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Exploring the interaction between growth mindset and self-efficacy in predicting English as a foreign language learning achievement

Yuyang Cai ✉
Shanghai International Studies University, China
https://orcid.org/0000-0002-0320-4602
ycai@shisu.edu.cn

Abstract

Growth mindset has been a hot topic in English as a second or foreign language (L2) research. Despite its popularity, a growth mindset is not always found to benefit L2 learning achievement. A major reason for this complexity has been ascribed to the interference of other variables. The current study focused on the interplay between self-efficacy and growth mindset in impacting L2 (English) learning achievement. Specifically, the study tested three forms of interaction: competition, mediation, and moderation. Participants included 367 second-year students from a Chinese university who were recruited through convenient sampling. The results of structural equation modeling after controlling for variances at the teacher level showed that: (1) self-efficacy played a dominant role in predicting English achievement (confirming competition); (2) self-efficacy did not mediate the relationship between growth mindset and English achievement (disconfirming mediation), and (3) growth mindset amplified the relationship between self-efficacy and English achievement (confirming moderation). Findings from the interaction analyses suggest that growth mindset serves as an amplifier strengthening the association between self-efficacy and English achievement. Therefore, instruction should not only focus on fostering self-efficacy but also on boosting a growth mindset to optimize learning efficiency.

Keywords: growth mindset; mediation; moderation; multilevel; self-efficacy

1. Introduction

Growth mindset refers to individuals' belief that their abilities are changeable (Dweck, 2006). Since the beginning of this millenium, the growth mindset has received much attention for its significant role in impacting students' academic achievements (Bernardo et al., 2021). However, whether a growth mindset works across contexts is still an ongoing debate (Burgoyne et al., 2020; Wang & Sun, 2025; Yeager & Dweck, 2020). On the one hand, meta-analytical reviews indicate a positive relationship between growth mindset and learning achievement (Burnette et al., 2013; Burnette et al., 2023; Sisk et al., 2018; Tipton et al., 2023). On the other hand, this association has been claimed to be weak and trivial (Burgoyne et al., 2020) due to issues such as study design, analysis, and publication preference (Macnamara & Burgoyne, 2023).

Despite these controversies, the two sides of the tug-of-war share one common position: A growth mindset does not work alone but interplays with many other variables. Yeager and Dweck (2020) argue for a "mindset × context" approach in contrast to the idea of "mindset alone" (p. 11). The implications of the controversies are many, the central one being that more studies are needed to focus on the heterogeneous effects of a growth mindset on learning in different conditions (Burgoyne et al., 2020; Lou, 2025; Yeager & Dweck, 2020). Yeager and Dweck (2020) called for more research to discover how a growth mindset works in contexts where a non-significant growth mindset effect has been occasionally reported, such as mainland China (Li & Bates, 2019, 2020; OECD, 2019). Burgoyne et al. (2020) suggested that individual variables such as motivational factors, especially self-efficacy (Payne et al., 2007), should play a major role in explaining the heterogeneous effects of growth mindset.

Compared with the relatively long history of mindset studies in education, mindset has caught the attention of second and foreign language (L2) researchers only recently (Jiang et al., 2024; Zarrinabadi et al., 2022). A considerable bulk of research has examined language learner mindsets (e.g., mindsets about language ability and language intelligence; Lou & Noels, 2017) as well as teachers' mindsets (mindsets about teaching ability and about the future; Hejazi et al., 2024; Mohammadzadeh, 2025). A main feature of these studies is that the growth mindset has been uncritically treated as inherently advantageous from the outset and embraced as a "good" thing for language learning by nature. Earlier empirical evidence strengthening this belief mostly comes from the West (Lou et al., 2022; Lou & Noels, 2020). The recent years have seen an increasing number of relevant studies on growth mindset conducted in Asian L2 contexts (Li et al., 2024; Zhang et al., 2024, 2025). While these studies suggest a positive association between growth mindset and L2 achievement, there is a crucial research gap regarding the complex interplay between growth mindset and other individual factors, such as self-efficacy (Burgoyne et al., 2020).

In L2 research, Cai (2023) distinguishes three patterns in which two or more predictors may interact with each other: competition (Type I interaction, shortened as C), mediation (Type II interaction, shortened as M), and moderation (Type III interaction, also shortened as M), thereby proposing the CMM approach (Cai, 2023). According to Cai (2023), competition refers to the relative importance of two or more predictors (e.g., growth mindset and self-efficacy) in explaining the outcome variable (e.g., language achievement); mediation means the indirect effect of one predictor on the outcome variable by another predictor (e.g., the growth mindset effect mediated by self-efficacy); and moderation is about the constraining/amplifying effect of one predictor (e.g., growth mindset) on the relationship between another predictor (e.g., self-efficacy) and the outcome variable (e.g., language achievement).

So far, very few studies have explicitly compared the relative importance of growth mindset and self-efficacy in shaping language achievement, though a relatively larger effect for self-efficacy is suggested in meta-analytical studies on self-efficacy (Goetze & Driver, 2022) and growth mindset (Khajavy et al., 2022). Only a few studies have addressed the mediation of self-efficacy between growth mindset and language achievement (Bai et al., 2024). No relevant research, to the author's best knowledge, is available that has directly examined the moderation between self-efficacy and growth mindset in determining language achievement. This lags behind the implicit theory (Dweck, 2006) that suggests the great potential of the growth mindset in facilitating the effects of other individual attributes, such as self-efficacy, on learning achievement (Burgoyne et al., 2020; Yeager & Dweck, 2020). The purpose of the current study is to explore all three types of interactions between growth mindset and self-efficacy in predicting English achievement.

