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Article

Metacognition, Self-efficacy Belief, Language Learning Motivation, and Perceived Progress in Online English Learning: A Cross-lagged Analysis

Mark Feng Teng
Macau Polytechnic University, Macau SAR, China

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Abstract
The present study aims to address the research gap by investigating the relationships among students' metacognitive strategies (MS), self-efficacy belief (SEB), language learning motivation (LLM), and perceived progress in online English learning. Utilizing a cross-lagged analysis approach, the study analyzed survey data collected twice from a sample of 627 university students in China. The findings provide new insights into the changes in learners' metacognition, motivation, and self-efficacy belief over time. The findings suggested that there is a reciprocal relationship between SEB and MS, indicating that they influence each other. MS predicts LLM and perceived progress in online English learning, suggesting that metacognitive strategies have a causal effect on motivation and learning outcomes. LLM predicts SEB and perceived progress in English learning, indicating that motivation plays a causal role in shaping self-efficacy belief and learning outcomes. Perceived progress in English learning is influenced by other variables but does not act as a cause among the factors examined in this study. These findings highlight the potential to enhance online English learning by fostering learners' awareness of metacognition, self-efficacy belief, and motivation.

Keywords
Metacognitive strategies, language learning motivation, self-efficacy belief, online English learning, digital learning

1 Introduction

The outbreak of COVID-19 precipitated a global cessation of in-person educational activities, compelling institutions to adopt online learning modalities (Wong, 2020). This abrupt transition in pedagogical approach has posed significant challenges to online teaching (F. Teng & Wu, 2021; Utley & Roe, 2022), with English language teaching and learning being no exception. Within the domain of applied

Email: markteng@mpu.edu.mo

linguistics, a crucial research focus is the examination of students' cognitive and psychological responses to this shift. This inquiry is particularly pertinent given that online learning environments can engender adverse emotional states, including but not limited to depression, anxiety, boredom, and exacerbated mental distress (Wang et al., 2023). Such negative affective conditions may undermine students' proficiency and self-assurance in learning English through digital platforms. Empirical evidence suggests that students enrolled in online foreign language courses report considerably less favorable perceptions compared to their counterparts in other disciplines (Oliver et al., 2012). This disparity underscores the need for targeted investigations in how to support language learners in virtual settings.

University students, particularly in the online English learning environment, are prone to experiencing affective disorders, with feelings of isolation and disconnection being common (F. Teng, 2024). Therefore, the first focus of the present study is to explore the strategies employed by language learners to cope with the challenges associated with online learning, specifically the perspective of metacognition. Metacognitive strategies, defined as "general skills through which learners manage, direct, regulate, guide their learning, i.e., planning, monitoring and evaluating" (Wenden, 1987, p. 519), are crucial for success in online learning context. In such settings, students must activate cognitive resources to organize their knowledge and experiences in self-regulating their online learning activities (F. Teng, Wu, & Wang, 2021).

A prominent challenge in online learning is empowering learners to take control of their educational experiences (Zheng et al., 2018). This challenge is closely linked to EFL learners' ability to plan, monitor, and evaluate their learning pace effectively (F. Teng & Yang, 2023). For instance, research has shown that students who exhibit higher levels of control and better abilities in maintaining self-directed learning tend to perform better in online language courses (Lin et al., 2017). This suggests that fostering metacognitive strategies can enhance students' autonomy and effectiveness in navigating online learning environments. The implementation of metacognitive strategies can mitigate some of the negative psychological impacts of online learning by promoting a sense of agency and self-efficacy among students (F. Teng & Yang, 2023). By planning their study schedules, monitoring their progress, and evaluating their understanding, students can develop a more structured and proactive approach to learning. This, in turn, can alleviate feelings of isolation and disconnection, as students become more engaged and invested in their educational journey.

