

Metacognitive strategies and self-efficacy co-shape L2 achievement: A multilevel structural equation modeling approach

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ABSTRACT

Numerous studies in second or foreign language (L2) learning have shown that students' L2 self-efficacy and metacognitive strategies play essential roles in predicting L2 achievement. However, how these two constructs co-shape L2 learning is understudied. The current study examined the mediation of L2 self-efficacy between metacognitive strategies and L2 achievement in English. Participants involved 368 s-year undergraduate students studying English as an L2 taught by 19 teachers from a university in China. Multilevel structural equation modeling results showed that: (1) English self-efficacy and metacognitive strategies significantly predicted English achievement either represented by a standardized English test or the terminal exam, and (2) English self-efficacy mediated the relation between metacognitive strategies and English achievement. The results suggested the importance of accounting for the interplay between metacognitive strategies and self-efficacy in determining L2 achievement.

Consent to publication

The authors consent to publish this article in *System*.

1. Introduction

Self-regulated learning (SRL) has been considered an empowering toolbox for optimizing learning in various domains, including second or foreign language (L2) learning (Oxford & Amerstorfer, 2018; Raofi et al., 2012). The literature has documented two critical components of SRL: metacognitive strategies and self-efficacy (Bandura, 1982; Pintrich, 2000; Zimmerman, 2013). Metacognitive strategies encourage learners to review past learning experiences, monitor their L2 learning process and adjust learning activities to better adapt to their L2 learning goal (Muijs & Bokhove, 2020), whereas self-efficacy provides students with more persistence and confidence to handle challenging tasks (Eccles & Wigfield, 2020; Jiang & Zhang, 2022; Mills et al., 2007).

In L2 research, the critical role of metacognitive strategies and self-efficacy in predicting L2 achievement has caught much attention. However, their foci have been on the respective effects of metacognitive strategies (Cai & Kunnan, 2020; De Silva & Graham, 2015; Teng et al., 2022) and L2 self-efficacy (Hsieh & Kang, 2010; Sun et al., 2021), or the mutual relationship between these two constructs (Gentner & Seufert, 2020; Raofi et al., 2012). Whether and how metacognitive strategies and self-efficacy interplay in

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predicting L2 achievement, however, is understudied.

This deficiency inevitably renders a fragmented understanding of how metacognitive strategies and self-efficacy work together to empower L2 learning. In a relevant longitudinal study, Cai et al. (2019) found intrinsic motivation (i.e., intrinsic value) mediated the relationship between metacognitive strategies and L2 achievement. We hypothesize that this strategy-achievement relation might also be mediated by self-efficacy, another key aspect of intrinsic motivation (Wigfield & Guthrie, 1997). The current study aimed to examine the role of L2 self-efficacy in mediating the relation between metacognitive strategies and L2 (English) achievement.

2. Literature review

2.1. Metacognitive strategies and L2 achievement

In the rubric of SRL, metacognitive strategies have been defined as students' cognition control (Pintrich, 2004). Metacognitively strategic learners are aware of their learning plan, when to use various cognitive strategies to monitor their learning process (Veenman et al., 2006), and how to evaluate and change their learning (Schunk & Zimmerman, 2012). Metacognitive strategies have usually been operationalized as planning, monitoring, and evaluating strategies (e.g., Mok et al., 2006; Pintrich et al., 1993). During the past decades, this SRL view of metacognitive strategies has gradually found its way into L2 research (Cai et al., 2022; Oxford, 2017; Phakiti, 2008; Purpura, 1999).

One preliminary version of metacognitive strategies in L2 research can be represented by the concept of strategic competence, a component of communicative language ability (Bachman & Palmer, 2010). According to Bachman and Palmer, strategic competence involves pre-event strategic processes, including goal-setting (deciding what to do), assessment (weighing the task requirements and one's knowledge), and planning (deciding how to do). However, this view of metacognitive strategies has been critiqued for lacking supporting empirical evidence (Purpura, 1999). McNamara (1996) called for a full investigation by referring to insights from other disciplines, such as psychology. Owing to the efforts for over three decades, a three-dimensional structure of metacognitive strategies (i.e., planning, monitoring, and evaluating) has been gradually established in L2 literature (Cai, 2020; Oxford, 2017; Phakiti, 2008).

Numerous studies have examined the relationship between metacognitive strategies and L2 learning achievement. Specifically, metacognitive strategies have been found to contribute to L2 learning in general (Teng et al., 2021), reading (L. J. Zhang, 2010), listening (Goh et al., 2014), writing (De Silva & Graham, 2015), and speaking (Pawlak, 2018). Despite

These positive results, heterogenous findings also appeared. In a few studies, metacognitive strategies were found to have a weak or nonsignificant direct effect on general L2 achievement (Phakiti, 2006; Purpura, 1999). An important reason revealed in these studies is the mediation of cognition factors such as L2 knowledge and cognitive strategies (Purpura, 1999). We posit that the list of mediators should also include intrinsic motivation factors such as intrinsic value and self-efficacy (Wigfield & Guthrie, 1997). For instance, Cai et al. (2019) found in a longitudinal study that metacognitive strategies produced a lagged indirect effect on Hong Kong students' English achievement by intrinsic motivation (intrinsic goals). Given the critical role of self-efficacy in predicting L2 achievement and the mutual relationship between self-efficacy and metacognitive strategies (Zimmerman, 2013), self-efficacy may mediate the relationship between metacognitive strategies and L2 achievement. Surprisingly, empirical studies are scarce that explicitly explore the interplay between metacognitive strategies, self-efficacy, and L2 achievement.