2. Literature review

2.1. Growth mindset and language achievement

Mindset theory posits two contrasting mindsets about human intelligence: a growth and a fixed mindset (Dweck, 2006; Yeager & Dweck, 2020). Students holding a *growth mindset* believe that their abilities are malleable, whereas those with a *fixed mindset* hold that these abilities are unchangeable (Yeager & Dweck, 2012). Mindsets have been considered as either a domain-general construct that emphasizes a belief in general intelligence (Blackwell et al., 2007), or a domain-specific construct that focuses on specific subjects, such as science (Bedford, 2017), mathematics (Sun, 2018), or a specific language (Lou & Noels, 2017). Having a growth mindset enables students to accept challenges, enjoy

achievement, and continuously invest their efforts in learning (Ng, 2018). This sustained motivation, behaviors, and cognition in learning eventually bring about enhanced learning achievement (Dweck, 2017). However, students with a fixed mindset think that their current failures or difficulties mainly come from their inability to master the subject, and they will avoid making further attempts to overcome these difficulties (Dweck & Yeager, 2019; Yan et al., 2021).

Given its domain-specific character, the concept of mindset began to be studied in the context of L2 learning (Khajavy et al., 2021; Lou & Noels, 2017). Within this area, a growth mindset has been defined as students' belief that their language ability is mutable through continuous effort (Lou & Noels, 2017). During the past few years, an increasing number of studies have emerged to explore language learners' growth mindset and its relation to language learning. Among them, most studies are confined to investigating the relationship between growth mindset and motivational and behavioral variables, such as learning goals and responses to challenging situations (Yao et al., 2021), or cognitive variables, such as self-regulation strategies (Bai & Wang, 2023; Xu & Wang, 2022). However, a positive association between growth mindset and these learning process variables does not necessarily lead to a positive association between growth mindset and language learning achievement (Burgoyne et al., 2020).

Possibly because of this concern, many other studies have attempted to link a growth mindset to language achievement. Evidence from these studies shows that a growth mindset significantly predicts general language achievement (Bernardo, 2023; Hu et al., 2022; Khajavy et al., 2021) and specific language skills and subsystems, such as grammar (Zarrinabadi et al., 2021), reading (Bernardo, 2023; Cho et al., 2019; Khajavy et al., 2022), and writing (Lee et al., 2023; Quinto et al., 2021). This positive association has been identified with young language learners studying at K-12 levels (Bai & Wang, 2023; Bernardo, 2023), adult learners at the university level (Khajavy et al., 2022; Lee et al., 2023), language learners studying in the West (Lee et al., 2023; Lou & Noels, 2020), and language learners in educational contexts, such as, for example, Hong Kong (Bai & Wang, 2023) and mainland China (Hu et al., 2022).

Despite such encouraging evidence, language growth mindset research carries over certain issues from mindset research in the broader field. Among a few recent studies that have explicitly examined the relationship between language growth mindset and language achievement, the effect is either non-significant (Berg, 2021; Huang et al., 2022), positive but weak (e.g., β = .15, Khajavy et al., 2021), mixed across boys and girls (Guo et al., 2023), or fully mediated by other variables such as language anxiety, language use (Lou & Noels, 2020), and self-regulated learning (Bai & Wang, 2023). This mixed evidence, hence, lends little support to the core role of the L2 growth mindset in the meaning system of learning claimed by growth mindset researchers (e.g., Dweck & Yeager, 2019; Lou & Zarrinabadi, 2022).

To promote mindset research, Lou and Noels (2019) called for a research agenda that regards mindset as a complex system. A core idea in complex system thinking is that the effect of one factor may change due to the change in another factor (Cai & Kunnan, 2020; Leith et al., 2014). This idea aligns with the concept of heterogeneity recognized by Yeager and Dweck (2020) and Burgoyne et al. (2020). In fact, studies have already looked at the heterogeneity of the mindset effect on language achievement. For instance, Quinto et al. (2021) used ANOVA, and Lou and colleagues (2022) used latent profile analysis to explore the interaction between language growth mindset and engagement. Both studies disclosed that growth mindset and engagement amplify each other's effects on L2 achievement. Using the interaction term approach with PISA 2018 data of Filipino students, Bernardo (2023) found that the growth mindset effect on English reading decreased as students' socioeconomic status decreased. These studies provided promising evidence supporting the heterogeneity hypothesis regarding the growth mindset effect. However, whether and how a growth mindset interacts (i.e., competes, mediates, and moderates) with language self-efficacy, a critical individual predictor of language achievement emphasized in the growth mindset literature (Burgoyne et al., 2020), has yet to be explored.

2.2. Self-efficacy and language achievement

Self-efficacy refers to individuals' beliefs in their ability to execute specific tasks (Bandura, 1997). In educational contexts, self-efficacy is known as academic self-efficacy, defined as individuals' judgment about their abilities to successfully attain learning goals (Elias & MacDonald, 2007). According to social-cognitive theory (Bandura, 1982), students with higher academic self-efficacy are more likely to believe they can accomplish the task in hand (Mills et al., 2007). Hence, they are more ready to persist and engage with the tasks when confronted with challenges or difficulties (Bandura, 1997). Thus, students with higher self-efficacy are more likely to succeed in learning (Maddux & Kleiman, 2016). Numerous studies have shown a positive relationship between academic self-efficacy and learning achievement (Afari et al., 2012; Anam & Stracke, 2016; Soland & Sandilos, 2020). In a recent meta-analytical review, Honicke and Broadbent (2016) found an effect size of $\beta = .071$ ($p < .001$).

