

AI-enhanced Writing Tools and Language Learning Mindsets: Exploring Usage and Relationships Among Chinese Undergraduates in Thailand

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Abstract

This study investigates the usage patterns of AI-enhanced writing tools among Chinese undergraduate EFL students in Thailand and examines the relationship between their usage frequency and language learning mindsets. Based on Dweck's growth and fixed mindset theory, this quantitative study used a structured questionnaire to collect data from 75 students at a Bangkok university. The questionnaire included a language learning mindset scale and measures of frequency and purposes, along with open questions for supplementary insights. Descriptive statistics and correlation analysis indicated a statistically significant but weak positive relationship between the use of AI tools and growth mindset scores ($M = 56.33$, $SD = 5.39$; $\rho = .245$, $p = .0338$). Frequent users reported greater confidence in vocabulary, grammar, and academic reading. Qualitative responses supported these results, suggesting that students with growth mindsets viewed AI tools as valuable resources for autonomous learning, while students remained cautious in interpreting AI-generated feedback. The findings highlight the potential to foster adaptive learning beliefs and improve learner confidence in EFL contexts, thus suggesting practical implications for pedagogy in second language acquisition, especially in contexts involving learner mindset and digital tool use.

Keywords: AI-enhanced writing tools, Chinese EFL learners, language learning mindset, growth mindset, educational psychology

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Received: 28 September 2025; Revised: 8 December 2025; Accepted: 11 December 2025

Introduction

Artificial intelligence (AI) has become an influential force in modern education, particularly in the area of language acquisition. With tools like AI-enhanced writing tools, learners are now exposed to interactive environments that offer adaptive guidance, real-time corrections, and personalised language tasks—shifting away from traditional English as a Foreign Language (EFL) instruction. Although this technological support enhances learning efficiency, psychological variables, especially the mindset of the learner, continue to be decisive in determining academic outcomes.

Mindset theory was proposed by (Dweck, 2006) that a learner's language learning mindset falls on a spectrum between two core beliefs: a growth mindset, which views abilities as improvable through effort, and a fixed mindset, which sees them as static and innate. This foundational perspective directly shapes the engagement and resilience of a language learner. Research shows that growth-minded learners embrace challenges and view errors as opportunities to learn, whereas those with a fixed mindset often avoid risks and withdraw from difficult tasks (Dweck, 2006; Lou & Noels, 2020; Mercer & Ryan, 2010).

Chinese undergraduate students studying in Thailand constitute a distinctive learner group because they acquire English in a multilingual environment rather than in a monolingual English-dominant setting. Unlike domestic EFL learners in China who often engage with English primarily through exam-driven instruction students in Thai universities navigate English as a lingua franca in academic, social, and professional domains. Thailand has become one of the most popular educational destinations for Chinese students in Southeast Asia, and English is widely used as a medium of instruction in international programmes. This shift from high-stakes, test-oriented learning to communicative academic exposure may influence learners' language learning mindsets, confidence, and willingness to adopt new learning tools such as generative AI systems. Therefore, focusing on this population allows exploration of how cultural background, relocation, and contextual learning conditions interact with technology-based language support, making nationality and study context central not peripheral to the research inquiry. The EF English Proficiency Index shows China dropping from 62nd globally in 2022 to 86th in 2025, highlighting persistent challenges as the country remains within the low proficiency band (EF Education First, 2026). Researchers like Bai and Wang (2020) attribute this

to a system focused heavily on standardised testing and societal pressure, which discourages risk-taking and fosters fixed mindsets that undermine language development.

However, AI-enhanced writing tools offer promising opportunities to counter these barriers. AI-enhanced writing tools and other platforms provide low-stakes, supportive settings that promote regular language practice (Lou & Noels, 2017). Previous studies suggest that such technologies not only improve linguistic skills but also reinforce growth-orientated beliefs by offering immediate feedback, reducing performance anxiety, and boosting students' confidence in their ability to improve (Ekizoğlu & Demir, 2025; Ruwe & Mayweg-Paus, 2023). Although there is a growing body of literature on AI's role in education, relatively few investigations have focused specifically on how these tools affect learners' language mindsets. This research examines the usage of AI-enhanced writing tools and mindset orientation among Chinese undergraduate students in Thailand to address this gap. Understanding this relationship may help create language learning settings that use AI to improve language results and foster adaptable attitudes. Integration might help English language learners engage more, persevere longer and succeed more.

Research Objectives

1. Identify the patterns of usage of AI-enhanced writing tools among Chinese undergraduate students in Thailand.
2. To examine the correlation between the frequency of using AI-enhanced writing tools and language learning mindset scores among Chinese undergraduate students in Thailand.