The second focus is on students' self-efficacy beliefs, which are defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). In the realm of applied linguistics and beyond, self-efficacy has been confirmed to significantly predict learners' performance, often surpassing the predictive power of actual ability (Schunk, 1991; L.Teng, 2024; F. Teng & L. Teng, 2024). This relationship between self-efficacy and performance has been extensively studied across various dimensions such as reading (Mills et al., 2006, 2007) and writing (L. Teng et al., 2018; F. Teng & Wang, 2023; F. Teng & Zhan, 2023; Torres & Ray, 2022), and in different languages including English (Rahimpour & Nariman-Jahan, 2010) and French (Mills et al., 2006). In the context of online learning, self-efficacy beliefs assume an even more critical role. The online learning environment, characterized by its lack of physical presence and direct interaction, places greater responsibility on students to manage their own learning processes. This increased need for personal control makes self-efficacy a pivotal factor in determining students' success in online education. The belief in one's ability to effectively engage with and navigate the online learning platform can significantly enhance a student's motivation and persistence, leading to better academic outcomes in online English learning (F. Teng & Wu, 2024). Furthermore, the intricate connection between self-efficacy and motivational systems, as highlighted by Bandura (1997) and Schunk (1991), aligns well with the present research model. Self-efficacy not only influences students' learning behaviors and strategies but also interacts with their motivational orientations. For instance, students with high self-efficacy are more likely to set challenging goals, sustain effort in the face of difficulties, and employ effective learning strategies. This, in turn, boosts their intrinsic motivation and fosters a positive learning experience.

The third focus of the present study is the dynamics of language learning motivation. As conceptualized by Dörnyei (1994), language learning motivation encompasses both personal and social dimensions that shape an individual's attitudes toward acquiring a target language. In this framework, personal factors—such as prior learning experiences, personal growth, and a sense of achievement—interact with social factors, including perceptions of the status or power associated with the target language, to influence students' willingness to learn (Noels et al., 2000). Research in this area has also delineated between intrinsic and extrinsic motivation (Deci & Ryan, 1995). Intrinsic motivation refers to engaging in an activity for its inherent satisfaction and enjoyment, whereas extrinsic motivation involves performing an activity to achieve external rewards or avoid negative outcomes. Within the context of online learning, students may experience shifts in these motivational dimensions, influenced by various internal and external factors. For instance, intrinsic motivation might be affected by students' personal interest in the subject matter and their enjoyment of the learning process, which can be challenged by the isolating nature of online learning (Zheng et al., 2018). Hence, the dynamics of language learning motivation are complex and multifaceted, influenced by a range of personal and social factors. The transition to online learning necessitates a deeper exploration of these motivational dimensions to address the unique challenges and opportunities presented by digital education. Understanding these dynamics is crucial for developing effective pedagogical strategies that can sustain and enhance students' motivation in online language learning settings.

Armed with the knowledge of the key focuses, the present study aims to examine the interconnections between metacognitive strategies, language learning motivation, self-efficacy, and perceived progress in English learning from a longitudinal perspective, contributing to F. Teng (2024). Specifically, cross-lagged analysis was employed to investigate the correlations between these constructs over time within a longitudinal model. The present study makes several significant contributions to the understanding of online English learning. Firstly, it provides a comprehensive analysis of how metacognitive strategies, motivation, and self-efficacy interact and influence each other over an extended period. This longitudinal approach offers deeper insights into the dynamic nature of these constructs, which are often studied in isolation or within shorter time frames. Secondly, by employing cross-lagged analysis, the study highlights the bidirectional relationships between these variables, revealing how changes in one construct can predict subsequent changes in another. This methodological approach allows for a more nuanced understanding of the causal pathways and reciprocal effects among metacognitive strategies, motivation, self-efficacy, and perceived progress.

2 Literature Review

2.1 Metacognition

Metacognition is a key construct in both second and foreign language learning (F. Teng, 2023) and autonomous learning (F. Teng, 2019). The concept of metacognition was first introduced by Flavell (1976), who defined it as "one's knowledge concerning one's own cognitive processes and products or anything related to them" (p. 232). Metacognition encompasses three main components: metacognitive knowledge, metacognitive experiences, and metacognitive strategies. According to Wenden (1987), metacognitive knowledge refers to information about one's own learning, including person, task, and strategy knowledge. Flavell (1976) described metacognitive experiences as "any conscious cognitive or affective experiences that accompany or pertain to an intellectual enterprise" (p. 906). Metacognitive strategies involve skills that enable learners to manage, direct, regulate, and guide their learning, including planning, monitoring, and evaluating (Wenden, 1998, p. 519).

The critical role of metacognitive strategies—one of the three dimensions of metacognition—in online language learning is the focus of the current study. In the online learning environment, metacognitive strategies such as self-planning, self-monitoring, self-evaluation, and reflective thinking

can mediate the influence of self-efficacy beliefs on English learning achievement (F. Teng & Yang, 2023). Previous studies have also highlighted the predictive effects of metacognitive strategies on English learning, particularly in writing (F. Teng, 2020; L. Teng, 2024) and vocabulary learning (F. Teng & Zhang, 2024). Research on the impact of metacognitive strategies on English learning achievement in digital environments has also been supportive (Lin et al., 2017). Online learning requires learners to be independent stakeholders in their own learning and to possess a strong desire to succeed, contrasting with traditional learning environments (Barnard et al., 2009; Zheng et al., 2018). These positive outcomes can be attributed to students' increasing mastery of self-regulatory techniques in online learning, such as goal-setting, planning, and monitoring (King et al., 2000; F. Teng & Wu, 2024).