2.2. Self-efficacy and L2 achievement

Self-efficacy refers to personal judgments about one's ability to organize and execute actions to handle tasks (Bandura, 1986). Individuals with high self-efficacy tend to believe they can accomplish a task and are ready for persistent engagement, whereas individuals with lower efficacy may try to avoid it (Bandura, 1982). In educational research, self-efficacy is known as academic self-efficacy and refers to students' confidence in how well they can solve academic problems (Kitsantas et al., 2011). There are two critical indicators underlying academic self-efficacy, that is, the ability to classify ideas and compare them (Schunk, 1989) and the ability to transform ideas into personal experiences in the future (Bong & Skaalvik, 2003).

Students with higher self-efficacy are more likely to set higher goals, confront higher-level tasks, spend more effort, and be more persistent when facing difficulties (Mills et al., 2007). As a result, self-efficacious students are likely to gain more learning outcomes (Maddux & Kleiman, 2016). Numerous studies have examined the relationship between self-efficacy and learning achievement and a positive association between self-efficacy and learning achievement has been consistently observed. These include studies in general academic achievement (Afari et al., 2012; Anam & Stracke, 2016) and studies in specific domains such as life science (Huang et al., 2022), and mathematics and reading (Soland & Sandilos, 2020). This positive relation has been verified in a few systematic reviews (Honicke & Broadbent, 2016; Richardson et al., 2012; Talsma et al., 2018). In a recent meta-analysis (Honicke & Broadbent, 2016), self-efficacy was found to have an effect of $\beta = 0.071$ ($p < .001$) on achievement. In a more recent meta-analytic review (Wang & Sun, 2020), self-efficacy explained 18% of the total variance of Eastern Asian students' L2 achievement.

Similar studies have also been conducted in L2 learning. L2 self-efficacy (hereafter shortened as self-efficacy) has been found to be positively related to general L2 achievement represented by standardized tests (Wang et al., 2021) or by self-reported proficiency (Hsieh & Kang, 2010), and to specific L2 skills such as reading (Giladi et al., 2022), writing (Sun et al., 2021), speaking (X. Zhang et al., 2020), and listening (Yabukoshi, 2021).

However, mixed findings also emerged. For instance, in a few studies addressing L2 writing, self-efficacy was found to be unrelated to writing proficiency in undergraduate students in Malaysia (Jalaluddin, 2013), China (Y. Zhang & Guo, 2012), and the United Kingdom (Wilby, 2020). Wang et al. (2021) proposed several factors that might have blurred the function of self-efficacy in predicting

L2 achievements, such as cultural contexts (Sun & Wang, 2020) and the use of SRL metacognitive strategies (Yabukoshi, 2021). For instance,

Yabukoshi (2021) found that self-efficacious students exhibiting sophisticated metacognitive strategy use at the same time made more significant listening progress.

2.3. Metacognitive strategies, self-efficacy, and L2 achievement

The interplay between metacognitive strategies and self-efficacy in determining academic achievements has been the attention of SRL researchers for a long time. Pintrich (1999) contends self-efficacy can promote self-regulated metacognitive strategies and learning achievement. In the three-phase cyclical model of self-regulated learning (Zimmerman, 2013), self-efficacy is explicitly listed in the forthright phase, followed by the performance phase (involving metacognitive monitoring) and the self-reflection phase. This model explicitly specifies the information flow from self-efficacy to metacognitive strategies.

Meanwhile, the SRL literature also implies the path from metacognitive strategies to self-efficacy. According to Bandura (1997), a major source of self-efficacy is 'mastery experiences' (p.80), through which individuals experience success by solving challenging tasks with their efforts. To achieve L2 learning success during this problem-solving process, efficient use of metacognitive strategies is inevitable (Bachman & Palmer, 2010).

Furthermore, the relationship between self-efficacy and metacognitive strategies can be bidirectional, as posited by social-cognitive theorists (Bandura, 1999; Zimmerman, 2013). In this sense, metacognitive strategies are the basis for self-efficacy judgments, and self-efficacy might change due to metacognitive strategies (Gentner & Seufert, 2020; Kyo, 2022). The view that metacognitive strategies function as an antecedent of self-efficacy has been gaining increasing attention in L2 research during the past decade (Kyo, 2022; Raoofi et al., 2012). In a review of L2 studies, Raoofi et al. (2012) identified that strategy instruction significantly enhanced the reading self-efficacy of undergraduate students in Taiwan (Shang, 2010), the vocabulary self-efficacy of Grades 7 and 8 students in Hong Kong (Chan & Lam, 2010), and the French listening self-efficacy of Year 12 students in the South of England (Graham, 2007). More recently, Bai and Guo (2018) found that Hong Kong primary school students with higher self-regulated learning strategies had higher self-efficacy in English writing. Graham et al. (2020) also found that strategy instruction significantly enhanced the reading self-efficacy of 529 French beginners.