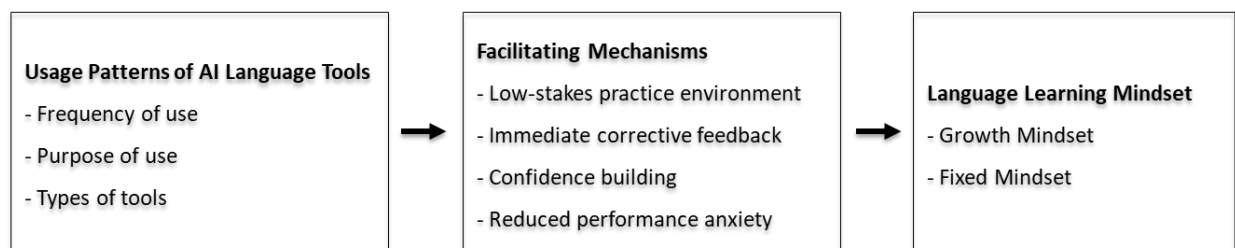
Conceptual Framework

The conceptual framework illustrates how Chinese undergraduate students' usage patterns of AI-enhanced writing tools, including frequency, purpose, and types, can influence their language learning mindset (growth vs. fixed) as conceptualised by Dweck (2006). This influence is proposed to occur through facilitating mechanisms such as low-stakes practice, immediate feedback, increased confidence, and reduced performance anxiety. The framework aligns with the research questions by examining both the patterns of use of AI tools (RQ1) and

their potential correlation with mindset scores (RQ2), highlighting the pathways through which AI-supported practice may foster a growth-orientated approach to language learning.

Figure 1

Conceptual Framework



Significance of the Study

This study is significant because it aims to investigate how Chinese students use artificial intelligence instruments in a language learning context. As AI-enhanced writing tools are increasingly incorporated into educational systems, understanding their impact on students' mindsets can provide valuable insights into their role in shaping language learning behaviours. The findings could contribute to a deeper understanding of how technology affects learners' cognitive approaches, specifically whether AI-enhanced writing tools encourage a language learning mindset in language acquisition.

Additionally, this research is important in the context of China's growing emphasis on AI in education. By analysing the relationship between AI-enhanced writing tools and mindset, the study could inform educators and policymakers about the potential benefits and challenges of integrating AI into language learning environments. The results may help improve the use of AI in educational strategies, improving language learning outcomes for students.

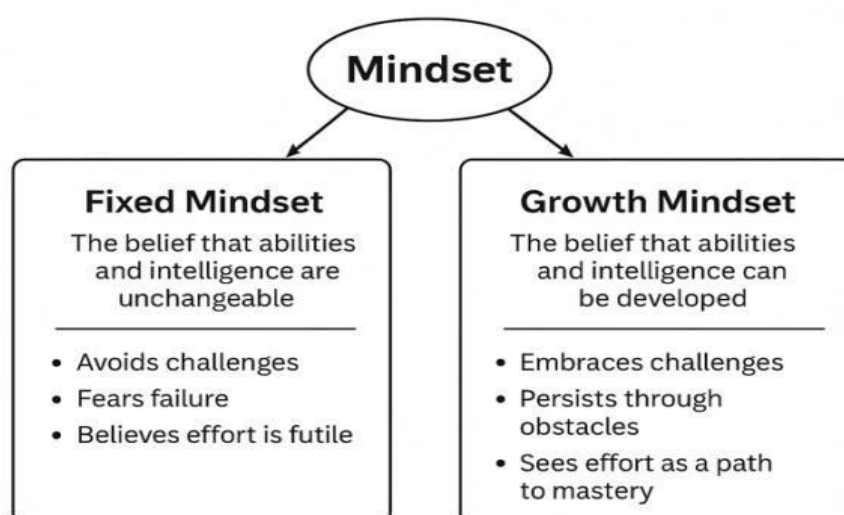
Literature review

Mindset Theory and Language Learning

Mindset theory, originating from Dweck (2006), conceptualizes beliefs about ability along a fixed–growth continuum. A fixed mindset assumes that language ability is predetermined and difficult to change, while a growth mindset frames ability as improvable through effort and strategy use. Subsequent language-learning research adapts this framework to second language acquisition (SLA). Lou and Noels (2017, 2019) argue that language mindsets influence learners’ motivation, persistence, and responses to challenges—particularly in demanding contexts such as grammar acquisition or pronunciation. More recent scholarship emphasizes that mindsets are fluid rather than static and shaped by contextual factors, including feedback quality, learning environment, and digital tools (Mercer, 2012). Although these concepts are widely accepted, the concept of mindset is detailed and has been investigated in a variety of academic fields.

