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Fostering AI Tools in Oral Fluency Developing among Khmer(1) EFL University Students: A Focus on English for Academic Purposes (EAP)

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Abstract. Artificial intelligence (AI)-assisted speaking tools have increasingly been integrated into English for Academic Purposes (EAP) instruction to support oral communication. However, limited research has examined how AI-mediated speaking practice influences oral fluency while simultaneously addressing speaking anxiety and learner autonomy among Khmer EFL university students. This study investigates the effects of AI-mediated speaking practice on the oral fluency, speaking anxiety, and learner autonomy of ten Khmer EFL university students. Using a qualitative case study with embedded quantitative fluency analysis, participants completed nine AI-assisted speaking sessions over a three-week intervention using the EAP Talk platform. Oral fluency was assessed through Praat acoustic analysis focusing on speaking ratio, repair phenomena, and pause placement, while reflective questionnaires and semi-structured interviews explored learners' perceptions of anxiety and autonomy. The findings indicate that participants demonstrated longer speaking duration and fewer repair phenomena following the intervention, while pause placement shifted toward more meaningful syntactic boundaries. Questionnaire and interview data also revealed reduced speaking anxiety and improved learner autonomy during AI-mediated practice. These findings suggest that AI-assisted speaking practice can provide supportive opportunities for developing oral fluency while fostering greater confidence and self-directed learning in EAP contexts. Nevertheless, the findings should be interpreted cautiously because of the small sample size and the absence of a comparison group. Future studies should employ larger samples, longer intervention periods, and experimental designs to provide stronger evidence regarding the effectiveness of AI-assisted speaking practice.
Keywords: AI Tools; Oral Fluency Developing; Khmer EFL University Students; English for Academic Purposes (EAP)

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(1) "Khmer" is a noun and an adjective in the Khmer language. Pronounced ***"khmaer,"*** the final "**r**" is silent. Both Cambodia and the Cambodian people are described by this word. ***Yeung khmaer,*** for example, means ***"We Khmer,"*** but ***sruk khmaer*** denotes Cambodia. When employed as an adjective, it means "Cambodian" in translation. ***Mahop kmaer,*** for example, means ***"Khmer food,"*** whereas ***khnhom kmaer*** implies ***"I am Khmer."*** In this paper, it refers to the nation-state or country as ***"Cambodia,"*** the people of Cambodia as ***"Khmer"*** or ***"the Khmer,"*** and ***"Khmer"*** as an adjective for consistency. I don't use ***"Cambodian"*** unless I'm mentioning someone or it is a part of an organization's name.

Introduction

In order to shed light on how practice and feedback encourage automatization, which improves fluency in monologic academic discourse, this study expanded upon DeKeyser's (2020) skill acquisition theory (SAT). Research shows that using ASR, Chatbots, and multimodal analytics for practice can improve university English as a Foreign Language (EFL) students' speaking skills and make it easier to track their development (Chen et al., 2023; Jiang et al., 2023; Liu et al., 2022; Ochoa & Zhao, 2024; Sun, 2023; Yang et al., 2022). However, several important research gaps remain. First, previous studies have primarily focused on pronunciation accuracy, overall speaking scores, or automated assessment outcomes, while relatively few have examined utterance fluency using detailed acoustic indicators such as speaking ratio, repair phenomena, and pause placement. Second, evidence regarding the influence of AI-mediated speaking practice on learners' speaking anxiety and autonomy remains inconsistent, particularly in English for Academic Purposes (EAP) contexts. Finally, empirical studies involving Khmer EFL university students remain limited despite the growing implementation of AI-assisted language learning in higher education.

Given its importance, Chafe's (1987, 1994, 2015) research indicates that pauses are caused by both cognitive and psychological limitations on the flow of information. Because consciousness can only process a limited quantity of information at once, it offers ideas or concepts in short bursts interspersed with brief pauses. One of the primary boundary indicators for these surges, known as intonation units, is a pause or break. The speaker's attention changes and new material is prepared during pauses. As a result, whereas new ideas require longer or more obvious pauses that reflect significant activation costs, concepts that are already active require little to no wait. For example, the activation cost of introducing a new notion within a noun phrase may be the cause of a pause that takes place before a noun.

By examining the pauses inside intonation units in the pre- and post-test to ascertain whether the pauses came before new concepts or before previously expressed ones, authors attempted to incorporate Chafe's work into my research. Authors realized that interjecting pauses and corrections between intonation units may not always be a sign of poor fluency; rather, they may be a sign of improved fluency when the speaker is attempting to introduce a new idea. Consequently, the hesitancy in this situation suggests an effort to activate a novel concept and search for appropriate terminology to convey it. On the other hand, it indicates that the speaker is having difficulty retrieving the vocabulary that expresses the notion or concept they need to convey if the pause came before an active concept that has previously been triggered in the speech.

According to Liu et al. (2025) and Zou et al. (2024), automated scoring and feedback systems show uneven accuracy across different task types when it comes to the impact of AI feedback on EAP students' autonomy and anxiety. Students acknowledge both advantages and disadvantages of AI over their language learning. Additionally, multimodal AI is being used more and more to mimic anxiety in EAP contexts like presentations and public speaking. Nevertheless, little is known about how AI feedback affects anxiety or whether teachers must be involved when students use AI tools (Zheng et al., 2024; Sichterman et al., 2025). Gaps in the research on academic speaking fluency, qualitative developmental processes like students' chunking and pause placement over time, and the relationship between AI feedback and speaking anxiety in EAP have all been found by this study. The research topics, which focus on qualitative changes in delivery and students' emotional reactions during academic tasks, are shaped by these gaps and examine the effect of AI-mediated repeated practice on EAP oral fluency. Despite these advances, little is known about how AI-mediated speaking practice simultaneously influences objective oral fluency, speaking anxiety, and learner autonomy among Khmer EFL university students. Most previous studies have examined these variables separately, making it difficult to understand how they interact within an EAP learning environment. Therefore, this study attempts to address this gap by integrating acoustic fluency analysis with learners' perceptions obtained through reflective questionnaires and interviews.