Additionally, two studies have examined the predictive effects of metacognition in students' multimedia writing. F. Teng and Zhang (2023) found that learners' working memory, proficiency, and self-regulated strategies are essential to their writing performance. English proficiency plays a moderating role in the relationship between self-regulation and writing performance; when English proficiency is low, self-regulation has a greater impact on writing performance, and vice versa. F. Teng and Qin (2024) validated an 11-factor correlated model of metacognitive writing strategies, with eight of these strategies significantly predicting learners' multimedia writing performance. This study supports the application of self-regulated learning theory in educational psychology to applied linguistics, particularly in EFL writing research in multimedia environments. F. Teng and Ma (2024) extended the role of metacognition in students' feedback literacy, highlighting its importance in predicting academic writing performance.

Therefore, the use of metacognitive strategies is crucial for successful online learning. Unlike traditional classroom instruction, online learning is not constrained by physical factors such as place and time, necessitating higher levels of autonomy and locus of control over the learning process (Barnard et al., 2009). According to F. Teng and Yang (2023), the use of metacognitive strategies enhances students' self-evaluative and self-regulatory abilities, allowing them to exercise greater autonomy over when, what, and how they learn. Despite receiving relatively limited attention in the field of ELT within a digital learning context, metacognition warrants further exploration in relation to motivation in online English learning.

2.2 Self-efficacy belief

Self-efficacy belief is a foundational concept derived from Albert Bandura's social cognitive theory. It refers to an individual's belief in their capacity to execute behaviors necessary to produce specific performance attainments (Bandura, 1997). Self-efficacy beliefs significantly impact learners' understanding of their psychological development and their confidence in managing strategic learning (Zimmerman, 2000). Students who possess strong self-efficacy beliefs are more likely to take charge of their education, persist through obstacles, and achieve their academic goals. This is because they are more inclined to engage in behaviors that promote learning and resilience.

Self-efficacy belief is multifaceted, encompassing people's expectations, confidence, and beliefs about their own abilities. For example, an individual's ability to complete specific tasks, such as writing, is influenced by their emotions, thoughts, and motivations (Kong & Teng, 2023; L. Teng et al., 2018; F. Teng & Wang, 2023; F. Teng & L. Teng, 2024). In the context of online learning, self-efficacy beliefs play a crucial role in a language learner's ability to activate and sustain cognition, emotions, and behaviors necessary for achieving academic goals (Zheng et al., 2009). For instance, a learner's belief in their ability to learn a language online can influence their stress levels, vulnerability to challenges, and overall performance. Positive self-efficacy beliefs can lead to reduced stress, greater resilience, and enhanced academic outcomes.

Given that self-efficacy beliefs are context-specific, studying them within ELT online learning environments is particularly valuable. Shea and Bidjerano (2010) explored how self-efficacy and self-regulation contribute to the development of learning presence in online virtual learning environments.

Their model of learning presence includes three components: social presence, cognitive presence, and teaching presence. These components are interconnected and reinforce one another, ultimately enhancing learners' self-efficacy and creating a productive learning environment. Students with strong self-efficacy beliefs are more likely to engage in online learning activities and adopt effective metacognitive strategies. F. Teng et al. (2021) argued that self-efficacy belief serves as a subpersonal factor that orchestrates individuals' actions when facing challenges inherent to online learning. They found that self-efficacy belief is a significant predictor of learners' success in online English learning. Additionally, students who believe in their abilities are more motivated to study English online. In the context of online English learning, F. Teng (2024) highlighted the importance of anxiety in the relationship between motivation and self-efficacy beliefs. Investigating the self-efficacy beliefs of EFL students in online learning environments is essential, given the individual differences in learners' experiences and capabilities. These differences can significantly impact their online learning outcomes and overall educational success.

Hence, self-efficacy beliefs are critical in shaping students' educational experiences and outcomes, particularly in online learning environments. By fostering strong self-efficacy beliefs, educators can help students overcome challenges, stay motivated, and achieve their academic goals (L. Teng, 2022). Further research into the interplay between self-efficacy and language learning motivation in online learning contexts can provide deeper insights and inform effective teaching strategies.