Figure 2

Mindset: Fixed vs. Growth (adapted from Dweck, 2006, pp. 16–17)



Language mindset distinguishes fixed and growth mindsets like Dweck (2006) did. Rather than treating mindset as an internal, stable trait, emerging perspectives propose dynamic models such as ecological or situational mindsets, acknowledging that learners’

beliefs shift depending on task difficulty, feedback style, and cultural expectations (Shirvan et al., 2021). This evolving understanding is particularly relevant to technology-enhanced learning, where interaction with AI-generated feedback may alter learners' perceptions of progress, capability, or error-making (Lou & Noels, 2017; Mercer & Ryan, 2010).

A common instrument used to measure these constructs is the Language Mindset Inventory (LMI) developed by Lou and Noels (2017, 2019), which assesses learners' perceptions about the malleability of language intelligence, aptitude, and age sensitivity. This tool helps identify student motivation and mindset. Most research affirms the advantages of promoting a language learning mindset in EFL settings, but few have explored how learners' attitudes change in new technology contexts like AI-assisted learning platforms. Next, we explore this developing sector. Researchers have also studied linguistic attitudes and language success, notably among EFL learners. Engagement and self-regulation mediate this connection, showing the complexity of language mental components (Bai & Wang, 2020). A "language mindset meaning system" examines how language learners' views about language acquisition affect their motivation and behaviour (Lou & Noels, 2017, 2019). This system is important for incorporating AI technologies. Language learning may help or hurt students depending on how these tools are used.

AI-enhanced writing tools in Education

AI language technologies, including ChatGPT, Grammarly, and automated writing evaluation systems, have grown rapidly as support mechanisms for language learning. These tools provide real-time feedback, grammar correction, text generation, and scaffolding for vocabulary and reading comprehension (Krullaars et al., 2023). Research shows their potential to support learner autonomy, reduce anxiety, and encourage experimentation through low-risk practice environments (Ruwe & Mayweg-Paus, 2023). For instance, Bai and Wang (2020) utilised a structural equation modelling approach to investigate the mediating role of achievement emotions and engagement in language learning. Furthermore, Lou and Noels (2017) highlighted how mindset interacts with the use of learners' tools, while Ruwe and Mayweg-Paus (2023) investigated AI-assisted feedback in writing and its influence on self-efficacy of learners. These studies suggest that AI tools can support and challenge students

depending on their mindset orientation.’ Their study emphasises that language mindset can significantly influence students' emotional responses and, consequently, their engagement in learning activities.

However, the role of AI is contested. Some studies warn that excessive reliance on AI-generated feedback may reduce cognitive engagement or critical thinking, contributing to passive learning behaviours (Elzerman, 2025). Others emphasize that AI does not inherently improve learning outcomes; rather, its impact depends on learners’ strategies, metacognitive awareness, and perceptions of AI’s credibility (Clark et al., 2020; Shirvan et al., 2021).

Related Studies

Empirical studies on language mindsets have focused primarily on how these mindsets are measured and their impact on language learning outcomes. One common approach is the use of questionnaires and self-report surveys, such as the Language Mindset Inventory developed by Lou and Noels (2019), which has been widely utilised to assess learners' fixed and language learning mindsets. This tool has provided insights into how language learners perceive their ability to learn a language and how these perceptions influence their learning behaviours. Researchers like Mercer and Ryan (2010) have also expanded on the concept by examining specific dimensions of language mindsets, including beliefs about language aptitude, effort, and external factors such as the quality of instruction. These dimensions help to explain why some learners persist in the face of challenges while others may give up more easily.

Additionally, Bai and Wang (2020) conducted a study that linked language learning mindsets to improved learning outcomes, particularly in speaking and listening tasks, by showing that students with language learning mindsets are more likely to engage in meaningful practice and seek feedback. This research suggests that the development of a language learning mindset in language learners can lead to better academic performance and greater resilience to overcome linguistic challenges. Despite these advances, there remains a research gap concerning the integration of AI-enhanced writing tools and their influence on language mindsets. Most existing studies have not yet explored how these emerging technologies might shape learners' beliefs and attitudes towards language learning, highlighting the need for further investigation in this area.

Furthermore, currently research on the relationship between second language learning mindsets and AI-enhanced writing tools among Chinese undergraduate students is limited. There is little research exploring the role of AI-enhanced writing tools in language learning, particularly their impact on student engagement and motivation in writing and grammar exercises. The study highlights the potential of AI to enhance the learning experience by increasing participation and motivation, which is relevant to understanding how AI might influence language learning mindsets.