Despite the positive message in these studies about the relationship between metacognitive strategies and self-efficacy, whether and how self-efficacy mediates the relationship between metacognitive strategies and L2 achievement is underexplored. The current study aimed to address this gap by examining the mediating role of self-efficacy between metacognitive strategies and the L2 achievement of undergraduate students in mainland China.

2.4. The current study

The present study addressed three research questions:

1. To what extent do metacognitive strategies predict English achievement?
2. To what extent does self-efficacy predict English achievement?
3. To what extent does self-efficacy mediate the relation of metacognitive strategies to English achievement?

3. Method

3.1. Participants and data collection

This quantitative study was conducted with 368 s-year undergraduate students ($M_{age}=18.4$, $SD=0.77$; females=70%) in a university in Eastern China. These students were distributed in different disciplines: international economics and trade (50%), accounting (14%), financial management (11%), business management (9%), and statistics (6%). The remaining 10% was from law, tourism, and financial management studies.

At the time of data collection, students were enrolled in the Comprehensive English Course in the 2021 fall semester. The course trained students in their English listening, reading, and writing skills. During this skill-focused instruction, the course also explicitly instructed students' English vocabulary. They came from 19 different English classes, each taught by a different teacher. These students were chosen through purposive sampling as they had registered to participate in the College English Test Band Six (CET-6) to take place at the end of the semester.

Before data collection, we obtained approval from the Academic Board of the School of Languages at the authors' host university. Afterward, the research team sent a consent form letter to each student through their English teachers. In the letter, we explicitly stated our codes of confidentiality protection, the pure nature of volunteers participating, and our promise to delete any data generated by the students at their request at any time.

Data collection involved two questionnaires (i.e., English self-efficacy and engagement) and two tests (i.e., the CET-6 and the terminal course examination). The questionnaire data were collected in December of 2021 with the teachers' facilitation during the sixteenth instruction week of the semester (altogether eighteen weeks), and the test data were collected during March 2022 when both the CET-6 and the course scores were immediately available.

3.2. Measures

Metacognitive strategies. Metacognitive strategies were measured using the Metacognitive Strategies Questionnaire (MSQ) which was validated by Cai et al. (2019). The MSQ was initially included as a subscale in the Self-directed Learning Scale (SLS) which was developed by Mok et al. (2006) to measure students' motivation, cognitive, and metacognitive strategies during learning in general domains. Consistent with predecessors, the MSQ contained three factors: planning, monitoring, and changing (also known as evaluating), each with five items on a six-point scale (1 = Strongly Disagree, 6 = Strongly Agree). Planning refers to students' preparation activities for future English learning (e.g., 'I schedule the time to study English according to my plan,' $M = 4.17$, $SD = 1.23$). Monitoring refers to students' from-time-to-time self-check of their English learning and understanding (e.g., 'I keep records of my English learning performance to monitor how much progress I have made,' $M = 4.03$, $SD = 1.26$). Evaluating refers to how students attempt to improve their English when identifying mistakes made (e.g., 'When I find that I decline in my English, I change my learning approaches,' $M = 4.21$, $SD = 1.15$). The internal consistency estimates of the subscales were $\alpha = 0.89$, 0.91 , and 0.89 for planning, monitoring, and changing, respectively (see Table 1).

Self-efficacy. Self-efficacy was measured using the English Self-Efficacy Questionnaire (ESEQ), an 8-item scale adapted by Chao et al. (2019) from the self-efficacy subscale of the MSLQ developed by Pintrich et al. (1991). Students were asked to evaluate their extent of aspiration to succeed in their college English courses on a six-point scale (1 = Strongly Disagree, 6 = Strongly Agree). An example item was: "I believe I will receive an excellent grade in this class" ($M = 4.11$, $SD = 1.09$). The internal consistency of the scale was $\alpha = 0.96$.

English achievement. English achievement was indicated by two tests: the CET-6 and the terminal exam. We used two types of tests for the concern that the CET-6 carried requirements common to Chinese English learners, whereas the terminal exam captured requirements more specific to the learning setting. By referring to two types of tests, we expected to reduce bias due to differences in the measurement of English achievement.

The CET-6 was a national standardized test launched in the late 1980s by the National College English Testing Committee (CET Design Group, 1987) in China. The test was designed to assess whether non-English major students have met the English proficiency levels required in the national College English teaching syllabus (Higher Education

Department of the Ministry of Higher Education Department of the Ministry of Education, 2007). The current CET-6 contained four subtests: listening, reading, translating, and writing (National College English Testing Committee, 2016). The mean score for our sample was $M = 548.51$ ($SD = 62.47$) out of a total of 710. According to a recent linking study (Jin et al., 2022), the language proficiency of the sample students corresponded to The Common European Framework of Reference for Languages (CEFR) B2 to C1.