In L2 research, self-efficacy has also attracted much attention. Existing studies have consistently shown a positive relationship between language self-efficacy and general language proficiency (Hsieh & Kang, 2010), and between language self-efficacy and specific language skills, such as listening (Yabukoshi, 2021), speaking (Zhang et al., 2020), reading (Giladi et al., 2022), and writing (Sun et al., 2021). In their meta-analysis, Wang and Sun (2020) found that self-efficacy explains 15% of the general language proficiency variance and the effect size is larger in Asian

contexts (i.e., r^2 = 18%). In a more recent meta-analysis, Goetze and Driver (2022) observed an average effect of r^2 = 22% for self-efficacy.

2.3. Interaction between growth mindset, self-efficacy, and language achievement

Findings from existing literature warrant more studies that would explore the interaction between growth mindset and self-efficacy in predicting language achievement. First, very few studies have explicitly compared the relative effects of self-efficacy and growth mindset on L2 achievement (i.e., Type I interaction or competition). Regardless, the frequently reported effect sizes of the growth mindset effect provided in empirical studies (e.g., β = .15, r^2 = 3%, Khajavy et al., 2022) and those reported in meta-analytic reviews for language self-efficacy (e.g., r^2 = 22%, Goetze & Driver, 2022) appear to suggest the relatively larger effect of self-efficacy. Such empirical evidence reinforces our belief in explicitly examining the relative importance of self-efficacy and a growth mindset.

Another insight from the literature is that a growth mindset might predict self-efficacy. For instance, Bai et al. (2024) examined the relationships between struggling L2 writers' motivation (i.e., self-efficacy, growth mindset), self-regulated learning (SRL) strategies, and language writing performance among 368 Hong Kong primary school students. Results of structural equation modeling (SEM) indicated that a growth mindset positively correlated with self-efficacy and that only self-efficacy positively predicted writing performance. Zarrinabadi et al. (2022) concurrently examined the relationships among several variables, including language mindsets (growth and fixed mindset), self-concept, self-efficacy, and adaptability of 211 English learners in an Iranian university. Path analysis results showed that adaptability positively mediated between growth mindset and self-efficacy. These results suggest the value of a growth mindset in enhancing the level of self-efficacy, one condition for the mediating role of self-efficacy between growth mindset and L2 achievement (Type II interaction or mediation). Despite the evidence supporting the positive link between growth mindset and self-efficacy, studies also show different results. For example, Rhew et al. (2018) investigated students in special education and found that a growth mindset intervention positively affected motivation but non-significantly influenced self-efficacy. Although this study was not conducted in language settings, the results remind us of the possible unstable association between growth mindset and self-efficacy in different contexts.

Studies that have explicitly investigated Type III interaction (i.e., moderation) between growth mindset and self-efficacy are also rare. This fails to align with the literature that indicates the great potential of growth mindset in facilitating the

effect of self-efficacy on language achievement (Bai et al., 2024; Burgoyne et al., 2020; Wasylkiw et al., 2020). Nevertheless, a few studies conducted in non-L2 contexts shed light on this issue. For instance, Diseth et al. (2014) examined the predictive effects of self-esteem, self-efficacy, and fixed and growth mindset on learning achievement (a combination of mathematics, first language, and English) of Norwegian sixth- and eighth-graders (*N* = 2,062). Results of structural equation modeling (SEM) showed that achievement was positively predicted by self-efficacy, but negatively by both growth and fixed mindset. The researchers explained that the negative predictive effect of growth mindset could be due to a suppression effect. According to Horst (1941), when simultaneously including a weaker predictor and a stronger predictor, the effect of the weaker predictor is likely to be suppressed by the stronger predictor (suppressor), which will result in an enhanced effect size of the stronger predictor. This suppression effect has been regarded as a signal for possible interaction between two predictors.

Another study conducted in first language reading research sheds light on our understanding of the moderation of growth mindset between self-efficacy and language achievement. Using a person-centered method, Lee et al. (2023) examined how reading mindset and self-efficacy interacted in predicting reading-specific achievement goals, engagement, and reading achievement with fourth-graders (*N* = 206) studying in the United States. Results of latent profile analysis identified three latent groups: Group 1 had median self-efficacy + fixed mindset, Group 2 had the lowest self-efficacy + neutral mindset, and Group 3 had the highest self-efficacy + growth mindset. These results suggested that Group 3 had the highest reading achievement (highest self-efficacy + growth mindset), followed by Group 2 (lowest self-efficacy + neutral mindset) and Group 1 (median self-efficacy + fixed mindset). The implications for our study are that a growth mindset might play a more important role than self-efficacy in determining language achievement (Type I interaction) and that a growth mindset might moderate the relationship between self-efficacy and reading achievement (as suggested by Group 2, the lowest self-efficacy group obtained higher achievement scores than the medium self-efficacy group). However, the pattern and effect size of the moderation have yet to be further explored.

2.4. Research questions

Drawing on the brief literature review, the present study addressed three research questions regarding the interaction between growth mindset and self-efficacy in predicting English as an L2 achievement in mainland China. Each of these questions corresponds to one type of interaction in the CMM approach conceptualized in Cai (2023):

RQ1: What is the relative importance of English growth mindset and English self-efficacy in predicting English achievement?
RQ2: To what extent does self-efficacy mediate the relationship between growth mindset and English achievement?
RQ3: To what extent does a growth mindset moderate the relationship between self-efficacy and English achievement?

3. Method

3.1. Participants

The current study involved 367 second-year undergraduate students (M_{age} = 19.25, *SD* = .66; females = 74%) studying English as a foreign language. They were recruited through convenient sampling from a university in East China. These students were nested within different classes taught by 20 English teachers, each taught by a single English teacher. All teachers used the same standardized curriculum. Students came from nine different disciplines: financial management (34%), international economics and trade (21%), business administration management (16%), accounting (16%), and other disciplines including law studies, statistics, exhibition and tourism, negotiation for trading, economics, and foreign studies (13%).