Classification of AI in Language Learning

Recent EdTech research categorizes AI-driven systems used in language learning into three major groups (Krullaars et al., 2023):

Table 1

Recent EdTech Research Categorizes AI-driven Systems

Category	Examples	Function
LLMs (Large Language Models)	ChatGPT, Claude, Gemini	Dialogue practice, content generation, grammar explanation
AI-Enhanced Writing and Assessment Tools	AI-enhanced writing tools	Automated writing feedback, clarity suggestions, error correction
AI-Based Intelligent Tutoring systems	IELTS Speaking Assist, ELSA Speak	Pronunciation Feedback, progress tracking, adaptive learning

Research Methodology

Research Design

This study adopted a mixed method. In the first step, the researchers used a quantitative research design to examine the relationship between the usage of AI-enhanced writing tools and language learning mindset among Chinese undergraduate students studying in Thailand. A structured questionnaire was employed to collect data on students’ frequency and purposes of using AI-enhanced writing tools for English language learning, as well as their mindset orientation, whether they exhibited a growth or fixed mindset.

The collected data were analysed using descriptive statistics and correlation analysis to identify patterns and associations between the use of AI-enhanced writing tools and the beliefs about language acquisition.

Participants

This research aimed at Chinese undergraduates in Thai universities. A convenience sampling approach was used to recruit participants for this study. The target population consisted of Chinese undergraduate students enrolled in universities in Thailand who had prior experience using AI-enhanced writing tools for English learning. To reduce potential sampling bias and improve diversity, recruitment invitations were disseminated across multiple channels including university international student offices, Chinese student associations, programme coordinators, WeChat groups, and faculty-based communication platforms. This approach enabled access to students from different academic majors, levels of study, and degree programmes. These students were non-native English speakers studying English as a Foreign Language (EFL) and had prior experience with AI technologies in academic contexts. This research included Chinese undergraduates who used AI-enhanced writing tools to learn English or acquire English-related information. In the quantitative phase, 75 valid answers from students of different academic years and specialties were gathered using a standardized questionnaire.

The inclusion criteria for this study were as follows: (1) Chinese undergraduate students currently enrolled in a Thai university; (2) students who had used AI-enhanced writing tools for English language learning or to obtain English-related content; and (3) voluntary participation in the questionnaire survey. Participants were recruited through university channels, such as student networks, online platforms, and institutional referrals, to ensure diversity in gender, academic background, year of study, and English proficiency, enhancing sample representativeness. Additionally, participants were categorised based on their frequency of AI-enhanced writing tools usage (e.g., daily, weekly, or occasional users) to examine potential differences in mindset associated with varying levels of AI tool engagement.

Instruments

The questionnaire was designed to measure the key variables of this study and consisted of three sections. The first section assessed students' language learning mindset using 17 adapted items from Dweck's (2006) Mindset Scale, rated on a 5-point Likert scale (1 = Strongly disagree, 5 = Strongly agree). Five fixed mindset items were reverse-scored to align with the scale. The second section examined the use of AI-enhanced writing tools, covering frequency, purpose, and types of tools (e.g., grammar correction, conversational practice). Frequency was measured on a 6-point scale (0 = Never, 5 = Multiple times a day), while purpose was measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The final section included an open-ended question inviting participants to describe their perceptions of the effectiveness of AI tools in supporting English learning.

Development Process

The questionnaire was developed in three phases. The language learning mindset section was adapted from Dweck's (2006) scale, and the AI language tool usage section was informed by a literature review on AI tools in education. The entire questionnaire was then reviewed for content relevance by two experts in language teaching and one expert in language-learning mindset; problematic items were revised based on their suggestions. Next, the instrument was pilot-tested with students to refine clarity and suitability. Content validity was assessed using the item-level Content Validity Index (I-CVI) derived from expert ratings; all items achieved ≥ 0.67 , the minimum acceptable threshold with three experts, indicating satisfactory content validity.

Data Analysis

To address Research Objective 1, descriptive statistics were used to summarise the frequency, purpose, and types of use of AI-enhanced writing tools. Qualitative data from the open-ended responses were analysed using data-driven thematic analysis, using data-driven (inductive) coding. Each response was carefully read and coded, with similar codes grouped to form overarching themes that represent students' perceptions of the use of AI-enhanced writing tools. AI-assisted comparison was used only as a supplemental reference to check the

consistency of manually generated codes. This approach is increasingly discussed in emerging qualitative research practice, where AI tools are used not to replace researcher interpretation but as a secondary audit process comparable to peer debriefing. The final coding decisions were made by human coders through consensus, and the AI output served only as an external reference point. This method is exploratory and reflects current developments in digital qualitative research rather than a standardized procedure. To enhance data trustworthiness, the manually coded themes were compared with codes generated by a generative AI tool, and any discrepancies were discussed and resolved to ensure the consistency and reliability of the coding process.

To address Research Objective 2, descriptive statistics were used to identify the level and Spearman's rank-order correlation was used to examine the relationship between the frequency of the use of AI language tool use and the language learning mindset scores of students. Spearman's Rank correlation was selected because the study variables were derived from Likert-type ordinal data and did not meet normality assumptions. Normality testing using the Shapiro–Wilk test confirmed non-normal distribution for both the AI use score and mindset score. Although Pearson's correlation is commonly used in correlational analysis, it assumes interval data and normality, which were not satisfied in this dataset. Therefore, Spearman's coefficient provided a more appropriate non-parametric measure of the association between the two variables.