This study examines artificial intelligence (AI) technologies for enhancing fluency, lowering speaking anxiety, and fostering autonomy in adult and university English for Academic Purposes (EAP) studies among Khmer EFL university students. Research suggests that AI-mediated activities including automated feedback, analytics for presentations, and Automated Speech Recognition-assisted (ASR-assisted) practice can improve the speaking performance of ESL/EFL students. Nevertheless, a lot of research either don't place themselves in EAP-specific circumstances or put pronunciation and correctness ahead of fluency. This shortcoming is being addressed by recent studies on multimodal feedback for presentations and EAP Talk. However, there are still issues with the validity of scores, the accuracy of feedback, and the learner's ability to be autonomous and self-directed, especially when it comes to difficult EAP tasks like presenting and arguing. Cambodia represents an important context for investigating AI-assisted speaking practice because Khmer EFL learners often have limited opportunities to engage in authentic English communication outside the classroom. Consequently, AI-mediated speaking tools may provide accessible opportunities for repeated speaking practice, immediate feedback, and independent learning that complement classroom instruction. Based on the research gaps identified above, the following research questions were formulated.

1. Do AI speaking tools enhance the oral fluency development of Khmer EAP university students?
2. How does the use of AI speaking tools influence speaking anxiety among Khmer EAP university students?
3. Does AI feedback support Khmer EFL university students' independence and accountability for their oral language development?

The results of this study will add to the larger discussion of AI-mediated speaking practice in EAP, specifically how it affects the ratio of speed, breakdown/repair, and affect in oral performance. As part of a developmental arc that equips students for more complex academic tasks like research presentations and seminar turns, skills like chunk planning, pause placement, and repair monitoring are usually developed gradually. Even though these techniques are essential for developing Khmer EAP speakers, it might not be feasible to completely incorporate them into advanced courses without taking Khmer students' ability level into account. In order for students to stabilize delivery control (pause/repair) in their speech before instructors emphasize speed, programs should sequence the employment of AI and instructional scaffolding through spaced repeated practice of new syntactic chunks and concepts.

The Comprehensive Theoretical and Conceptual Basis

Skill acquisition theory (SAT) is used in this study to create a theoretical and conceptual foundation for improved fluency and EFL/ESL speech development. It particularly demonstrates how incorporating AI-driven practice and feedback can encourage automation in language students.

Understanding the SAT

By demonstrating how declarative knowledge becomes proceduralized and subsequently mechanized through practice, skill acquisition theory explains how learning occurs (DeKeyser, 2020). Repeated practice reduces cognitive burden during performance by converting controlled processes into rapid and automatic routines when given and encouraged by appropriate feedback. Declarative knowledge representations are restructured and automated as a result of repeated and spaced practice and regular exposure. According to SAT, lexical retrieval speeds up and syntactic frames become ingrained when EFL/ESL speech is practiced often and intently. DeKeyser (1997) explains how repetitive practice schedules and task situations, where the same work is completed under time constraints, may promote automaticity by resulting in quicker and more accurate execution.

According to recent research, distributed practice in brief, repeated sessions is more effective for long-lasting fluency improvements in university EFL learners (Kakitani & Kormos, 2024), while massed practice of a task in a lengthy individual session may yield inconsistent results (Suzuki & Hanzawa, 2022). It's easy to practice in high-frequency, low-stakes, and feedback-rich settings with AI tools like presentation simulators, Chatbot interactions, and ASR-enabled drills. Automated feedback on prosody, delivery, and temporal fluency clarifies the procedural aims. Consistency in practice and self-control can benefit from this. AI can also plan spaced interventions and identify subtle changes like a person's speech ratio. This is entirely consistent with SAT's emphasis on practice distribution and quality. This theoretical framework supports the EAP's emphasis on systems such as EAP Talk and multimodal analytics for presentations by integrating assessment, feedback, and repeated practice (Liu et al., 2025; Ochoa & Zhao, 2024; Zou et al., 2024).

In fluency research, three dimensions should be clearly distinguished. Cognitive fluency refers to the efficiency of underlying mental processes involved in language production, such as lexical retrieval and syntactic planning.

Utterance fluency refers to observable speech characteristics that can be measured objectively, including speaking ratio, repair phenomena, and pause placement. Perceived fluency, meanwhile, represents listeners' subjective judgments regarding how fluent a speaker sounds. Because this study focuses on objectively measurable changes following AI-mediated speaking practice, utterance fluency serves as the primary analytical construct, while cognitive fluency provides the theoretical explanation for these observable improvements. Based on Skill Acquisition Theory (SAT), repeated AI-mediated speaking practice is expected to influence different dimensions of utterance fluency through gradual proceduralization. As learners repeatedly perform speaking tasks and receive immediate feedback, lexical retrieval becomes more automatic, reducing the frequency of self-repairs. Likewise, increased automaticity enables learners to sustain longer stretches of speech, thereby improving the speaking ratio. Repeated practice also facilitates more efficient planning during speech production, leading to pauses that occur at meaningful syntactic boundaries rather than within clauses. Therefore, SAT provides a theoretical explanation for the expected improvements in speaking ratio, repair phenomena, and pause placement observed in this study.

Understanding the Factors Affecting the Fluency of EAP Students

This study examines three primary aspects that affect Cambodian EAP university students' fluency development: (1) Speaking anxiety: Students who have higher levels of speaking anxiety tend to pause longer, talk more slowly (slower speech/articulation rate), and make more corrections. Fluency breakdowns (silent/filled pauses and shorter fluent runs) and speed fluency (words per minute) are where anxiety effects are most noticeable (Rood & de Jong, 2023; Szyszka et al., 2024); (2) Practice distribution and frequency: Frequent, spaced practice helps proceduralize and reorganize knowledge to become automatic and routinized, making SAT predictions match what occurs in the classroom. This is especially true when there are explicit goals (e.g., eliminate mid-clause pausing). Scheduling is crucial, according to research on task repetition. The EFL students in Suzuki and Hanzawa's (2022) classroom study were split into three groups and given six repetitions of the same picture-narration task under massed practice for the first group, short-spaced practice distribution for the second group, and long-spaced practice distribution for the third group. The massed practice group had the largest decrease in pauses, but with more repetition, according to an immediate post-test; however, the groups with distributed practice that was recycled over time had more long-lasting changes in fluency, similar to automatization, according to a later test (Suzuki & Hanzawa, 2022); and (3) Self-monitoring and feedback: Both direct (a correction or explanation) and indirect (recasts or suggestions) feedback can be given to students while they are speaking. According to Banister (2020) and Nassaji (2016), students' motivation for autonomy and their level of responsibility for their language learning are influenced by the way feedback is presented.