3.2. Procedures and measures

Students responded to two questionnaires tapping into: English growth mindset and English self-efficacy (see Appendix). Before data collection, ethical approval was obtained from the author's host university. Consent form letters were sent to teachers and students to encourage voluntary participation, and signed consent forms were obtained before data collection. The questionnaires were delivered in Chinese through an online survey platform called Questionnaire Star. The questionnaire data were collected two weeks before the end of the semester. Students' course terminal examination and College English Test Band Six (CET-6; National College English Testing Committee, 2016) scores were also collected to represent their English achievement.

3.2.1. Growth mindset

We used the *English Mindset Questionnaire* (EGMQ) to measure growth mindset, which included the first three items of the L2B subscale of the *Language*

Mindsets Inventory by Lou and Noels (2017). The EGMQ asked students to report their agreement on a six-point scale (1 = *Strongly disagree*, 6 = *Strongly agree*) on three statements regarding fixed mindset in English. Students' responses were reversed to represent a growth mindset before data analysis. The overall mean was $M = 3.50$ ($SD = 1.21$). The internal consistency was $\alpha = .81$.

3.2.2. Self-efficacy

The *English Self-Efficacy Questionnaire* (ESEQ) is a six-point scale (1 = *strongly disagree*, 6 = *strongly agree*) validated in Cai and Xing (2023) in the L2 setting. The ESEQ comprised six statements regarding students' aspiration to succeed in the college English course. The overall mean was $M = 4.11$ ($SD = 1.03$). The internal consistency was $\alpha = .95$.

3.2.3. English achievement

English achievement was represented using two measures: the scores of students' final course achievement exam (or final exam) for the College English Course and the CET-6 scores. The final exam contained listening, vocabulary, grammar, reading, and writing test papers. The mean was $M = 68.81$ out of 100 ($SD = 10.49$). This was a standardized measure within the university that was identical to all participants in our study. The mean score of CET-6 was $M = 501$ out of 710 ($SD = 63.44$). According to Jin et al. (2022), this language proficiency corresponded to the *Common European Framework of Reference for Languages* (CEFR) B2 to C1.

3.3. Data analysis

Primary data analyses consisted of three steps: (1) conducting confirmatory factor analyses (CFA) with each latent variable (i.e., growth mindset and self-efficacy) to ensure the measurement quality of each latent variable; (2) conducting a multilevel structural equation model (ML-SEM) by regressing English achievement on growth mindset and self-efficacy; and (3) testing an ML-SEM with growth mindset, self-efficacy, and the latent interaction between growth mindset and self-efficacy as predictors of English achievement.

Primary data analyses were conducted on M*plus* Version 8.10 (Muthén & Muthén, 1998-2023). To evaluate the fit of ML-CFA and ML-SEM models, we applied the following criteria: comparative fit index (CFI), Tucker-Lewis index (TLI), root

mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). According to Byrne (2010), the model with RMSEA and SRMR values below .05 indicated a good fit, whereas values below .08 indicated an acceptable fit. Similarly, CFI and TLI values above .95 reflected a good fit, while values above .90 reflected an acceptable fit. As the above model fit indices are not appropriate for evaluating a nonlinear model (Cai & Kunnan, 2020), the validity of the model with latent interaction was determined by the significance level of the path estimate from the interaction term to L2 achievement. A *p*-value no larger than .05 indicates a significant latent interaction.

Regarding the effect sizes of main effects, Hattie's (2009) criteria of 0.05, 0.15, and 0.24 were adopted as points of references for small, medium, and large effects for positive relationships, and values of -0.10, -0.20, and -0.29 and lower as references of small, moderate, and large effects. As for the moderation effect, we consulted Cohen's (1988) f^2 values (f^2 = the ratio of the variance of the dependent variable explained by the moderation to the variance of the dependent variable unexplained by the moderator). Values of 0.005, 0.01, and 0.025 were regarded as small, medium, and large effects (Cai & Lin, 2024; Kenny, 2015).

4. Results

This section presents results of correlations, model fit for multilevel CFA and SEM models, and estimates for ML-SEM without and with latent interactions.

4.1. Correlations

Table 1 presents the correlations among English achievement (the terminal exam and CET-6), growth mindset, and self-efficacy. Growth mindset was neither significantly related to L2 achievement nor to self-efficacy. Self-efficacy was positively related to English achievement. Finally, both age and gender were non-significantly related to the English exam or CET-6. As shown in the table, self-efficacy was strongly and positively associated with English achievement, with a relatively larger effect on CET-6, whereas growth mindset was non-significantly associated with either English exam or CET-6 scores.

Table 1 Correlations

	CET-6	Growth mindset	Self-efficacy	Age	Gender
English exam	.63*	-.01	.22*	-.02	-.05
CET-6		.03	.28*	-.01	-.04
Growth mindset			-.04	-.09	-.21*
Self-efficacy				-.001	.08

Note. * $p < .01$

4.2. Model fit results

Table 2 shows the model fit results. The three-item growth mindset scale had a perfect fit as this model is saturated. The self-efficacy scale had an excellent fit after releasing the covariance between the last two items (i.e., SE05 and SE06, both addressing students' expectations for good performance in the English course): RMSEA = .046, SRMR = .010, CFI = .994, and TLI = .984. The ML-SEM that combined all key variables had an excellent fit: RMSEA = .030, SRMR = .029, CFI = .994, and TLI = .991. For the final model, the path estimate from the latent interaction term to L2 achievement was $\beta = .13$, $p = .002$, indicating the meaningfulness of the moderation of growth mindset on the relationship between self-efficacy and L2 achievement.