Demographic Information

A total of 75 students from five Thai universities participated in the study. The majority (40%) were enrolled in Business, Economics, or Accounting. Other fields included Engineering, Humanities, Social Sciences, and Health Sciences. About 20% were from interdisciplinary or unclassified programs. Most participants were in their first or second academic year (88%), while only 12% were in their third year. This suggests a tendency for younger students to engage with AI-enhanced writing tools more frequently than older students, possibly due to differences in digital familiarity and confidence.

By analyzing Liker-scale responses related to English language learning, the participants' mindset was evaluated. This common technique assumes growth, with bigger

numbers indicating growth. As seen in Table 1, the 75 respondents' scores ranged from 40 to 70 with a mean of 56.33 and a standard deviation of 5.39. These results showed that most participants had a language learning mindset, albeit with some variance. Based on mindset scores, participants were placed into two groups based on their mindset score for analysis and comparison. Scores ranged from 40 to 70, with a mean of 56.33 (SD = 5.39). A cutoff point of 55 was used to distinguish between fixed and growth mindsets. This threshold, aligned with the overall sample mean and prior use in mindset research (Dweck, 2006), served to differentiate students with a generally growth-oriented perspective (≥ 55) from those with a more fixed mindset (< 55). Among the 75 participants, 61 students (81.3%) demonstrated a growth mindset, while 14 students (18.7%) showed a fixed mindset.

Table 2

Descriptive Statistics of English Language Learning Mindset Score and AI-enhanced writing tools Usage Frequency

	n	Min	Max	Mean	SD
English Language Learning Mindset	75	40.0	70.0	56.33	5.39
AI-enhanced writing tools Usage Frequency	75	30.0	65.0	51.00	4.15

Data descriptive Analysis of AI-enhanced writing tools Usage Patterns

The 10 ESL learning AI-enhanced writing tools poll questions included grammar check, writing aid, vocabulary expansion, reading comprehension, speaking support, and AI-enhanced writing tools. The usage of AI technologies was assessed using a five-point Likert scale to obtain the means of each item and a composite total score. Participants answered 10 questions on utilising AI technologies for English learning. Reading help (M = 3.92), English writing checking (M = 3.73), and grammar/vocabulary aid (M = 3.71) were the most prevalent goals. Emotional assistance, such as a confidence boost (M = 3.52), and applying AI for learning challenges were the least prevalent objectives. This indicates that students primarily use AI technologies for academic support rather than for motivation.

Table 3

Top and Lowest Mean Scores of AI-enhanced Writing Tools Usage Purposes

Purpose of using AI-enhanced writing tools (n = 75)	Mean	SD
Reading support (e.g., science texts)	3.92	0.84
Checking English writing	3.73	0.91
Grammar and vocabulary assistance	3.71	0.89
Confidence boost	3.52	0.95
Use when encountering learning problems	3.52	0.97

To explore the relationship between students' language learning mindset and their use of AI-enhanced writing tools, a Spearman rank-order correlation was conducted using SPSS. Results showed a statistically significant but weak positive correlation ($\rho = 0.245$, $p = .0338$), indicating that students with a stronger language learning mindset were slightly more likely to engage with AI-enhanced writing tools in English learning. This finding suggests a tendency among growth-oriented learners to explore technology-enhanced strategies more actively. Moreover, the means ranged from 3.12 to 3.92, indicating moderate engagement across usage types rather than strong or frequent reliance. Notably, no item exceeded a mean score of 4.0, suggesting that although participants regularly interact with GAILLTs, these tools function as supplementary rather than primary learning mechanisms.

Table 4

Spearman Correlation between the Frequency of AI-enhanced Writing Tools Usage and Language Learning Mindset

Variable Pair	Correlation Coefficient (ρ)	p-value	Significant
Language learning mindset & AI-enhanced writing tools usage	0.245	.0338	* ($p < .05$)

Note: $n = 75$. ρ = Spearman rank-order correlation coefficient. * $p < .05$.

Qualitative Findings on Mindset and AI Tool Usage

The survey found that most respondents perceived AI language support tools as important and effective tools for English language acquisition. Students expressed moderate to high levels of satisfaction with these tools across a variety of domains, including grammatical correction, vocabulary growth, reading comprehension, and writing development. Reading support ($M = 3.92$) was the most popular aim, followed by writing support ($M = 3.73$) and grammar or vocabulary enhancement ($M = 3.71$). These evaluations indicate that students used AI tools for academic reasons, specifically to increase understanding and writing, rather than for informal or conversational practice. Many participants also reported enhanced language confidence after using AI tools regularly. Their capacity to practice privately without judgment, get rapid feedback, and repeat at their own speed seemed to correlate with their perceived success. Students with poorer competence or those who were reluctant to ask for assistance in typical classroom settings were more affected by such encounters. This suggests that AI tools helped reduce emotional barriers and provided linguistic support, thereby encouraging autonomous and reflective language learning.