Understanding of the Impact of AI and Technology on Autonomy, Anxiety, and Oral Fluency

In higher education, AI refers to computer systems that can interpret data, learn from it, and adjust their objectives as necessary (Haenlein & Kaplan, 2019). Natural language processing (NLP) can be used extensively thanks to machine

learning, particularly contemporary statistical learning (Jordan & Mitchell, 2015). However, the literature claims that the discipline favors certain areas of study and that the methods utilized are not always of the same quality (Zawacki-Richter et al., 2019). Three major instances of AI are encountered by EFL/EAP institutions: multimodal presentation analytics, conversation Chatbots, and practice and feedback based on ASR (Meidyana et al., 2025). This current study is motivated by a number of empirical investigations within these categories that explore the potential impact of AI practice on speech proficiency.

Research conducted on college students demonstrates that ASR-mediated practice can enhance speaking performance and students' perceptions of their education. 118 Taiwanese university students enrolled in an elective ESL course participated in a quasi-experimental study by Tsai (2023). The experimental class used an ASR-based system to practice speaking and listening in English, whereas the control group used conventional materials. The ASR group did better than the control group on speaking and listening assessments. Positive opinions of the system were also revealed by questionnaire results (Tsai, 2023). Despite the fact that overall speaking scores were used to measure fluency in this study, the results indicate that ASR-based materials can promote quantifiable improvements in oral performance over the course of a semester.

In a different study, Sun (2023) taught pronunciation to Chinese university EFL students using a mixed-methods methodology. The comparison group relied solely on peer correction during the 12-week intervention, but the experimental group also received ASR-enhanced feedback. The ASR + peer group outperformed the peer-only group in both segmental and suprasegmentally accuracy as well as total speaking competency, according to pre-post speaking tests (reading texts, word lists, and narrative recounting). Data from questionnaires and interviews also showed that students thought ASR feedback was useful for identifying pronunciation issues and tracking progress (Sun, 2023). Again, rather than using micro-level fluency indices, speaking improvements were recorded using holistic proficiency measures.

Chatbots are used as conversational partners in addition to ASR. A task-oriented speech Chatbot called "Ellie" was utilized in Korean EFL speaking classrooms by Yang et al. (2022). Three activities including conversations with Ellie in real-world contexts with embedded target vocabulary and prompts were completed by 314 students during the study. The findings showed that the tasks' total success rate, or the percentage of Chatbot sessions in which students successfully comprehended and finished the given task, was about 88%. Additionally, according to the survey results, students felt that the Chatbot encouraged them to talk more and provided them with excellent practice opportunities. However, the students expressed frustration with recognition failures and a lack of diversity in Chatbot responses (Yang et al., 2022). Although the study shows that a Chatbot may offer users organized speaking practice, it did not monitor the improvement in fluency over time.

In line with the second research question of this study, a second set of investigations examines the impact of AI-mediated speaking environments on speaking confidence and fear. A mixed-method study including 249 EFL students from a Chinese institution was carried out by Liu et al. in 2022. They looked at how the participants' learning experiences, including fear, were affected by ASR-

supported speaking practice. For oral practice, both the experimental and control groups used ASR-based mobile applications; however, only the experimental group received assistance from teachers in interpreting ASR results. Students in both groups valued ASR as a self-monitoring tool and enjoyed its instant response, according to questionnaire and interview data. However, participants voiced concerns over the validity of scores and its ability to recognize errors. Additionally, participants reported conflicting results on anxiety: some reported feeling less nervous when training with ASR compared to peers, while others continued to feel uneasy about being assessed by a machine (Liu et al., 2022). These findings imply that practicing AI on its own does not ensure a decrease in speaking fear. Collectively, previous studies suggest that AI-assisted speaking tools consistently provide greater opportunities for speaking practice and immediate feedback. However, their findings remain inconclusive regarding the extent to which AI independently improves oral fluency and reduces speaking anxiety. Several studies reported positive outcomes, whereas others highlighted limitations related to feedback accuracy, learner trust, and the need for teacher guidance. Furthermore, most previous studies measured overall speaking performance rather than detailed utterance fluency indicators. These inconsistencies demonstrate the need for further investigation using multiple fluency measures and qualitative evidence, as employed in the present study.

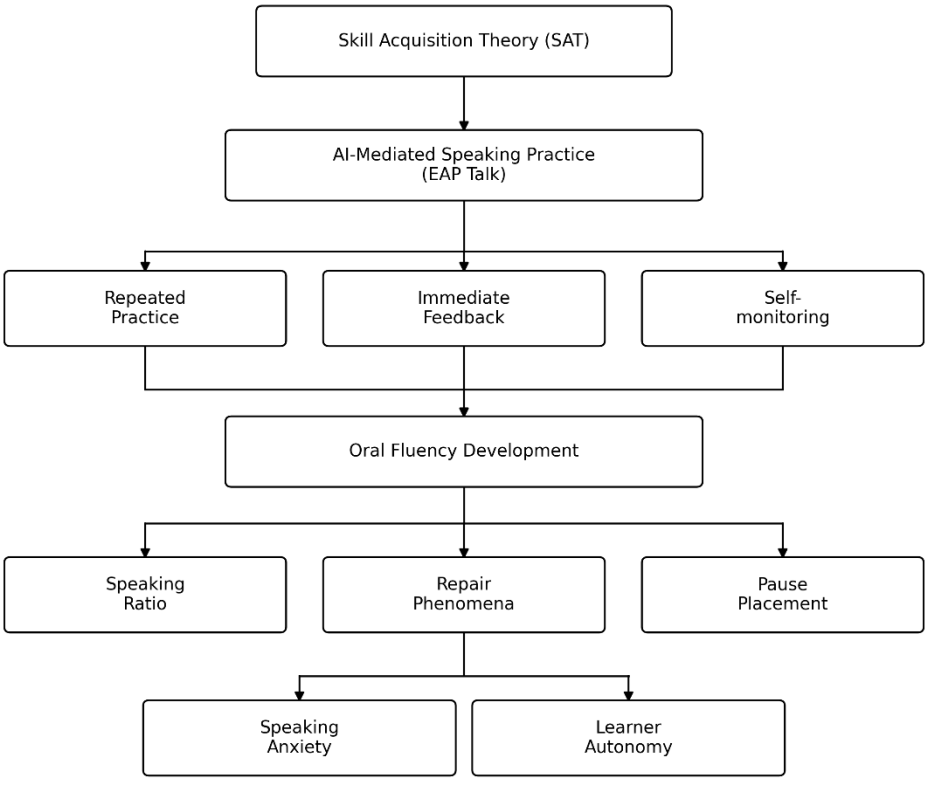

Figure 1. Conceptual Framework of AI-Mediated Speaking Practice Based on Skill Acquisition Theory