Table 2 Model fit indices

Model	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR (within)
Model 1. ML-CFA of the growth mindset	.000	0	1.000	1.000	1.000	.000	.000
Model 2. ML-CFA of self-efficacy (covariances between Items 5 and 6)	14.240	8	.076	.994	.984	.046	.010
Model 3. ML-SEM	52.045	39	.079	.994	.991	.030	.029

4.3. Estimates of ML-SEM without interaction (RQ1 and RQ2)

Figure 1 shows the estimates of the ML-SEM without interaction. As shown, growth mindset neither significantly predicted English achievement ($\beta = .01$, 95% CI = [-.10 .12], $p = .91$, for the exam score; $\beta = .04$, 95% CI = [-.06 .14], $p = .47$, for CET-6) nor significantly predicted self-efficacy ($\beta = -.03$, 90% CI = [-.09 .14], $p = .60$). Meanwhile, self-efficacy positively predicted English achievement, as indicated both by the terminal exam ($\beta = .19$, 95% CI = [.11 .26], $p < .001$) and by CET-6 ($\beta = .28$, 95% CI = [.20 .36], $p < .001$), showing medium and large effect sizes, respectively.

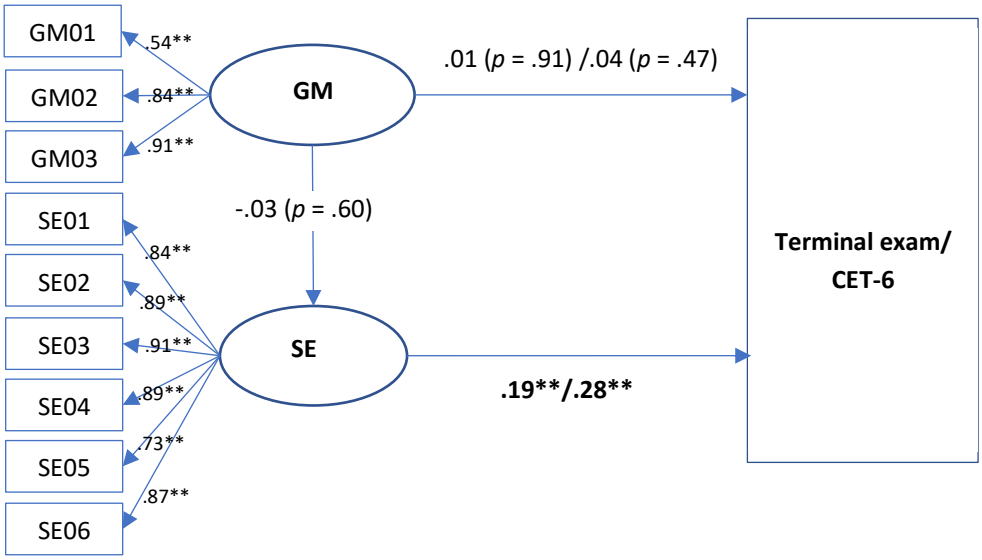

Figure 1 Addictive effects of growth mindset and self-efficacy on English achievement (** $p < .001$; * $p < .05$; correlation between the terminal exam and CET-6 was $r = .61$, $p < .001$); SE = self-efficacy; GM = growth mindset; GM×SE = interaction between growth mindset and self-efficacy)

4.4. Estimates of ML-SEM with interaction (RQ3)

Figure 2 shows the estimates of the ML-SEM with a latent interaction between growth mindset and self-efficacy. The interaction term between growth mindset and self-efficacy positively predicted English achievement, as represented both by the terminal exam ($\beta = .16$, 95% CI = [.06 .25], $p < .001$) and by CET-6 ($\beta = .10$, 95% CI = [.01 .20], $p = .015$). Using Cohen's f^2 formula, the effect sizes of the moderations were 0.03 and .01, respectively, indicating a large effect size for the terminal exam and a medium effect size for the CET-6.

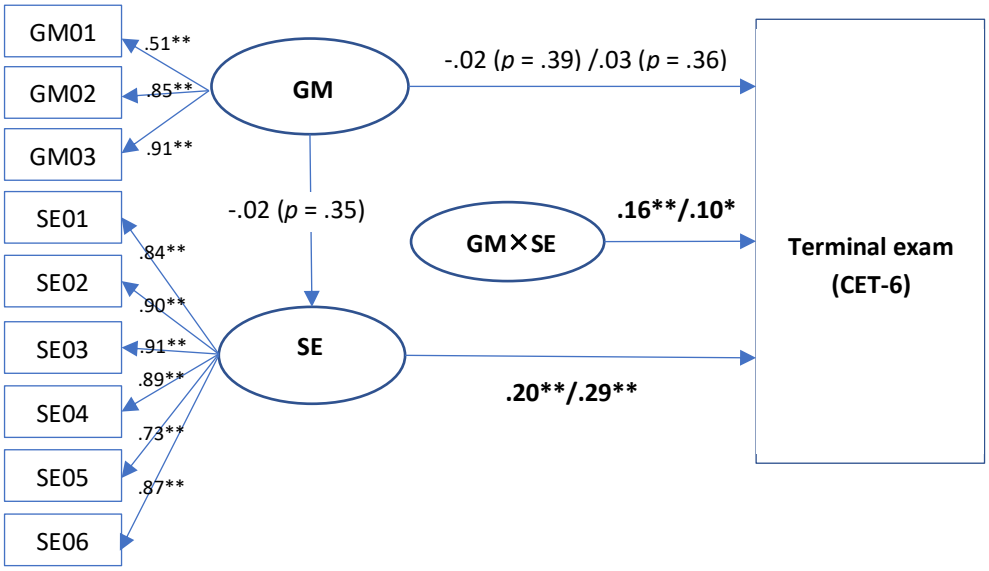

Figure 2 Multiplicative effects of growth mindset and self-efficacy on English achievement (** $p < .001$; * $p < .05$; correlation between the terminal exam and CET-6 was $r = .61$, $p < .001$; SE = self-efficacy; GM = growth mindset; GM×SE = interaction between growth mindset and self-efficacy)