To complement the quantitative results, qualitative data were analyzed using Braun and Clarke's (2006) six-phase thematic analysis. The analysis included familiarization, initial coding, theme development, review, definition, and reporting. The first round of coding was conducted manually by the researcher to identify recurring patterns in learners' responses related to perceptions of AI tools, learning confidence, and engagement. This analysis revealed three central themes that reflect participants' perceptions of AI-enhanced writing tools:

1. Viewing AI Feedback as a Learning Resource

Many participants described AI-generated corrections and suggestions as constructive guidance rather than criticism. This perspective reflects a growth-oriented mindset, where mistakes are viewed as opportunities to improve. Students reported revisiting AI feedback to better understand language rules, which enhanced their self-directed learning practices.

2. Enhanced Confidence and Private Learning Space

Participants emphasized the value of practicing privately with AI tools. Platforms such as Grammarly or ChatGPT provided a “safe space” where they could experiment, take risks, and make errors without embarrassment. This non-judgmental environment boosted their confidence and encouraged consistent, independent practice.

3. Support for Low-Proficiency and Hesitant Learners

Students with lower English proficiency or those lacking confidence particularly benefited from AI tools. They relied on these platforms to access explanations, generate examples, and clarify misunderstandings, enabling them to build foundational skills at their own pace. This accessibility was especially significant for students reluctant to seek help from peers or instructors.

To enhance trustworthiness, the study applied criteria established by Lincoln and Guba (1985): Credibility was strengthened through coder triangulation and review of discrepancies. Dependability was supported through transparent coding documentation and audit trail. Confirmability was ensured by maintaining researcher reflexivity notes to monitor interpretation bias and prevent over-reliance on AI-generated patterns. Transferability was attended to by providing contextual information about participants, setting, and sampling. Moreover, the researchers also sent a consent form to every respondent detailing the study's content and procedures before they participated. We guarantee that no personal information from the respondents was leaked and data was handled confidentially.

Discussion

This study examined the relationship between Chinese undergraduate students' language learning mindsets and their use of AI tools in English learning. The findings reveal several important patterns that shed light on how psychological orientations shape technology adoption in second language acquisition.

First, the majority of participants (81.3%) displayed a growth mindset, with an average mindset score of 56.33 (SD = 5.39). This indicates that most of the students believed in the malleability of their language abilities and saw effort as a meaningful path to mastery. This result aligns with Dweck's (2006) foundational theory of growth versus fixed mindsets, which

posits that learners who embrace challenges and view failure as a learning opportunity are more likely to persist in academic settings. Within the specific domain of language learning, this pattern echoes the framework of language mindsets, showing that beliefs about language aptitude directly affect learners' motivation, strategy use, and openness to new approaches.

Second, the use of AI tools was found to be at a moderate level across the sample, with the highest reported functions being reading support, grammar correction, and writing improvement. These results suggest that students are not only aware of the potential of AI, but are also using it in ways that target key areas of English proficiency. Interestingly, more advanced uses, such as speaking practice or critical analysis of content, were less frequently reported. This may reflect both the current limitations of AI tools in oral interaction and students' own uncertainty about relying on AI for higher-level academic reasoning.

Most importantly, the analysis revealed a statistically significant positive correlation ($r = 0.245$, $p = .0338$) between the frequency of AI use and growth mindset scores. However, the findings indicate a statistically significant but weak positive correlation between students' language learning mindset and the frequency of AI language tool use. This means that students who more often used AI tools also tended to have stronger growth-orientated beliefs. Although the correlation is modest in size, its significance indicates a meaningful relationship. AI use is not random but is systematically associated with the psychological orientation of learners towards effort and improvement. Learners with a growth mindset were more likely to explore different functions of AI, engage with adaptive feedback, and perceive the tools as a resource to overcome challenges rather than a threat to their abilities.

This finding is consistent with previous research linking growth mindset to persistence, flexibility, and resilience in language learning (Mercer & Ryan, 2010). The study also resonates with recent research on educational technology, suggesting that learners' beliefs about intelligence and learning strongly influence how they engage with AI (Shirvan et al., 2021; Xia & Shannon, 2025). In particular, the immediate feedback generated by AI tools may be interpreted differently depending on mindset: for growth-orientated learners, feedback represents a chance to learn and refine strategies, while for fixed-mindset learners, it may be perceived as evidence of inadequacy.