The terminal exam measured the English learning achievement of the Comprehensive English Course, which focused on instruction in basic language knowledge, listening, reading, and writing. A typical terminal exam is timed for 90 min and consists of four sections: vocabulary, listening, reading, and writing (i.e., paraphrasing). The mean for our sample was $M = 70.49$ out of a total of 100 ($SD = 10.03$).

Table 1
Items for the metacognitive strategies and English self-efficacy.

Planning	MT01	At the beginning of each school term, I set an English language learning plan for myself.
	MT02	If it will take longer to finish an English learning task, I will set a working schedule in advance.
	MT03	Before important English language examinations, I arrange my revision according to my planned schedule.
	MT04	I schedule the time to study English according to my plan.
	MT05	I like to get a list of the things I need to do, and then tackle them one by one.
Evaluati ng	MT06	I modify the way I complete my English assignments according to the different requirements.
	MT07	After I get back my English test papers, I try to understand the mistakes I have made.
	MT08	I focus on my common mistakes and repeatedly practise the items until I get them right.
	MT09	When I find that I decline in my English achievement, I change my language learning methods.
	MT10	I modify my English language learning methods to meet the needs of the College English course.
Monitori ng	MT11	I reflect upon my English language learning strategies to see if they are effective.
	MT12	I compare myself with others to observe if my language learning strategies are effective.
	MT13	I keep records of my English language learning performance in order to monitor how much progress I have made.
	MT14	When I encounter difficulties in English language learning, I reflect on possible mistakes that I might have made.
	MT15	I check if I have corrected the mistakes in English language learning that I have made previously.
Self- efficacy	SE01	I believe I will receive an excellent grade in this English class.
	SE02	I'm certain I can understand the most difficult material presented in the readings for the English course.
	SE03	I'm confident I can understand the basic concepts taught in this English course.
	SE04	I'm confident I can understand the most complex material presented by the instructor in this English course.
	SE05	I'm confident I can do an excellent job on the assignments and tests in this English course.
	SE06	I expect to do well in this English class.
	SE07	I'm certain I can master the skills being taught in this English class.
	SE08	Considering the difficulty of this English course, the teacher, and my skills, I think I will do well in this class.

3.3. Data analysis

To control for possible confounding effects from classes and teachers, multilevel structural equation modeling (ML-SEM) was used for data analysis. This involved two steps:

- (1) conducting multilevel confirmatory factor analyses (ML-CFA) to assess the measurement validity of each multiple-indicators variable (metacognitive strategies and self-efficacy); and
- (2) conducting ML-SEM to explore the relationships between metacognitive strategies, self-efficacy, and English achievement.

Mplus Version 8.8 (Muthén & Muthén, 1998–2022) with maximum likelihood robust (MLR) was used for these analyses. Model-data fit was evaluated by consulting comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). TLI and CFI values of 0.99, 0.95, 0.92, and 0.90 and RMSEA and SRMR values of 0.01, 0.05, 0.08, and 0.10 were referred to as criteria for judging whether the tested model is excellent, good, fair, or mediocre (Marcoulides & Yuan, 2017).

4. Results

4.1. Preliminary analysis

Table 2 shows the bivariate correlations among the study variables. Self-efficacy is positively related to the CET-6 score ($r = 0.35, p < .01$) and the course examination score ($r = 0.28, p < .01$). Metacognitive strategies are also positively associated with CET-6 ($r = 0.340, p < .01$) and terminal examination scores ($r = 0.29, p < .01$). Besides, metacognitive strategies and self-efficacy are positively associated with each other ($r = 0.63, p < .01$). In short, all key variables were positively associated with each other and the associations were all statistically significant.

4.2. Model-fit results

Before primary structural analyses, we conducted ML-CFA to ensure the measurement quality of the two scales with multiple indicators (metacognitive strategies and self-efficacy in English). Table 3 shows the results of model-data fit. The three-factor MSQ (Model 1) had a close to good fit after minor modifications (releasing the covariances between Items 1 and 2 within the planning subscale, between Items 9 and 10 within changing, and between Items 11 and 12 within monitoring). The one-factor scale of self-efficacy in English (Model 2) produced a good fit. The final ML-SEM model also had a good fit. These results ensured the measurement quality of each scale and justified the assumed relationships among these key variables.

4.3. Estimates of ML-SEM

Fig. 1 shows the estimates of the ML-SEM at the student level. Self-efficacy had a positive and direct effect on the terminal exam ($\beta = 0.17, 90\% CI = [0.08, 0.25], p < .01$) and on the CET-6 score ($\beta = 0.27, 90\% CI = [0.14, 0.39], p < .01$).

Metacognitive strategies had a positive direct effect on the terminal exam ($\beta = 0.17, 90\% CI = [0.03, 0.32], p < .01$) and a positive indirect effect on the terminal exam ($\beta = 0.12, 90\% CI = [0.02, 0.22], p < .01$). This rendered about 41% of the total effect of metacognitive strategies on the course score mediated by self-efficacy.