Drawing on the estimates presented in Figure 2, the relationships among the two key predictors, their interactions, and English achievement can be expressed in the following equation:

*English achievement (Terminal Exam/CET-6) = .20/.29*self-efficacy +.16/.10*self-efficacy*growth mindset (Equation 1)*

The moderation of self-efficacy on the relationship between growth mindset and L2 achievement, in turn, can be expressed as:

*Moderation (Terminal Exam/CET-6) = (.20/.29 +.16/.10*growth mindset) *self-efficacy (Equation 2)*

The moderation effect of a growth mindset on the relationship between self-efficacy and English achievement (represented by the terminal exam score) is plotted in Figure 3. Substantially, when growth mindset was lower (e.g., -1 standardized unit), the effect size of self-efficacy on English achievement was smaller (e.g., $\beta = .05$ when growth mindset = -1). In this case, a lower self-efficacy of -1 contributed to a lower achievement score of -.05. A higher self-efficacy of +1 contributed to a higher achievement score of .05. Meanwhile, when

growth mindset became higher (e.g., +1), the effect size of self-efficacy on English achievement also became higher (e.g., β = .35 when growth mindset = +1). Under this condition, a low self-efficacy (-1) contributed to a low achievement score of -.35, and a higher self-efficacy (+1) contributed to an even higher achievement score of .35. Clearly, a larger growth mindset is associated with a larger size of self-efficacy effect on English achievement.

Figure 3 Plot for the moderation of growth mindset (x-axis = self-efficacy; y-axis = English achievement)

5. Discussion

The current study examined the relative importance of growth mindset and self-efficacy in English achievement and the interplay between them in determining English achievement. The results of multilevel structural equation modeling showed that growth mindset neither directly nor indirectly impacted English achievement, whereas self-efficacy had a strong direct positive association with English achievement. Furthermore, growth mindset amplified the association between self-efficacy and English achievement. The subsequent sections address each of these associations in turn.

5.1. The relative importance of growth mindset and self-efficacy in English achievement (RQ1)

Our results showed that the direct effect of growth mindset on English achievement was non-significant. This result is inconsistent with most existing studies that support a positive relationship between English growth mindset and English

achievement for university students in educational systems in the West, such as North America (Lee et al., 2023), the Middle East (Khajavy et al., 2021; Lee et al., 2023), South Asia (Quinto et al., 2021), or even mainland China (Hu et al., 2022). However, the finding is consistent with two recent studies conducted with university English learners in two educational systems in the East: Japan (Berg, 2021) and mainland China (Huang et al., 2022). The inconsistency and consistency reinforce the need to examine the growth mindset in a specific educational system (Bernardo et al., 2021; OECD, 2019), such as mainland China.

However, these findings are surprising when compared with Hu et al. (2022), which involved a similar sample of Chinese English learners at university. One possible reason could relate to the measure of growth mindset. Hu et al. (2022) used the inventory developed by Lou and Noels (2017), which also contained two other mindset factors: general language mindset and age sensitivity language mindset. In this sense, their study might have conflated the pure effect of a growth mindset on English achievement. Another possible reason is related to the differences in students' language proficiency. The students in Hu et al. (2022) were first-year undergraduate students, and their English proficiency was about the level of College English Test Band Four (CET-4; National College English Testing Committee, 2016), but participants in our study were second-year undergraduate students, and their English proficiency was about the level of CET-6. According to Jin et al. (2022), CET-4 measures English proficiency levels equivalent to CEFR B1-B2 (2 is higher than 1), and CET-6 measures English proficiency levels equivalent to CEFR B1-C2 (C is higher than B). As argued by other scholars, a growth mindset might work more for less proficient learners than for more advanced learners (Yeager & Dweck, 2020). A third reason is related to our use of multilevel modeling, which allowed us to control for noise from the teacher level, whereas the study by Hu et al. (2022) might have been biased by their failure to deal with nested data. The final reason pertains to the inclusion of different co-variables. Hu et al. (2022) included grit with the growth mindset, whereas our study included self-efficacy, which has been assumed to play a relatively more important role than other motivation factors (Burgoyne et al., 2020; Payne et al., 2007). The stronger predictive power of self-efficacy may have absorbed the effect of the less competitive variable of the growth mindset.

Our results showed that self-efficacy was directly related to English achievement. This positive relation of self-efficacy to English achievement is consistent with studies in English self-efficacy research among English learners at universities across cultures, such as Israel (Giladi et al., 2022), South Korea (Wang et al., 2013), and Japan (Harris, 2022), and with primary school students in Eastern countries such as Indonesia (Anam & Stracke, 2016) and Hong Kong (Bai & Wang, 2023). This result also corroborates the meta-analysis by Wang and Sun (2020) in which the researchers concluded that self-efficacy has a stronger association with English

achievement in the East cultures than in the West. In our case, English self-efficacy refers to students' belief in their abilities to accomplish success in the college English course. The significant relationship between self-efficacy and English achievement indicates the alignment between students' self-evaluation of their English ability and their real English proficiency levels with the sampled students.