Method

Research Methodology

This study employed a qualitative case study with embedded quantitative analysis to investigate the effects of AI-mediated speaking practice on the oral fluency, speaking anxiety, and learner autonomy of Khmer EFL university students. The qualitative component explored participants' perceptions through reflective questionnaires, semi-structured interviews, and researcher field notes, whereas the quantitative component involved pre- and post-intervention acoustic analyses using Praat to examine changes in speaking ratio, repair phenomena, and pause placement. Integrating qualitative and quantitative evidence enabled a more comprehensive understanding of how AI-assisted speaking practice influenced learners' oral performance and learning experiences.

In linguistics, the qualitative case study approach is widely used to thoroughly examine a trend in a limited setting (Duff, 2018). Ten upper-intermediate Khmer EFL university students participated in nine structured AI-mediated speaking sessions conducted over a three-week intervention period. The purpose of this qualitative case study is to examine many facets of AI-mediated practice, including the students' reported changes in fluency and their emotional responses (autonomy and anxiety). Additionally, the case study style makes it easier to combine several data sources, such as semi-structured interviews, reflective surveys, voice samples, and researcher field notes, to create a thorough summary (Tisdell et al., 2025).

Participants and Sampling

In the study, ten Khmer EFL university students took part at the Institute of Foreign Language (IFL) under the Royal University of Phnom Penh (RUPP) in Cambodia. They were all at the advanced intermediate level of English, based on their placement classes. The participants came from a variety of linguistic, cultural and religion (Buddhism, Islam and Christianity) backgrounds that are typical of EFL communities in Cambodia, and they all shared the same goal of improving academic English. Since the goal of the study is to collect rich qualitative data rather than make generalizations, a small-N case study sample was chosen (Creswell, 2013). Furthermore, a thorough analysis of a small cohort is often preferred in the second language acquisition (SLA) case study research (Duff, 2018). Recent studies on AI-mediated language acquisition have also employed small groups to monitor individual advancements (Tsai, 2023; Zou et al., 2023). All targeted participants were instructed and taken pre-tests and post-tests.

Participants were selected using purposive sampling because the study sought individuals who met specific criteria relevant to the research objectives. Eligible participants were undergraduate Khmer EFL students enrolled in English for Academic Purposes (EAP) courses, demonstrated an upper-intermediate level of English proficiency based on institutional placement results, and were willing to participate throughout the entire intervention. This sampling strategy enabled the researchers to obtain rich information regarding learners' experiences with AI-mediated speaking practice rather than to achieve statistical generalization.

Research Instruments

In addition to assessing the participants' sentiments of fear and autonomy, a range of instruments were developed to measure their oral fluency both objectively and subjectively. These resources comprised the researcher's notes, reflective surveys, semi-structured interviews, AI Chatbot sessions, and speaking exercises using cue cards.

1. Speaking Exercises Using Clue Cards: Before and after the intervention, two IELTS Part 2 speaking tests were used to gather speech samples. Participants were required to answer a modified question in each speaking assignment. from a cue card for the IELTS Part 2 exam. Participants had to prepare for a minute before speaking for two to three minutes. Audio recordings of the tasks were made for later transcription and analysis. The choice of IELTS-style examinations is supported by research on fluency since these speaking tasks are suitable for assessing features of utterance fluency such as speech rate and pause frequency since they promote and elicit long speech samples (Saito et al., 2018; Tavakoli & Skehan, 2005).
2. AI Chatbot Sessions: EAP Talk, a specific AI-assisted speaking tool, was the AI Chatbot that participants trained using. It is specifically made to help EAP students practice their English and get automatic feedback on their academic abilities, such answering speaking prompts. By using their microphones, students can converse verbally with the Chatbot. It also transcribes their speech on the screen allowing them to recognize how their speech is perceived. Peer-reviewed studies by Zou et al. (2023, 2024) and Liu et al. (2025) introduced and assessed the system. Nine practice sessions with the AI Chatbot EAP Talk were conducted over a three-week intervention period. Each session used the following protocol and lasted 45 minutes: (1) Preparation (20 minutes): Participants accessed the EAP Talk Chatbot link and reviewed the prompt for the session; (2) AI interaction (15 minutes): Participants discussed the topic, such as hobbies, time management, or hometown cuisine; and (3) Survey (10 minutes): Participants completed a reflective questionnaire. Because it offers opportunities for repeated practice, as noted by DeKeyser (1997), without the social anxiety associated with human partners, the AI Chatbot was selected in this study for AI speaking practice (Bashori et al., 2022; Zou et al., 2023).
3. Likert-Scale Question Reflective Survey: Students completed reflective surveys with Likert-scale questions about conversational fluency, anxiety, autonomy, and general perceptions after each session. Throughout the AI intervention, researchers tried to use questionnaires to track participants' opinions of the Chatbot after each session to make sure they were not just dependent on responses from a single session. In order to monitor their opinions of the Chatbot practice, each participant was required to

complete nine questionnaires, one for each session. Reflective surveys provide data created by students that may capture emotive and motivational characteristics in addition to auditory metrics (Liu et al., 2022; Sun, 2023).

4. Semi-structured Interview: After completing the AI intervention, each student took part in a 30-minute semi-structured interview. Fluency changes, perceived confidence, fear, autonomy, and general experiences with AI-mediated practice were all included in the interview questions. Because they allow researchers to explore participant viewpoints while retaining freedom to follow up on emergent themes, semi-structured interviews are highly valuable in research (Tisdell et al., 2025).
5. Notes by Researchers: Throughout the study, researchers took field notes to document participant involvement, session environment, and technical problems. Therefore, these notes that document contextual observations offer a reflexive layer to the research (Barkhuizen et al., 2014).