Finally, metacognitive strategies had an indirect positive effect on CET-6 by way of self-efficacy: $\beta = 0.18, 90\% CI = [0.09, 0.27]$. The CI excluded the value of Zero, thereby suggesting the statistical significance of the mediation of self-efficacy between metacognitive strategies and CET-6 scores.

5. Discussion

This study used the ML-SEM approach to explore the interplay between metacognitive strategies and English self-efficacy in predicting English achievement represented by two tests: the CET-6 test and the terminal exam. By controlling for possible confounding variables from and beyond the teacher and class level, as well as gender effect at the student level, we found that (a) metacognitive strategies had a direct positive effect on English achievement measured by the terminal exam; (b) self-efficacy had a direct positive effect on English achievement represented either by the CET-6 or the terminal exam; and (c) metacognitive strategies

Table 2
Correlations.

	Terminal exam	Self-efficacy	Metacognitive strategies
CET-6	.63*	.35*	.34*
Terminal exam		.28*	.29*
English self-efficacy			.63*

* $p < .01$.

Table 3
Model fit statistics.

χ^2 df		p	RMSEA	SRMR (within)	CFI	TLI	
Model 1. Metacognitive strategies	197.450	84	<.001	.063	.044	.954	.942
a. Planning (1 & 2) ^a	6.301	4	.178	.041	.017	.996	.991
b. Monitoring (9&10) ^a	8.949	4	.062	.060	.016	.994	.984
c. Changing (11&12) ^a	9.730	4	.045	.065	.020	.987	.967
Model 2. Self-efficacy	49.800	19	<.001	.066	.019	.983	.975
Model 3. ML-SEM	165.753	69	<.001	.062	.028	.976	.968

^a Covariances between item errors.

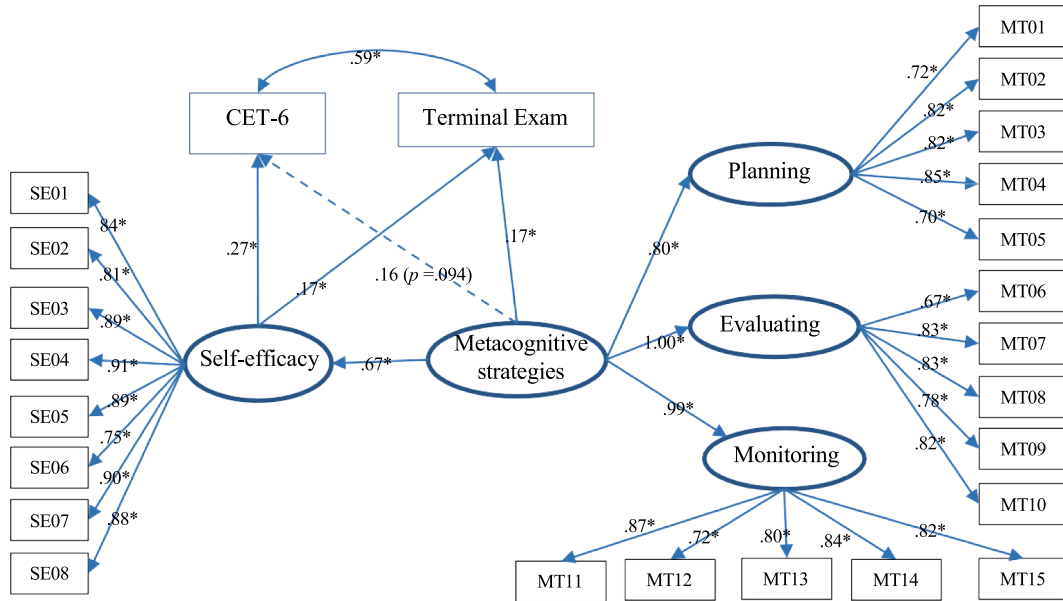


Fig. 1. ML-SEM with standardized estimates (student level only)
* $p < .05$.

had an indirect effect on English achievement represented either by CET-6 or the terminal exam, with a relatively larger indirect effect on the former.

5.1. To what extent do metacognitive strategies predict English achievement?

The results of ML-SEM showed that, even after controlling for factors at the teacher and classroom level and student gender at the student level, metacognitive strategies still had a direct and positive relation to the terminal exam score and an indirect and positive relation to the CET-6 score. Overall, our study verified a positive relationship between metacognitive strategies and L2 achievement, though this relationship with CET-6 was mediated by self-efficacy. This result is consistent with the meta-analysis conducted by [Dent and Koenka \(2015\)](#) with adolescent students in the K-12 education system.

