3.10	23	-1.32	-.26	.01

The table depicts that the p-values of most elements, including vocabulary, pronunciation, and discourse management, were lower than 0.05, meaning that there was a significant difference in the results of those speaking aspects between before and after the intervention. Conversely, there was no significant difference in grammar before and after integrating the ICTE robot in the learning program ($p=0.41$). It can be inferred that the ICTE robot was an effective tool in improving students' lexical resources, pronunciation, and fluency. Specifically, regarding the mean difference and Cohen's d indicating the effect size, the students had a considerable improvement in discourse management ($M= -0.79$, $\text{Cohen's } d = 1.25$) while they had a slight improvement in pronunciation ($M=-0.54$, $\text{Cohen's } d = 0.78$), and vocabulary ($M= -.42$, $\text{Cohen's } d = 0.67$), respectively.

Research question 2: What is the perception of NTTU non-English majored students on the adoption of the ICTE robot in the speaking class?

From the participants' perspectives on the issues in using the ICTE robot to improve their speaking skills, the researchers identified five dominant themes in the responses of the interviewed students.

To what extent does the ICTE robot help students boost their vocabulary, grammar, pronunciation, and discourse management?

According to the participants, the ICTE robot significantly improved pronunciation, prolonged word retention, and slightly improved syntactic structures.

After practicing with the ICTE robot, I feel that I pronounced better. In terms of vocabulary, I know more new and interesting words. I not only understand them but also know how to use them in context" (F1).

I didn't improve a lot, but I feel the extent of the improvement. About vocabulary, I improved the most. When I remember the words, I can read and write more quickly. About grammar, it just improved a bit (M1).

After learning with the ICTE robot, I can remember words better. And my ability to pronounce words has greatly improved because I normally miss final sounds, but when practicing with the robot, I tried to pronounce ending sound correctly (F3).

In short, thanks to the ICTE robot, the students improved their vocabulary and pronunciation dramatically but only marginally improved their grammar.

What do students think about the multimodal features of the ICTE robot?

All of them appreciated the ICTE robot's voice feature, which helps them record their speech and interact with the chatbot. It is supposed that it is an extraordinary and emergent finding.

First of all, some of them asserted that vocabulary tasks were plentiful and exciting.

There are many types of vocabulary exercises and there is much interesting content (F2)

Secondly, they complimented the design of the ICTE robot which eases comprehension.

The interface of the grammar section is appealing, which helps me understand the structures and learn English easily (M2).

Thirdly, thanks to the voicing and recording features, they can practice pronunciation and listening skills in all sections of the chatbot.

In the vocabulary section, students can practice placing stress on syllables and words (M1).

In the conversation section, I can talk with the robot. The sound is clear and loud enough. I can improve listening skills, and the robot corrects my mistakes (F5).

In short, all the participants approved of the voicing feature and multitasking functions of the ICTE robot.

Which sections of the ICTE robot were used frequently?

Most of them selected practice sections to suit their preference and needs. Two of them preferred the Conversation section.

I like practicing communication. Through the meaning, I can find suitable words to interact with the ICTE robot (F1).

In the conversation section, I can communicate with the ICTE robot, and practice speaking and pronunciation. The robot can correct my mistakes (F4).

Most of them chose to learn on vocabulary, reading and grammar sections.

I am not good at vocabulary, listening and speaking. So, I focus on those sections (M1).

In the vocabulary section, I can review words. In the reading section, I can recall the lesson and vocabulary to remember them longer. I can record my voice and talk with the ICTE robot (F3).

In the grammar section, there are examples so I can remember the structures easily (F5).

In brief, vocabulary, reading, and grammar were the students' preferred section in the ICTE robot.

What are the benefits and drawbacks of the ICTE robot?

All the interviewees asserted that their confidence has been boosted by the ICTE robot.

The chatbot is not human, so I am not scared of making mistakes (M3).

After learning with the robot, I am a bit more confident (F3).

The other plus points of the ICTE robot are its flexibility, prompt feedback, and ability to detect and correct errors.

I can learn with the ICTE robot anytime, anywhere. And when I make mistakes, it corrects them right way” (M1).

After learning with the ICTE robot, I know how to pronounce correctly and give correct responses (F2).

There are some new findings, such as the chatbot's reasonable speed to facilitate listening comprehension, an AI assistant to handle inquiries, maximizing learning, and increased excitement through diverse tasks.

When you combine the ICTE robot in- class lessons, I feel I can understand the lesson better. I can do various tasks: vocabulary, reading, listening...(M2)

The speed of the ICTE robot is slow, so I can listen easily (F2)

Because there are many tasks, learning is not boring. I am more eager to learn English (F3).