From a static view, these results corroborate the claim by Burgoyne et al. (2020) that self-efficacy plays a more important role than a growth mindset in predicting learning achievement. However, these results should not be overinterpreted as the growth mindset effect is trivial or ignorable. In line with mindset researchers in the broader field of educational psychology (Burgoyne et al., 2020; Yeager & Dweck, 2020) and in learning L2 English (Wang & Sun, 2020), it is advisable to adopt a more complex perspective when looking at the heterogeneity of growth mindset for understanding the heterogeneity of growth mindset effects. This could involve, for example, examining the mediating and moderating roles between growth mindset and self-efficacy in predicting English achievement.

5.2. Self-efficacy mediating between growth mindset and English achievement (RQ2)

Our results showed that self-efficacy produced a non-significant mediation effect on the relationship between growth mindset and English achievement. The non-significant indirect effect was due to the non-significant association between growth mindset and self-efficacy. The non-significant association between growth mindset and self-efficacy was consistent with what Rhew et al. (2018) found with students in special education. These students came from various educational systems. The growth mindset-self-efficacy association is likely insensitive to some educational systems, and the list might include mainland China.

However, our finding is inconsistent with the positive association between growth mindset and self-efficacy found by Zarrinabadi et al. (2022) with Iranian university students. This inconsistency can be accounted for in terms of cultural differences (Yeager & Dweck, 2020). Meanwhile, the non-significant relationship stands in contrast to the evidence reported by Bai and colleagues (Bai et al., 2024; Bai & Wang, 2023) with Hong Kong primary school students. They revealed that students' English growth mindset was positively associated with English self-efficacy, which in turn predicted students' English writing achievement. Given this difference, we argue that educational stage may moderate the association between growth mindset and self-efficacy. Specifically, younger learners may rely more on teachers' feedback on their incremental progress, potentially strengthening the mindset-self-efficacy association, whereas university students' self-efficacy may be shaped more by accumulated academic experiences, thereby weakening the direct influence of mindset.

5.3. Self-efficacy moderating between growth mindset and English achievement (RQ3)

The most interesting finding of the current study regards the moderation of English growth mindset between self-efficacy and English achievement. When students reported lower levels of growth mindset, the association between self-efficacy and English achievement was weaker. With the increase in the growth mindset, the positive relationship between self-efficacy and English achievement became stronger. Put another way, a growth mindset amplified the positive effect of self-efficacy on English achievement.

Studies on the English growth mindset have produced very few relevant results for us to compare with this Type III interaction. However, our results correspond with those that showed an amplifying function of a growth mindset for other individual and contextual attributes. The most relevant one focused on first language reading. In this study, Lee et al. (2023) observed that a growth mindset moderated the effect of fourth-graders' low self-efficacy. Other relevant studies have shown that a growth mindset amplifies the relationship between students' learning experience and their language learning achievement (Sadoughi et al., 2022) and that between teacher-student relationship and students' achievement in first language and mathematics (Brandisauskiene et al., 2021).

Our finding regarding the amplifying effect of a growth mindset on the relationship between self-efficacy and English achievement, along with the findings of the other studies we reviewed, partly supports Yeager and Dweck's (2020) argument for the important role of a growth mindset in impacting learning. According to the growth mindset proponents (e.g., Lou, 2025; Yeager & Dweck, 2020), the effect of a growth mindset is meaningfully heterogeneous across individuals and contexts. Even in a culture insensitive to the growth mindset effect, it is still likely that growth mindset works with some groups of specific individual attributes (Yeager & Dweck, 2020).

Given the non-significant direct and indirect effect of a growth mindset on English achievement in our study, the argument that a growth mindset should be the core of the meaning system of learning (Dweck & Yeager, 2019; Lou & Noels, 2019) should be taken with caution, at least for English learners sampled in the current study. On the other hand, it would be similarly unwarranted to devalue the status of a growth mindset when the direct and indirect effects of a growth mindset are small or even absent, as indicated in meta-analytical reviews (e.g., Wang & Sun, 2025). This is because not everyone learns in the same conditions as averaged in the meta-analysis, nor do students in the same classrooms carry the same attributes. The Type III (moderating) interaction found in this study shows that there are conditions where the growth mindset works more strongly and conditions where the growth mindset effect is weak. This effect usually goes unnoticed by most researchers, because they do not examine the changing effect of growth mindset as was done in the current study.

6. Conclusion, limitations, and implications

Aiming to seek more evidence regarding the heterogeneity of growth mindset, the present study was designed to examine the interaction between growth mindset and self-efficacy in predicting university students' English achievement in mainland China. It investigated the relative importance of growth mindset and self-efficacy in English achievement, the indirect effect of growth mindset on English achievement by self-efficacy, and the moderation of growth mindset on the relationship between self-efficacy and English achievement. Results of multilevel structural equation modeling showed that: (1) self-efficacy played a more important role in directly predicting English achievement, (2) growth mindset had a non-significant direct or indirect effect on English achievement through self-efficacy, and (3) growth mindset amplified the positive association between self-efficacy and English achievement. The results suggest that while a growth mindset plays a relatively smaller role in facilitating English achievements, it still plays an important role in amplifying the effect of self-efficacy on English achievements.

The study suffers from some limitations. First, it was carried out during the COVID-19 pandemic. During data collection, students occasionally experienced lockdowns and switched back and forth from online to offline instructions. In such a complex situation, their emotions might have fluctuated, which could have blurred the functions of growth mindset and self-efficacy. Future research could be conducted in more controlled learning environments, such as offline, online, or blended settings. Second, this study was cross-sectional. Therefore, it was not possible to test whether the predictive effect of a growth mindset on self-efficacy would emerge if the study had lasted longer. Besides, the study only included self-efficacy, leaving untested other variables at the individual (e.g., learning goals, intrinsic motivation, self-regulated learning) and contextual levels (e.g., teacher-student relationship) that might have affected the results. In addition, the study was confined to second-year undergraduate students at one university in China. Therefore, the findings cannot be generalized to students in other study levels, nor can they be generalized to other cultures. Finally, for confidential reasons mandated by the participating university school (specifically, to protect examination content and intellectual property), the test papers and specific data, such as reliability for the terminal exam, were not available to the author. Future studies may consider these limitations when investigating the heterogeneity of the growth mindset effect on English achievement.