The direct and positive direct association between metacognitive strategies and L2 achievement measured by terminal exam corroborated the findings in L2 research ([De Silva & Graham, 2015](#); [Rahimirad & Shams, 2014](#)). The indirect and positive association between metacognitive strategies and L2 achievement measured by the standardized test was consistent with a few other studies ([Purpura, 1999](#); [Teng et al., 2021](#)). This subtle difference in the directness of this strategy-achievement relationship could be interpreted by referring to the different features between the standardized test and the school-based exam. As a nationwide high-stakes standardized English test, CET-6 reflects the standard requirements for the whole target population of college English learners in China. However, the terminal exam represents more localized, tailor-made demands on participants' English learning in the specific context. This interpretation can also be reflected by existing studies such as [Purpura \(1999\)](#) and [Teng et al. \(2021\)](#). In the former, Purpura used an overall language proficiency test designed for international students from all over the world coming to the United States to pursue studies in higher education. In contrast, in the latter, [Teng et al. \(2021\)](#) applied an in-house language test to measure general L2 proficiency.

Second, the magnitude of the strategy-achievement relationships seemed to be sensitive to the study design. For instance, [Teng et al. \(2021\)](#) examined the mediation of metacognitive strategies and language learning motivation between self-efficacy and L2 achievement. The results sharply contrasted between the model with language learning

Motivation (i.e., a negative direct relation between metacognitive strategies and L2 writing).

and the model without language learning motivation (i.e., a positive direct relationship between metacognitive strategies and L2 writing). Surprisingly, the authors left unexplained the negative direct relationship between metacognitive strategies and L2 writing, although we agree with the researchers on their conclusion that metacognitive strategies still produced a positive effect on L2 writing achievement by accounting for the larger indirect positive effect of metacognitive strategies through language learning motivation.

5.2. *To what extent does self-efficacy predict English achievement?*

Our results showed that self-efficacy had a direct effect on English achievement measured by the CET-6 score and by the terminal exam. This result accentuates the facilitating role of self-efficacy in L2 learning, either measured with a common national standard of L2 requirements or with a localized L2 learning standard within the local university. This finding aligned with previous research studying the relation of self-efficacy to general L2 achievement represented by a standardized test (Wang et al., 2021) or students' self-report (Hsieh & Kang, 2010), or the relation of self-efficacy to specific L2 skills (Giladi et al., 2022).

An interesting finding in our study is that the effect of self-efficacy on CET-6 was larger than the effect on the terminal exam. This difference should mainly ascribe to the nature of self-efficacy, which reflects a subjective judgment of students' English proficiency, and the different natures of school-based exams and standardized tests. As we discussed earlier, school-based exams are more curriculum-oriented, whereas standardized tests are more criteria oriented. However, this interpretation needs to be verified in more studies.

However, our results are inconsistent with a few studies on domain-specific self-efficacy in writing (e.g., Jalaluddin, 2013). The literature has provided several interpretations for this inconsistency. The first reason is the cultural background that renders the

Performance of self-efficacy unstable across cultures (Sun & Wang, 2020; Wang et al.,

2021). It is possible that self-efficacy works more significantly in Eastern Asian countries such as mainland China than in other cultures such as Malaysia (Jalaluddin, 2013). Besides, the inconsistency could also be due to the difference in national educational policies, institutional policies, or teacher expectations between China and other countries.

A closer look into the measurement of L2 achievement can also shed light on the mechanism behind the instability of the L2 self-efficacy effect. The study mentioned above used a reading-to-writing task and showed a nonsignificant relation between self-efficacy and L2 writing. According to research in integrated writing, reading-to-writing tasks are especially demanding on metacognitive strategies (Plakans, 2009; Yang & Plakans, 2012).

The high demand for metacognitive strategies may have competed against the role of self-efficacy in predicting L2 writing achievement.

5.3. *To what extent does self-efficacy mediate the relation between metacognitive strategies and English achievement?*

After controlling for possible confounding effects from the teacher and class level and gender at the student level, our results showed that self-efficacy positively mediated the relationship between metacognitive strategies and L2 achievement, be it measured by the CET-6 or the terminal exam. In general, these results reinforced the information loop between metacognitive strategies, self-efficacy, and L2 achievement in self-efficacy theory (Bandura, 1986).

The literature has documented various sources of self-efficacy and emphasized the role of mastery experience (Bandura, 1986). In the context of L2 learning, mastery experience usually refers to students' successful mastery of linguistic and cognition competence (Graham, 2022). However, existing literature has mainly focused on the importance of the mastery of linguistic competence as an important source of self-efficacy, leaving cognitive competence downplayed. This is also against the dominant language assessment theory that sees metacognitive strategies as a critical component of general language competence (Bachman & Palmer, 2010). The significant relationship between metacognitive strategies and self-efficacy suggested the importance of considering metacognitive strategies as an important element of mastery experience.

Moreover, the concept of self-efficacy involves both the belief in the current L2 ability (Bandura, 1986) and the confidence in the ability to accomplish future L2 tasks (Bong & Skaalvik, 2003; Marsh et al., 2018). The current study focused on the future-oriented aspect of the construct and reflected the power of the future-oriented construct in predicting future L2 tasks.