Instrument Validity and Trustworthiness

To enhance the trustworthiness of the study, the research instruments were developed based on previous studies investigating AI-assisted language learning and oral fluency. The interview protocol and reflective questionnaire were reviewed by two experts in applied linguistics and English language teaching to ensure content relevance and clarity. The speaking tasks were adapted from IELTS Part 2 speaking prompts, which have been widely used to assess oral fluency. Triangulation across acoustic analysis, questionnaires, interviews, and researcher field notes further strengthened the credibility of the findings.

Ethical Considerations

Prior to data collection, all participants received an explanation of the study objectives, research procedures, and their rights as participants. Written informed consent was obtained from every participant before the intervention began. Participants were informed that their involvement was voluntary and that they could withdraw from the study at any stage without penalty. To maintain confidentiality, pseudonyms were used during data analysis and reporting, and all audio recordings were stored securely for research purposes only.

Procedure

The study was carried out through a pre-intervention assessment, an AI-mediated practice cycle, and a post-intervention assessment. At the beginning of the study, all participants were introduced to the research purpose, the use of EAP Talk, and the speaking tasks used in the study. They then completed an IELTS Part 2-style pre-test by preparing for one minute and speaking for two to three minutes. The speech samples were audio-recorded and prepared for later transcription and acoustic analysis.

After the pre-test, participants joined structured AI Chatbot practice sessions using EAP Talk. In each session, the participants accessed the Chatbot link, reviewed the speaking prompt, interacted orally with the AI through their

microphones, and observed the automatic transcription of their speech. The topics used in the sessions included familiar academic and daily-life themes, such as hobbies, time management, and hometown cuisine, so that the participants could practice extended turns in a low-stakes environment.

Each practice session followed three main stages. First, participants prepared for the session by reviewing the prompt and planning their response. Second, they interacted with the AI Chatbot and responded to the topic orally. Third, they completed a reflective questionnaire to report their perceived fluency, anxiety, autonomy, and overall experience after the session. This repeated procedure allowed the researchers to monitor the participants' responses across the intervention rather than relying on a single reflection.

At the end of the AI-mediated practice cycle, participants completed a post-test using another IELTS Part 2-style speaking task. The post-test speech samples were recorded and analyzed in the same way as the pre-test samples. After the final practice session, semi-structured interviews were conducted to obtain more detailed information about the participants' perceived fluency development, speaking anxiety, learning autonomy, and experiences with AI-mediated speaking practice. Researcher field notes were also used to document participant involvement, the session environment, and technical issues during the intervention.

Data Analysis

To examine changes in oral fluency, anxiety, autonomy, and the relationships among the observed factors, the study used descriptive and interpretive analyses. Descriptive statistics, including means and standard deviations, were calculated to summarize the acoustic and questionnaire data before the interpretation of the findings. The Spearman rank-order correlation (ρ) was employed to examine whether participants' fluency, anxiety, and autonomy scores demonstrated consistent monotonic trends across the nine AI-mediated speaking sessions. Spearman's correlation was selected because the study involved a small sample size and ordinal questionnaire data that did not necessarily satisfy the assumptions required for parametric correlation analyses. This rank-based coefficient was selected because it can show whether scores tended to increase or decrease monotonically over time without requiring assumptions about linear relationships or normal distributions.

Operational Definitions of Fluency Measures. Three utterance fluency indicators were analyzed using Praat. Speaking ratio was calculated by dividing the total phonation (sounding) time by the total speaking time (including silent pauses) and multiplying the result by 100 to obtain a percentage. Repair phenomena referred to the frequency of self-corrections, repetitions, and false starts produced per minute of speech. Pause placement was analyzed qualitatively by identifying whether pauses occurred within syntactic units or at clause and intonation-unit boundaries. These indicators were selected because they represent complementary aspects of utterance fluency and have been widely adopted in previous fluency research.

Formula 1. Speaking Ratio

$$\text{Speaking Ratio (\%)} = \frac{\textit{Total Sounding Time}}{\textit{Total Speaking Time}} \times 100$$

Formula 2. Repair Phenomena

$$\text{Repairs per Minute} = \frac{\textit{Total Number of Repairs}}{\textit{Total Speaking Time (minutes)}}$$

Figure 2. Equation

Qualitative themes were generated using an inductive thematic analysis. After repeated readings of the interview transcripts and reflective questionnaires, meaningful units of text were coded, compared, and grouped into broader categories. The themes were refined iteratively until they represented recurring patterns related to oral fluency development, speaking anxiety, learner autonomy, and perceptions of AI feedback.

The qualitative data were analyzed through an iterative process involving the interview transcripts, reflective questionnaires, researcher field notes, and Praat output. Rather than treating analysis as a single linear stage, the researchers moved back and forth between reading, coding, comparing, and interpreting the data. This process followed Creswell's (2013) data analysis spiral, which includes data management, reading, analyzing, categorizing, interpreting, and representing the findings. The acoustic data, questionnaire responses, and interview transcripts were organized digitally so that they could be compared closely during the interpretation process.

During coding, meaningful passages from the interview transcripts and questionnaire responses were labeled and grouped into broader themes. These themes represented the main patterns related to fluency improvement, speaking anxiety, learning autonomy, and the perceived value of AI feedback. The final findings were represented through quantitative tables derived from Praat acoustic analysis and descriptive narratives supported by excerpts from participants' responses. By combining acoustic measures, questionnaire results, interview data, and field notes, the analysis aimed to provide a transparent and reliable account of how AI-mediated speaking practice influenced the students' oral fluency development.

Findings and Discussion

Findings

Results of Pre- and Post-AI Intervention Assessment

Table 1 presents the descriptive statistics of the participants' oral fluency measures before and after the AI-mediated speaking intervention. The table summarizes the group-level means (M) and standard deviations (SD) for the number of silent pauses, duration of sounding, and repairs made per minute. These descriptive statistics provide an overall overview of participants' speaking performance prior to the detailed participant-level analysis presented in the following sections.