Irrespective of such limitations, the study had theoretical, practical, and methodological implications. First, it provided evidence to help partly resolve the controversies regarding the role of a growth mindset in the learning system. The dominant role of self-efficacy in predicting English achievement in this study

suggests that a growth mindset alone is insufficient for successful learning. This evidence indicates that the claim that a growth mindset is at the core of the meaningful learning system (Dweck & Yeager, 2019) should be toned down. On the other hand, the amplifying role of a growth mindset in the predictive effect of self-efficacy suggests that a static interpretation of the growth mindset effect is too simplistic to understand the true function of a growth mindset. In studies that merely focus on the main effect of a growth mindset, the failure to identify a non-significant positive effect of a growth mindset on English achievement does not necessarily suggest that growth mindset is useless. The growth mindset may still be contributing to learning by strengthening the positive effect of other factors. In this sense, it seems more appropriate to claim that a growth mindset is a *meaningful component* of the core learning system instead of the *core* of it.

The second implication pertains to methodology. A shared opinion among the two sides of the tug-of-war is the heterogeneity of the growth mindset. Methodologically, this means that the growth mindset effect may vary across students with different levels of individual attributes (e.g., achievement levels, self-beliefs, etc.) and contextual variables (e.g., teacher-student relationship, teacher attributes, school attributes, cultural values, etc.). A common practice in existing growth mindset studies is recruiting students from different classes, schools, or cultural backgrounds. Variation with respect to these variables will inevitably affect the results regarding the estimates of the growth mindset effect. One way to control for this effect is to measure these variables and include them as predictors in the statistical model. However, such factors are sometimes too difficult to identify. By using a multilevel approach, our study demonstrated an efficient way to control for noise at and beyond the teacher level. This method enables researchers to control for the heterogeneity out of the researcher's interest and focus on the heterogeneity due to variables within the researcher's interest.

The paper also helps provide better language education in the future as it sheds light on the ways in which language teaching programs can be designed to prepare the students for the future (Zarrinabadi, 2025). Given the current controversies over the role of a growth mindset, teachers may be unsure whether or not to apply strategies to encourage a growth mindset in English classrooms. The current study provided evidence easing this uncertainty. That is, although a growth mindset may not be able to bring about benefits to English learning directly, it may work together with other positive beliefs, such as self-efficacy, to enhance English achievement. This finding bears concrete implications for classroom practices.

For university English instruction, teachers should avoid treating growth mindset as a standalone approach expected to directly raise English exam or test scores. Instead, cultivation of growth mindset should encouraged alongside strategies that enhance students' confidence in their English ability. First, teachers can

design English learning tasks as staged and achievable steps rather than demanding mastery in a single attempt. Teachers can break a complex language activity into smaller stages, each with low-stakes and receiving actional feedback. This type of staged learning tasks allows students to monitor their continuous efforts and repeatedly experience small successes, thereby concurrently cultivating their growth mindset and self-efficacy. Through this staged learning, students have more opportunities to revise and repeat their practices. Importantly, teachers should convince students not to view the repeated revisions and practice as failure but as an inherent element of the learning process. When students re-attempt a learning task, the teacher might reinforce their consistent effort in revising the writing task and the progress the student has made through his/her effort. This strategy can foster both the growth mindset and self-efficacy. Second, teachers can normalize their feedback using structured rubrics on identifiable, and improvable features, such as accuracy, fluency, and organization. Teachers can also share anonymized examples of some students' progress over time with respect to different facets of learning achievement. This approach can further reinforce students' belief that their ability can grow through continuous effort. Furthermore, teacher professional development should emphasize both growth mindset and self-efficacy. Teachers need not only to understand what growth mindset and self-efficacy are, but also to know how to identify them when students lack these beliefs and provide appropriate coaching.

In a nutshell, English teachers should not abandon growth mindset strategies simply because direct effects are weak or nonsignificant. Instead, they should perceive growth mindset as a catalyst that amplifies the association between self-efficacy and English achievement. The most effective English classrooms will be those where teachers concurrently foster both growth mindset and self-efficacy.

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APPENDIX

Questionnaires, statements, and descriptive statistics

Scale	Item	Content	Mean	*SD*
Growth mindset	GM01	To a large extent, a person's biological factors (e.g., brain structures) determine his or her abilities to learn new languages.	2.83	1.31
	GM02	It is difficult to change how good you are in English.	3.93	1.44
	GM03	Many people will never do well in English, even if they try hard because they lack natural language intelligence.	3.73	1.52
		Overall	.50	1.21
		Alpha	.81	
Self-efficacy	SE01	I believe I will receive an excellent grade in English class.	4.07	1.17
	SE02	I am confident I can understand the basic concepts taught in this English course.	4.19	1.16
	SE03	I am confident I can understand the most complex material presented by the instructor in this English course.	4.01	1.19
	SE04	I am confident I can do an excellent job on the assignments and tests in this English course.	4.06	1.17
	SE05	I expect to do well in this English class.	4.42	1.13
	SE06	I am certain I can master the skills being taught in this English class.	4.18	1.13
		Overall	4.11	1.03
		Alpha	.95	