Regarding the mediated effect of metacognitive strategies on L2 achievement, more granular information can be obtained by comparing the mediated effect on CET-6 and the mediated effect on the terminal exam scores. As we discussed earlier, the style of test-taking can influence the use of metacognitive strategies (Purpura, 1999), suggesting the adaptability nature of metacognitive strategies (Cai & Yang, 2022). Our study showed that metacognitive strategies are more ready to directly affect test results when students take the in-house exam. In contrast, when students take the nationwide standardized test, the effect of metacognitive strategies on L2 had to be mediated by L2 self-efficacy. These results suggested the important role of self-efficacy in mediating the relationship between metacognitive strategies and L2 achievement.

6. Conclusion

The current study examined the interplay between metacognitive strategies and L2 self-efficacy in predicting L2 achievement with a focus on the mediation of self-efficacy between metacognitive strategies and L2 achievement. After controlling for possible confounding effects at and beyond the teacher level and gender difference at the student level, we found that: (a) metacognitive strategies and self-efficacy concurrently predicted L2 achievement either measured by a nationwide standardized test and by a classroom-based

terminal exam; (b) self-efficacy mediated the relationship between metacognitive strategies and L2 achievement; and (c) self-efficacy seemed to be a more stable predictor of general L2 achievement, whereas metacognitive strategies seemed to be more sensitive to the classroom-based exam. Overall, both metacognitive strategies and self-efficacy are important predictors of L2 achievement, and they show different paths and magnitudes in predicting L2 achievement.

7. Implications and limitations

The current study has a few strengths. Theoretically, the study was among the few that combined metacognitive strategies, self-efficacy, and L2 achievement simultaneously in one single study to examine the mediation of self-efficacy between metacognitive strategies and L2 achievement. Results of the mediating role of self-efficacy thus added valuable information regarding the information loop from metacognitive strategies through self-efficacy to L2 achievement posited in theories of self-efficacy (Bandura, 1986) and self-regulated learning (Zimmerman, 2013). Besides, previous studies on self-efficacy usually focused on the present-oriented aspect of the construct, whereas the current study focused on the future-oriented aspect of self-efficacy. In this way, our study added evidence to the predictive validity of the future-oriented aspect of self-efficacy.

From a methodological perspective, we applied a rigorous approach to ensuring the trustworthiness of the results. To ensure the representativeness of the sampling within the university to the maximum extent, we intended to invite all students who took the CET-6 at the time of data collection. As the students came from 19 classes taught by 19 different teachers, the learning achievement scores of the students would inevitably be confounded by teacher factors apart from student variables. Our application of the ML-SEM allowed us to control for all possible confounding variances from teacher and classroom variables (e.g., age, gender, years of teaching, teaching style, class sizes, classroom activities, etc.). To the authors' best knowledge, no such control has been made in existing studies on L2 self-efficacy. Results out of this meticulous control are more rigorous and capable of eliminating bias from these ecological factors.

Our results also have implications for L2 teaching and learning. Despite the widely held idea that self-efficacy comes from experience in L2 competence (e.g., knowledge and skills in the past), our study showed that enhanced confidence in one's ability to handle future L2 learning also benefits L2 learning success. L2 instructors could inform their students of this metaknowledge of self-efficacy and pay more attention to cultivating students' consciousness of self-efficacy. For instance, instructors may ask students to continuously monitor their learning process and reward each of their learning successes. Instructors may also pay close attention to students' learning progress, and provide them with cognitive and emotionally encouraging feedback on their learning performance. Moreover, instructors may cultivate a climate of collaborative learning and encourage students to appreciate each other's learning gains.

Our findings that metacognitive strategies can positively predict self-efficacy provide another solution to foster students' L2 self-efficacy. To promote students' L2 self-efficacy, teachers may focus on the instruction of metacognitive strategies, which is more malleable than L2 competence (Cai, 2020). At the beginning of the course, teachers may first instruct on the metaknowledge of metacognitive strategies to enhance their understanding of essential metacognitive strategies such as planning, monitoring, and evaluating. Besides, teachers may encourage students to make their own long-term and short-term goals for English learning at the beginning of the course. During the instruction weeks, teachers may ask students to work together with the teacher and with their peer students to monitor their progress in English learning, to continuously evaluate their learning activities, learning outcomes, and learning

Plans, and to continuously adjust their emotional, behavioural, and cognitive investment

During their English learning. Meanwhile, students do not need to wait for a long time for evidence of L2 improvement to emerge but can adjust their consciousness of self-efficacy based on the on-site estimate of metacognitive strategy use efficiency.

Finally, the larger effects of metacognitive strategies and self-efficacy on the course score than on the standardized test score suggested that intervention combining metacognitive strategies and self-efficacy is better applied with classroom-based assessment programs. This integration provides teachers and students more opportunities to monitor students' changes in metacognitive strategies and self-efficacy. During this course, a series of measures can be taken to make L2 teaching more efficient. For instance, teachers may diagnose students' English proficiency at the beginning of the college English course and put students into different learning profiles such as slow achievers, average achievers, and advanced achievers. When designing instruction and learning materials, teachers may apply the profile-based idea when choosing instruction and learning materials and mark these materials according to the difficulty levels. During the instruction, the teachers may appropriately distribute the instruction content and tasks according to their understanding of students' learning profiles.