The chatbot helps me improve listening comprehension and answer the questions correctly. Besides, when I have questions, I can ask the AI assistant (F5).

However, one commented that the interface is not neat enough, resulting in confusion.

Regarding the chatbot interface, because too many things appear at once, I feel confused, and sometimes it is difficult to find the section to practice (F1).

Most of the interviewees exhibited negative attitudes toward technical problems such as slow or no responses, failure to identify students' voices, microphone errors, and voice-off failures.

Sometimes I can't turn off the mic, or the robot can't hear my responses, or it responds incorrectly (F4).

Sometimes the robot says non-stop, so I don't understand (F5).

Some of them were not content with the chatbot's incorrect feedback and low Internet access.

Sometimes I pronounce words correctly, but the robot says it is wrong. Or I say this word, but the robot identified that word. I feel that it gave wrong feedback (M1).

What I don't like about the chatbot is that sometimes it lagged, or the mic was poor quality (M4)

Generally, they agreed that the ICTE robot is useful for their English learning and should be applied in the future.

What are the recommendations to improve the efficacy of the ICTE robot?

They predominantly argued that the technical problems mentioned should be addressed.

I think the conversation section should be upgraded. I mean the voice function should be upgraded (M2).

I think you should adjust the speed of the chatbot (F5).

One recommendation is that the researcher add more levels of difficulty to the exercises and design additional exercises beyond the coursebook so that students at mixed levels can practice.

I think that the teacher created the robot based on the coursebook content. But in our class, many students are not good at English. So, when they practice with the chatbot, they can feel that it is difficult. So, the teacher can design more exercises at a lower level of difficulty. All of us can learn (F3).

In summary, most students affirmed that addressing technical issues would enhance the ICTE robot's effectiveness.

Discussion

The finding for RQ1 is partly similar to that of Aliakbari, Barzan and Sayyadi (2025). This can be explained by the fact that, in this study, students' pronunciation slightly improved thanks to the ICTE robot's voice feature, which enabled them to record their speech and correct pronunciation errors. However, the repeated speech-production opportunities were limited, and speech-recognition feedback was sometimes incorrect, leading to minimal improvement. The lecturers can exploit the ICTE robot to its full potential to help non-English -major students improve their pronunciation, which is considered the weakest aspect. They can not only progress in pronunciation but also in word and sentence stress. The difference was that the present study showed no improvement in grammar, whereas the previous study showed moderate progress. Low proficiency in grammar may relate to limited practice intensity or poor task design. The researchers could make some innovations to this section of the ICTE robot.

The first result of RQ2 is somewhat at variance with that of Aliakbari, Barzan and Sayyadi (2025). The interviews indicated significant gains in vocabulary. Vocabulary gains may relate to repeated retrieval and contextual reuse. In other words, the students learn vocabulary through repeated tasks and know how to use the words in real contexts.

Regarding the benefits of the ICTE robot, the responses are supported by Zhang (2026), Grab (2025), and Tran (2025), who found that using the AI chatbot is beneficial for boosting confidence, flexibility, instant feedback, error detection, and correction. The similarity in findings can be explained by the fact that these are shared features among various AI chatbots. For instance, it takes at least one day to receive the teacher's feedback, whereas the chatbot can detect users' voices and errors in just a few seconds and provide feedback at once.

With reference to the downsides of chatbots, they concurred that the AI chatbot is somewhat disadvantageous to them due to technical problems (slow or no responses, no identification of students' voices, microphone errors, and voice-off failure), poor Internet access, and incorrect feedback. López-Molines (2025) and Safitri, Hidayati, and Ciptaningrum (2025) reported results similar to those of the current study, as machine-based interactions cannot avoid technical problems, regardless of the devices used. It is advisable to minimize those issues to create more favorable conditions for students to learn English with the ICTE robot.

Conclusion

To examine how the ICTE robot affected students' speaking skills and how chatbot use was perceived, a combination of quantitative and qualitative instruments was used. The quantitative findings revealed that the ICTE robot improved students' vocabulary and pronunciation, and

the qualitative findings showed that this digital tool helps them learn and use more new words, understand structures better, and pronounce words correctly. However, fluency practice should be carefully planned and systematically conducted to help students improve their speaking comprehensively. The advantages of the ICTE robot seemed to outweigh the disadvantages. They proposed that the technical problems be addressed, the ICTE robot's speed be adjusted, and more graded exercises be created. The study had some unavoidable limitations, such as a small sample size, virtual testing before practicing with the ICTE robot, and partial test administration (only two of four parts were tested). One of the major limitations is the use of a single-group experiment, which struggles to control other variables that affect students' speaking improvement. Despite those constraints, this research makes a contribution to the field of AI applications in English teaching.

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