Table 1. Comparing Pre- and Post- AI Intervention Assessment for the Whole Participant Group

Attributes	Pre-test		Post-test	
	M	S.D.	M	S.D.
Count of Silent Pauses	75.90	55.50	96.89	35.15
Duration of Sounding (sec)	95.70	56.10	142.25	39.70
Repairs Made in a Minute	7.45	5.45	5.35	2.86

Based on Table 1 above, the speaking ratio was computed by deducting the sounds duration from the overall speaking time, including silences, during the pre- and post-tests. According to the findings, the posttest speaking ratio was 142.25 with a standard deviation of 39.70, while the pretest speaking ratio mean was 95.70 with a standard deviation of 56.10. Cambodian EFL university students' speaking ratio nearly doubled in the post-test compared to the pre-test, demonstrating considerable progress. This participant's speech samples from the pre-test reveal that the sounding duration was only 51 seconds, with numerous brief and disjointed utterances. Overall, Table 1 indicates that participants produced fewer silent pauses after the intervention (M = 96.89, SD = 35.15) than before the intervention (M = 75.90, SD = 55.50). The mean duration of sounding increased from 95.70 seconds to 142.25 seconds, while the average number of repairs per minute decreased from 7.45 to 5.35. These descriptive results suggest an overall improvement in oral fluency across the participant group. The percentage change in each fluency indicator was also examined to provide a clearer description of participants' progress from the pre-intervention to the post-intervention assessment. Fluency problems are evident in the pre-test, which contains multiple breaks and partial utterances that occur inside grammatical units:

> *…a representation of my father's love for me and his admiration for my interest,*
> *as well as the fact that I didn't…*

Lexical retrieval disruption is demonstrated by the self-repair in "admiration." Additionally, "I didn't" indicates that the participant struggled to retrieve routinized syntactic pieces. However, after speaking for 100 seconds, the

post-test findings showed that this participant's speaking ratio had improved. Additionally, the participant's syntactic structure improved on the post-test, as evidenced by the lengthier syntactic chunks in the following passage from his post-test:

> *It is far simpler to use than Facebook or Tik Tok. And you know how it made it easier for me to maintain relationships?*

The effect of repeated and spaced practice, according to DeKeyser's (2020) SAT, helps learners become familiar with the new skills they wish to learn and improve in. This is what AI Chatbot practice gave the learners as they practiced speaking with the Chatbot in repeated and spaced sessions. During the interview, the participant emphasized the importance of AI practice by saying, *"I can have more time to practice because of talking with AI Chatbot."* Additionally, he said, *"I feel more fluent when talking to a Chatbot because I [don't] fear [making] mistakes."*

The speech samples from the Arabic participant's pre- and post-tests showed an improvement in syntactic chunks as well as in his concept growth and elaboration, despite the fact that the speaking ratio did not increase in the post-test. The following passage from the Arabic participant's pre-test speech sample illustrates how he struggled to retrieve fundamental syntactic structures: *"I mean, like I've had it. I have it."*

The following speech sample demonstrates how the post-test speech sample's syntactic chunks and concept development clearly improved:

> *It also has a positive mental impact on me more than a negative one, especially when I'm trying to learn anything.*

During the interview, the participant highlighted how practicing AI Chatbots has improved his oral communication abilities. He claimed that *"when I say anything incorrectly, the AI Chatbot [repeats] it for me so I can learn how to pronounce it or speak more [clearly]."*

These results align with those of the study conducted by Yang et al. in 2022. According to their study, the Korean participants in the EFL class valued having "Ellie," a Chatbot, as a conversation companion. According to the survey results, students felt that the Chatbot encouraged them to talk more and provided them with opportunities to improve. Additionally, the outcomes are consistent with Sun's (2023) research, which showed that the ASR + peer feedback group outperformed the peer-only feedback group in terms of overall speaking skill and segmental and suprasegmental accuracy. Additionally, the results of their study demonstrated that learners thought ASR feedback was useful for identifying pronunciation issues and tracking progress, which is consistent with the opinions of the study participants.

Results of Phenomenon Repairing

When researchers looked into repair phenomena (self-correction and repetition), researchers discovered that most participants' scores on the post-test were lower than those on the pre-test, which is a sign of improved fluency. The number of repeat and self-correction occurrences the participants made per

minute of speaking was used to measure repairs in this study. The findings indicate that the post-test repairs had a mean of 5.35 with a standard deviation of 2.86, whereas the pre-test repairs had a mean of 7.45 with a standard deviation of 5.45.

Speech snippets from the participant's pre- and post-tests show this improvement in repairs. The participant's repairs dropped from almost nine repairs per minute in the pre-test to nearly four repairs per minute in the post-test. In the pre-test section that follows:

I use it for transportation, so it's incredibly important to me because I drive a lot.
I also use it to get things done.

On the other hand, the post-test shows that the participant made fewer repairs. This decline is a sign of improved fluency. An illustration of this decline can be seen in the following passage:

I occasionally waste a lot of time on social media, which is bad since it encourages me to remain longer.

Despite a few word formation mistakes in this section, there were no corrections. This suggests that the speaker is more comfortable speaking on the spur of the moment, which improves his fluency. The participant seemed to have improved as a result of the frequent distributed exercise with the AI Chatbot.

Repeated distributed practice, according to SAT, lessens hesitancy and eventually promotes automaticity. The participant highlighted in the interview how the AI Chatbot helped him become less hesitant, which resulted in less speech corrections. He claimed that *"because the Chatbot focuses on a variety of themes, I am able to communicate [fluently] because I am familiar with a large number of vocabulary and correct grammar."*

These encouraging results are consistent with Tsai's (2023) research. Speaking and listening assessments in their study revealed that the ASR-using group performed better than the non-ASR-using control group. Positive opinions of the system were also revealed by questionnaire results. The results of this study appear to demonstrate that ASR-based materials can promote quantifiable improvements in oral performance, even if fluency was measured by overall speaking scores.

Results of Placement Pausing

One of the study's most significant conclusions was that, although participants tended to utilize short, fragmented intonation units on the pre-test, this pattern was less prevalent on the post-test. The placement of pauses changed from within familiar routine chunks to their borders in the post-test, indicating an improvement in fluency, even if the number of pauses did not decrease from the pre-test. Chafe (1994) refers to the frequent mid-clause pauses that occur inside an intonation unit prior to the production of new concepts or structures as *"an activation cost."* Before activating novel or unfamiliar themes or grammatical

structures to retrieve them, even the most proficient speakers frequently pause. Thus, in this instance, it is not regarded as a lack of fluency.

On the pretest, for example, the Russian participant gave many brief and disjointed intonation units. Her pauses frequently took place inside clauses in locations where fluent speakers would not typically pause. For example, the pre-test section that follows shows many breaks occurring within syntactic units: *"I no longer need to visit the post office in order to submit my emails."*

Similar patterns show up during the pre-test. For instance: *"I can save everything on one device, I guess."* These patterns suggest that the individual was unable to keep larger syntactic units engaged in working memory, resulting in short, fragmented IUs and frequent pauses that cannot be linked to activation cost. Overall, the pre-test speech demonstrates a restricted ability to organize and execute multi-clause utterances.