For course assignments, teachers may allow the students to choose their tasks and the decision can be made through negotiation between the teacher and students. A decision is considered appropriate when a learning task is slightly beyond the ability of the students. For students who are still confronted with challenges during learning, a combination of cognitively and emotionally constructive feedback from the teachers are usually welcomed. Cognitively constructive feedback can help students to identify their learning weaknesses and strengths, which in turn can help enhance students' metacognitive strategies and learning outcomes. Likewise, emotionally constructive feedback can help students to strengthen their self-efficacy, and bring up their learning motivation for more effortful investment in English learning, which in turn can help students to enhance their learning outcomes.

The present study bears at least two limitations. The first relates to the cross-sectional nature of the study design. Although the conceptual model of the study was constructed by referring to theories in self-efficacy and SRL, as well as findings from empirical studies, our results about the mutual relationships still need to be taken with care. A causal relationship between metacognitive strategies and self-efficacy and L2 achievement and that between self-efficacy and L2 achievement need to be further verified through intervention or longitudinal studies. The former is reputed for identifying cause-effect, while the latter is known for establishing mediation relationships. Future researchers may develop experimental studies to explore whether intervention in metacognitive

strategies can enhance students' English self-efficacy. Moreover, longitudinal studies can be conducted by repeatedly measuring metacognitive strategies, self-efficacy, and English achievement.

These repeatedly measured data can be analyzed using cross-lagged analysis (e.g., Cai et al., 2019) to explore whether an earlier measure of metacognitive strategies can significantly predict a later measure of self-efficacy and an earlier measure of self-efficacy would predict a later measure of English achievement. The significance of this cross-lagged relation would suggest a true mediation of self-efficacy between metacognitive strategies and English achievement.

Second, although we were able to use ML-SEM to control for interfering factors at the teacher or class level and the gender effect at the student level, there are other factors at the student level that might have biased our results, such as students' future career goals, growth mindset, test anxiety, past L2 proficiency, so on and so forth. According to a strand of studies centered around the Island Ridge Curve (IRC), individual attributes related to motivation (e.g., self-efficacy) and cognition (e.g., cognitive strategies and metacognitive strategies) might fluctuate across different L2 proficiency levels in terms of their effects on L2 achievement (Cai & Chen, 2022; Cai & Kunnan, 2020; Cai & Yang, 2022). Future studies

are encouraged to examine the variation of the interplay between metacognitive strategies, self-efficacy, and L2 achievement across students of different L2 proficiency levels. The last limitation resides in the limited information about the terminal exam.

Although the authors had tried to obtain more detailed information from the authority of the participating university, we failed due to the university's test safety concerns. Future studies may design their own English test to provide readers with more detailed information regarding the measure of L2 achievement.

CRedit author statement

Yuyang Cai: Conceptualization, Methodology, Software, Data curation, Writing- Original draft preparation, Visualization, Investigation, Supervision, Writing- Reviewing and Editing. **Chunzhi Zhao:** Literature review, Writing- Original draft preparation.

Declaration of competing interest

The authors report there are no competing interests to declare.

Appendices.

Appendix Table. The scales measuring English self-efficacy and metacognitive strategies		
English Self-Efficacy Questionnaire (ESEQ)		
Self-efficacy	SE01	I believe I will receive an excellent grade in this English class.
	SE02	I'm certain I can understand the most difficult material presented in the readings for the English course.
	SE03	I'm confident I can understand the basic concepts taught in this English course.
	SE04	I'm confident I can understand the most complex material presented by the instructor in this English course.
	SE05	I'm confident I can do an excellent job on the assignments and tests in this English course.
	SE06	I expect to do well in this English class.
	SE07	I'm certain I can master the skills being taught in this English class.
	SE08	Considering the difficulty of this English course, the teacher, and my skills, I think I will do well in this class.
Metacognitive Strategies Questionnaire (MSQ)		
Planning	MS01	At the beginning of each school term, I set an English language learning plan for myself.
	MS02	If it will take longer to finish an English learning task, I will set a working schedule in advance.
	MS03	Before important English language examinations, I arrange my revision according to my planned schedule.
	MS04	I schedule the time to study English according to my plan.
	MS05	I like to get a list of the things I need to do, and then tackle them one by one.
Evaluating	MS06	I modify the way I complete my English assignments according to the different requirements.
	MS07	After I get back my English test papers, I try to understand the mistakes I have made.
	MS08	I focus on my common mistakes and repeatedly practise the items until I get them right.
	MS09	When I find that I decline in my English achievement, I change my language learning methods.
Monitoring	MS10	I modify my English language learning methods to meet the needs of the College English course.
	MS11	I reflect upon my English language learning strategies to see if they are effective.
	MS12	I compare myself with others to observe if my language learning strategies are effective.
	MS13	I keep records of my English language learning performance in order to monitor how much progress I have made.
	MS14	When I encounter difficulties in English language learning, I reflect on possible mistakes that I might have made.
	MS15	I check if I have corrected the mistakes in English language learning that I have made previously.

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