At the same time, the results highlight the challenges faced by students with more fixed beliefs. Several students reported being selective or cautious when interpreting AI-generated responses. Rather than representing resistance to technology, this behavior may indicate emerging critical AI literacy—where learners actively evaluate accuracy, credibility, and appropriateness before incorporating feedback. Given current debates surrounding AI-generated hallucinations and reliability, such critical filtering can be considered a constructive and responsible approach to AI-supported learning. This aligns with the theoretical claim that fixed mindsets inhibit risk-taking and flexibility (Dweck, 2006; Mercer & Ryan, 2010). If such learners interpret mistakes as proof of limited ability, they are less likely to use AI feedback productively. This insight underscores the importance of not only providing technological tools, but also fostering the psychological readiness to use them effectively. From a pedagogical perspective, the findings suggest that educators need to adopt a dual approach: integrating AI tools into English language classrooms while also providing mindset-oriented support. Merely providing students with access to ChatGPT or similar platforms may not be sufficient. Teachers should explicitly frame AI feedback as an opportunity for growth and model ways of critically engaging with AI-generated suggestions. For example, classroom activities could involve comparing AI feedback with teacher feedback, encouraging students to evaluate, reflect, and refine their work. Such practices can help reduce the anxiety that fixed-mindset learners may feel and gradually build confidence in using AI as a supportive partner in learning.

The results also contribute to the broader discussion of how AI tools intersect with learner psychology. For others, the same response may indicate emerging critical AI literacy, where learners evaluate accuracy, appropriateness, and contextual fit before accepting feedback. Given the increasing recognition of AI hallucinations and variable accuracy, cautious evaluation may represent a constructive learning approach rather than resistance. Therefore, learners' attitudes toward AI should be interpreted not simply along a trust–mistrust continuum, but within a broader framework that considers mindset, technical awareness, and digital literacy. Therefore, it is crucial for instructors to balance AI integration with pedagogical scaffolding that promotes autonomy and critical engagement. By situating AI within a growth-

oriented learning environment, students are more likely to use the tools strategically rather than passively.

However, this study is not without limitations. The sample was limited to 75 Chinese undergraduate students in Thailand, which could affect the generalizability of the findings. Cultural factors, institutional contexts, and prior experiences with technology may all influence how students approach AI and mindset. Additionally, the study relied on self-reported data, which may be subject to biases such as overestimation of tool usage or socially desirable responses. The cross-sectional design also means that causal inferences cannot be drawn while growth mindset appears correlated with higher AI use, it is also possible that regular AI engagement gradually fosters more growth-orientated beliefs. Another limitation of this study is that it did not evaluate whether actual language acquisition or measurable development occurred among students with different mindset orientations. The results reflect participants' perceptions, self-reported use of AI, and mindset tendencies rather than objective linguistic outcomes. As such, it remains unclear whether students with growth mindsets, or those who reported greater engagement with AI tools, experienced observable improvement in English proficiency, accuracy, fluency, or task performance.

Future research should address these limitations by adopting longitudinal designs that track changes in mindset and AI usage over time. Experimental studies could also test interventions in which teachers explicitly combine AI tool training with mindset development workshops to determine whether such integration produces stronger learning outcomes. Comparative studies involving learners of different cultural backgrounds or proficiency levels would provide further insight into how universal these patterns are. Moreover, the researchers will also incorporate objective usage indicators, such as interaction logs, prompt characteristics, revision tracking, or embedded analytics from learning platforms in future study.

In conclusion, this study demonstrates that AI use and language learning mindsets are significantly related among Chinese undergraduates in Thailand. Learners with growth mindsets tend to make greater use of AI for English practice, while learners may require additional support to interpret AI feedback positively. The findings suggest that both psychological orientation and technological tools play complementary roles in supporting

second language learning, suggesting that effective pedagogy must address both dimensions simultaneously.

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Acknowledgements

The authors would like to express their sincere gratitude to Asst. Prof. Ruedeerath Chusanachoti, PhD from the Teaching English as a Foreign Language program, Faculty of Education, Chulalongkorn University, Bangkok, Thailand, and Wipada Sutthiroj, PhD from the Faculty of Liberal Arts, Rajamangala University of Technology Krungthep, Bangkok, Thailand. Their academic expertise, professional guidance, and valuable contributions in the field of English language education have provided meaningful support for this study. Their insights into EFL teaching, language learning activities, learner motivation, and innovative instructional practices have greatly enriched the quality and academic value of this research.

AI Declaration Statement

During the preparation of this manuscript, the authors used artificial intelligence tools to assist with language polishing, grammar checking, sentence refinement, and improving the clarity of academic expression. The AI tools were not used to generate original research data, conduct statistical analysis, replace the authors' academic judgment, or make independent conclusions. All intellectual content, research design, data collection, analysis, interpretation,

and final conclusions remain the responsibility of the authors. The authors carefully reviewed, edited, and verified all AI-assisted content to ensure its accuracy, originality, academic integrity, and alignment with the objectives of the study.