A filled pause was another example from the same posttest: *"Most social media platforms are risky to use since they have stolen our time and, well, our lives."* There is a filled pause within a verb phrase in this spoken piece. But this is in no way a sign of disfluency. In the list of social media site drawbacks, it is understood as an activation cost of a new object.

This filled silence wasn't caused by the speaker's inability to find the right term, but rather by her recollection of the social media platform she was already familiar with. The participant highlighted throughout the interview how the AI Chatbot improved her pause placement by strengthening her capacity to connect concepts. *"I think the Chatbot can help expand the variety of my vocabulary... and how to naturally link ideas together,"* she remarked. Thus, those are the objectives she has set for herself thus far.

The results are consistent with those of Chen et al. (2023). Participants in the study used AI to prepare oral presentations, and the AI gave them feedback on their pronunciation and filled pauses. Most participants in Chen et al. (2023) reported that AI feedback improved their oral presentation abilities.

Results of Students′ Speaking Anxiety

According to anxiety data, the AI Chatbot seems to lessen EAP students' speaking nervousness. The study participants expressed favorable opinions about AI Chatbot use and valued how it helped them feel less nervous when speaking. Nine surveys, one for each session, were required of each participant in order to monitor their opinions regarding the Chatbot practice. Based on the nine surveys that were collected right after each AI practice session, Figure 4 shows the participants' assessments of how the AI Chatbot changed their speaking anxiety levels; a higher Likert scale denotes lesser anxiety.

Most of the participants said that the AI Chatbot had a favorable effect on their speaking anxiety levels. The participant showed good opinions over the subsequent sessions, despite having a bad impression during the initial AI contact session. This implies that with time, their level of emotional comfort increased.

The ten participants stated in the interviews that they thought speaking with an AI Chatbot was safer and less dangerous than speaking with actual people. Talking to a robot or a non-existent person, according to the students, made them feel less criticized and less concerned about making mistakes, which helped them feel less anxious during practice. When interacting with the Chatbot, a number of participants stated clearly that they experienced less anxiety and less stress because they were not afraid of receiving negative feedback or criticism. The AI-mediated practice provided students with a secure mental environment to practice language without the stress of interacting with other people, according to the interview data and questionnaire patterns.

These results align with the research discussed in this study's second chapter. Liu et al. (2022) investigated the impact of ASR-supported speaking practice on the learning experience, particularly anxiety, of Chinese university EFL students. While some people were less nervous while using ASR, others were still uneasy about having a machine evaluate them. The study's participants reported varying degrees of nervousness when they first started using the AI Chatbot, but they all felt that the Chatbot had a beneficial effect on reducing their anxiety for the remaining sessions.

Furthermore, research on SECF by Shadiev et al. (2024) on university EFL students from China and Kazakhstan is consistent with the results of this study on lowering speech anxiety. Shadiev et al. (2024) used STR and ACF to develop an SECF system. According to their findings, participants' confidence rose and their worry about learning a foreign language lessened. This is consistent with recent research showing that EAP Talk and other AI-based corrective feedback systems can enhance affective results in structured, repetitive speaking activities.

Results of Students′ Learning Autonomy

According to autonomy findings, learners' feeling of autonomy appeared to be supported by AI practice. Particularly, the participants mentioned how the AI Chatbot's feedback affected their sense of independence and learning management. They did, however, report certain technological issues that occasionally interfered with their Chatbot practice.

Questionnaires and interviews were used to gather participant reflections. Throughout the AI intervention, researchers tried to track the participants' thoughts of the Chatbot using questionnaires after each session to make sure they weren't just dependent on responses from one session. In order to monitor their opinions of the Chatbot practice, each participant was required to complete nine questionnaires, one for each session. After the last AI Chatbot practice session, each participant was interviewed to provide more details about their experiences.

According to the participant, "Sometimes I feel comfortable talking to myself alone to practice English after using the Chatbot," interview responses also highlighted the AI Chatbot as a tool that allows learners practice independently and at their own pace. The fact that they could practice any time

without worrying about their partner's or teacher's schedule pleased the participants. Some even claimed to have utilized the Chatbot to learn more about topics or problems that piqued their attention.

Participants in the interviews also reported having a deeper awareness of their advantages and disadvantages, such as their limited vocabulary or bad pronunciation. During and after sessions, some participants said they used the Chatbot feedback to keep an eye on their speech patterns and make any necessary corrections. According to the Japanese participant, "I try to make more clear speaking when I speak because it helps me find out how I'm wrong." Additionally, several participants reported using the phrases they acquired from the Chatbot in a variety of contexts, including written tasks and casual interactions.

Data gathered from learning reflective diaries and questionnaires in the study by Liu et al. (2022) revealed that students had favorable opinions of ASR. When the ASR transcribed their speech, they appreciated the ability to see it more clearly. This was also the case in a recent study in which the AI Chatbot transcribed the speech of my research participants. Also, the AI Chatbot is a tool that lets learners practice autonomously and at their own pace while enabling them to discover their weaknesses, according to the results of the current study interview. This is in line with Tsai's (2023) findings, which showed that integrating mobile ASR into education encouraged EFL students to practice speaking and listening outside of class. Additionally, it enabled them to use recognition feedback to pinpoint and fix their mistakes, demonstrating the growth of their self-monitoring techniques as was shown in our current study.

Discussion

The findings of this study suggest that AI-mediated speaking practice was associated with improvements in the oral fluency of Khmer EAP university students. However, because this study employed a single-group design without a control group, the observed improvements should not be interpreted as definitive evidence of a causal effect. The increase in sounding duration from the pre-test to the post-test suggests that participants were able to sustain longer spoken turns after practicing with EAP Talk. At the same time, the reduction in repairs per minute shows that the participants became less dependent on repetition and self-correction during speech production. These findings support DeKeyser's (2020) Skill Acquisition Theory, which explains that repeated and distributed practice can help learners proceduralize language knowledge and perform with greater automaticity. It is also important to acknowledge that the observed improvements may have been influenced by factors other than the AI intervention itself. For example, repeated exposure to similar speaking tasks may have increased participants' familiarity with the assessment format, while repeated testing could have contributed to greater speaking confidence regardless of the AI-mediated practice.

One possible explanation for the improvement in speaking ratio is that the AI Chatbot provided participants with a low-pressure environment in which to practice speaking repeatedly. Without immediate evaluation from teachers or peers, participants may have felt more comfortable producing longer stretches of speech. Nevertheless, this interpretation should be considered cautiously because the present study did not directly compare AI-assisted practice with other instructional approaches. Participants had more opportunities to speak repeatedly without the immediate fear of being judged by teachers or peers. This condition appears to have helped them produce longer utterances and experiment with academic speaking more confidently. The result is consistent with previous studies showing that Chatbots and ASR-based tools can provide useful opportunities for speaking practice and help learners monitor their pronunciation and oral performance (Sun, 2023; Yang et al., 2022). Nevertheless, not all previous studies have reported uniformly positive outcomes. Some researchers have argued that AI-generated feedback may occasionally lack contextual sensitivity, resulting in less effective support for complex speaking tasks. Others have reported that learners still require teacher guidance to interpret AI feedback appropriately. These contrasting findings suggest that AI should be viewed as a complementary instructional tool rather than a complete replacement for teacher feedback.

The repair and pause findings further show that fluency improvement should not be interpreted only through speed or the total number of pauses. Although the number of silent pauses did not decrease in the post-test, the placement of pauses became more meaningful because participants tended to pause at stronger boundaries rather than within familiar syntactic chunks. This finding is important because Chafe's (1994) view of information flow explains that pauses may reflect the activation of new ideas rather than simple disfluency. Therefore, the study supports the use of multi-indicator fluency assessment, including sounding duration, repair phenomena, and pause location, to understand oral development more accurately.

The results related to speaking anxiety show that AI practice helped create a safer affective space for oral production. Participants reported feeling less nervous because the Chatbot was perceived as less judgmental than human interlocutors. This finding strengthens the idea that AI tools may act as affective buffers in EAP speaking practice, especially during early stages of fluency development. It also aligns with Liu et al. (2022), who found that ASR-supported speaking practice could reduce anxiety for some learners, and with Shadiev et al. (2024), who reported that speech-enabled corrective feedback technology could improve confidence while reducing foreign language anxiety.

In terms of learner autonomy, the findings show that AI feedback supported students' awareness of their strengths and weaknesses, particularly in pronunciation, vocabulary use, and idea organization. However, autonomy did not develop equally among all participants. Some learners were able to turn Chatbot feedback into self-monitoring strategies, while others still needed clearer guidance to use the feedback effectively. This suggests that AI tools should not replace teacher support but should be integrated with pedagogical scaffolding, such as pre-session goals, post-session reflection, and teacher-guided feedback interpretation.

Overall, the study demonstrates that AI Chatbots has strong potential to support EAP oral fluency development, anxiety reduction, and autonomous practice among Khmer EFL university students. Nevertheless, the findings should be interpreted carefully because the study used a small case-study sample and did not include a comparison group. Future studies need longer intervention periods, larger and more diverse participants, and comparative designs that examine AI-only practice, teacher-supported AI practice, and human-partner practice. Such designs would provide stronger evidence about whether the gains found in this study result mainly from AI interaction, repeated practice, or the combination of both.

Another limitation concerns the measurement of speaking anxiety and learner autonomy, both of which relied primarily on self-reported questionnaire responses and interviews. Although these instruments provided valuable insights into participants' perceptions, they may have been influenced by social desirability bias or participants' subjective interpretations. Future studies are therefore encouraged to combine self-reported data with additional behavioural or observational measures to strengthen the validity of these constructs.

Conclusion

This study investigated the potential of AI-mediated speaking practice to support the oral fluency development of Khmer EAP university students over nine intervention sessions. It also explored changes in learners' speaking anxiety and autonomy through acoustic analysis, questionnaires, interviews, and field notes. Overall, the findings suggest improvements in several dimensions of utterance fluency, including speaking ratio, repair phenomena, and pause placement. Participants also reported increased learning autonomy and lower levels of speaking anxiety following the intervention. Students’ autonomy appeared to have increased and their anxiety appeared to have decreased. These findings provide preliminary evidence that AI-mediated speaking practice may serve as a valuable complementary learning resource for developing oral fluency in EAP contexts. However, the findings should be interpreted cautiously because the study employed a single-group design without a comparison group. Put differently, students appeared to halt more effectively and make fewer repairs. Even though they had to pause or make corrections during an intonation unit, this did not indicate a lack of fluency; rather, it is a sign that learners are becoming more fluent and attempting to activate new concepts or syntactic structures, which result in an activation cost that manifest as a pause or repair that takes place prior to the activation of the new structure.

By taking into account advancements in breakdown and repair dimensions rather of just longer runs, this profile aids in balancing conflicting expectations regarding fluency. It also takes into account the emotional circumstances that support prolonged academic turns. However, the autonomy trajectories indicate that not all learners automatically self-regulate when they have access to an AI partner; some learners are more adept at turning AI feedback into micro-goals and monitoring. When taken as a whole, our findings highlight the usefulness of multi-indicator fluency evaluation and the significance of combining AI access with minimal self-regulation assistance. Overall, the study emphasizes the potential and constraints of AI-mediated speaking practice in EAP. However, the

data is still favorable rather than conclusive due to the small sample size and brief intervention window. These trends present significant practical issues for program design and pedagogy: how to arrange AI practice to first solidify control over various fluency profiles, and how to encourage autonomy so that more students can turn access to AI technology into useful methods.

From a pedagogical perspective, the findings suggest that AI-mediated speaking tools can be incorporated into EAP instruction as supplementary practice outside the classroom. By providing immediate feedback and opportunities for repeated speaking practice, such tools may help students increase their speaking confidence while allowing instructors to complement, rather than replace, classroom interaction and teacher feedback.

When considered collectively, the results lend credence to a phased approach to development wherein AI partners first reduce performance pressure and improve delivery, with longer runs anticipated as practice advances. Future studies are encouraged to employ larger and more diverse samples, include control or comparison groups, and adopt longitudinal or mixed-method research designs to provide stronger evidence regarding the effectiveness of AI-mediated speaking practice. Further research may also investigate different AI platforms and explore additional dimensions of oral proficiency beyond utterance fluency.

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