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Appendix

Questionnaire - Relationship Between AI language tools and Language Learning

Section 1: Demographic Information

1. What is your faculty or field of study?
 - ☐ Faculty of Humanities and Language
 - ☐ Faculty of Social Studies and Prelogical Science
 - ☐ Faculty of Business Management, Economics, or Accounting
 - ☐ Faculty of Education
 - ☐ Faculty of Engineering
 - ☐ Faculty of Medicine and Health Sciences
 - ☐ Other (please specify): _____
2. What is your current academic year?
 - ☐ First-year undergraduate
 - ☐ Second-year undergraduate
 - ☐ Third-year undergraduate
 - ☐ Fourth-year or above
3. What is your university?
(Provide name)

Section 2: Language Learning Perceptions

Please rate your level of agreement with the following statements (1 = Strongly Disagree, 5 = Strongly Agree):

4. Language Learning Beliefs
 - ☐ a) I believe that effort and practice can improve my English skills.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - ☐ b) My English ability is primarily limited by natural talent.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - ☐ c) Facing difficulties in English learning helps me progress.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - ☐ d) AI-enhanced writing tools can help me improve my English proficiency.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - ☐ e) My English proficiency can always be improved through learning.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
5. Beliefs About Language Learning
 - ☐ a) Intelligence is something that cannot be changed significantly.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

- o b) Hard work and perseverance can overcome natural limitations in language learning.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
- o c) Some people are just naturally good at learning languages, and others are not.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
- o d) My ability to learn English is shaped by my own effort, not just my innate talent.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Section 3: Use of AI-enhanced writing tools in English Learning

Please rate your level of agreement with the following statements (1 = Strongly Disagree, 5 = Strongly Agree):

9. I use AI-enhanced writing tools like ChatGPT or Grammarly to check my English writing.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
10. I use AI-enhanced writing tools to improve my grammar and vocabulary.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
11. I use AI-enhanced writing tools to practice my writing skills.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
12. I use AI-enhanced writing tools to practice my English speaking ability.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
13. I use AI-enhanced writing tools to clarify English grammar rules.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
14. I use AI-enhanced writing tools to ask general knowledge questions.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
15. I use AI-enhanced writing tools to assist in studying other subjects (e.g., Chinese, Science, etc.).
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
16. I spend several hours per week using AI-enhanced writing tools for English learning.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Section 4: Personal Perception Regarding AI-enhanced writing tools

Please rate your level of agreement with the following statements (1 = Strongly Disagree, 5 = Strongly Agree):

17. a) I feel more confident in my English proficiency when using AI-enhanced writing tools.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
- b) When I encounter difficulties in English learning, I turn to AI-enhanced writing tools for help.
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

18. c) The effort I am willing to put in affects how frequently I use AI-enhanced writing tools.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

d) Using AI-enhanced writing tools (e.g., AI-enhanced writing tools) has changed the way I view my learning ability.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

19. How do you perceive your English proficiency after using AI-enhanced writing tools like ChatGPT or Grammarly? (1 = Worse, 5 = Much Better)

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Section 5: Future Perspectives

20. Do you believe AI-enhanced writing tools can help learners overcome challenges in English learning? Why or why not? (Open-ended)

21. What additional support or features would help you align your learning process with AI-enhanced writing tools more effectively? (Open-ended)

Calculation of Mindset and AI Usage Scores

1. Mindset Score Calculation:

- Identify items related to positive learning beliefs and AI tool effectiveness.
- Calculate the language learning mindset (GM) and Fixed Mindset (FM) scores based on responses.
- Final Mindset Index:
 - If Mindset Index > 0 , the respondent leans toward a language learning mindset.
 - If Mindset Index < 0 , the respondent leans toward a Fixed Mindset.
 - A higher absolute value indicates stronger mindset tendencies.

2. AI Usage Score Calculation:

- Usage Frequency Score:
 - Multiple times a day (5 points)
 - Daily (4 points)
 - Weekly (3 points)
 - Monthly (2 points)
 - Rarely (1 point)
 - Never (0 points)
- Usage Diversity Score: Count the number of selected purposes for using AI (each purpose = 1 point).
- Self-Assessment Impact Score: Compute the average score from self-assessment questions regarding AI's impact.
- Final AI Usage Score:

- Higher scores indicate more frequent and diverse AI usage.
- 3. Learning Effect Score Calculation:
 - Pre-AI Proficiency Score: Self-assessed English proficiency before using AI (1-5).
 - Post-AI Proficiency Score: Self-assessed English proficiency after using AI (1-5).
 - Learning Effect Score:
 - 0: Positive impact from AI-enhanced writing tools.
 - = 0: No noticeable impact.
 - < 0: AI-enhanced writing tools did not contribute to perceived improvement.