2.3 Language learning motivation

Motivation has long been recognized as a significant factor influencing students' interest and engagement in language learning. In his seminal 1996 study, Dörnyei explored the social and personal influences on language learners' motivations and introduced the "L2 Motivational Self System" (L2MSS). According to Dörnyei, the L2MSS is a multifaceted system comprising three major components: the ideal L2 self, the ought-to L2 self, and the L2 learning experience. The ideal L2 self represents the attributes that learners would like to possess, such as proficiency in the target language. The ought-to L2 self pertains to the attributes that learners believe they should possess to meet expectations and avoid negative outcomes. The L2 learning experience encompasses the immediate learning environment and experiences that influence motivation. One key idea of the L2MSS is that motivation is not a stable trait but a dynamic process that evolves over time and is influenced by a wide range of factors, including personal, social, and cultural influences.

Motivations are deeply rooted in an individual's prior linguistic experiences, development, and accomplishments, as well as their perceptions of the status or power of the target language (Noels et al., 2000). Additionally, motivation has been conceptualized as a complex interaction between intrinsic and extrinsic motivations. Intrinsic motivation refers to the inherent satisfaction and enjoyment derived from engaging in an activity, while extrinsic motivation involves performing an activity to achieve external rewards (Deci & Ryan, 1995). Intrinsic motivation is considered the most self-determined type on the motivation continuum because it is driven by internal values, enjoyment, and interest. To explain the various ways behaviors are externally regulated, extrinsic motivation is divided into four categories: external regulation, introjected regulation, identified regulation, and integrated regulation (Ryan & Deci, 2000). External regulation involves performing actions to obtain external rewards or avoid negative consequences. Introjected regulation refers to actions driven by internal pressures to maintain self-worth, without fully accepting them as personally significant. Identified regulation occurs when behaviors are valued and seen as personally important, thus representing a more autonomous form of extrinsic motivation (Noels et al., 2000). Integrated regulation is the most autonomous form of extrinsic motivation, where individuals fully assimilate the behavior into their sense of self (Deci & Ryan, 2000).

Motivation has been identified as a crucial factor in L2 online learning contexts (Zheng et al., 2018). With the advent of new technologies in education, researchers have sought to understand language learning motivation within technology-supported environments (e.g., Barak et al., 2016). Studies

indicate that online learning platforms can facilitate social interactions, thereby enhancing students' motivation to learn languages (Adolphs et al., 2018; Barak et al., 2016). For instance, Barak et al. (2016) investigated the impact of massive open online courses (MOOCs) on language learners' motivation using a sample of 325 participants. The findings revealed that learners were intrinsically motivated to engage with the MOOC platform, and their motivation was positively correlated with their engagement and learning outcomes. Additionally, F. Teng and Wu (2024) found that in online English learning contexts, self-efficacy beliefs predicted students' use of metacognitive strategies, which in turn predicted their motivation and perceived progress in English learning. F. Teng (2024) highlighted that self-efficacy belief mediates the relationship between motivation and anxiety in online English learning, and anxiety mediates the relationship between self-efficacy belief and students' motivation. Such findings underscore the significance of self-efficacy beliefs, language learning motivation, and metacognitive strategies in online English learning.

Despite the recognized importance of motivation in online language learning, few studies have examined the complex connections between language learning motivation and self-efficacy beliefs from a longitudinal perspective. The dynamic nature of motivation, influenced by various factors including learners' affective dimensions in online learning, may explain the scarcity of research in this area. To gain a comprehensive understanding of language learning motivation in online environments, it is essential to consider metognition and self-efficacy.

2.4 Rationale for the present study

Though past research has shown that metacognitive strategies, self-efficacy beliefs, and language learning motivation are predictors of English learning achievement (F. Teng et al., 2021; F. Teng & Wu, 2024), the individual and collective contributions of each variable from a longitudional perspective have yet to be determined. To this end, cross-lagged analyses were conducted based on data collected twice to examine the directionality and strength of causal relationships between the examined variables over time. The results are expected to demonstrate how metacognitive strategies, self-efficacy beliefs, and language learning motivation each independently, and in combination, contribute to students' perceived progress in online English learning. Unravelling cross-lagged analyses is necessary to ascertain meaningful interventions that encourage self-regulated behaviour and enhance online language learning outcomes. The present study aims for the following research questions.

RQ1: What are the possible correlations among metacognitive strategies, self-efficacy belief, language learning motivation, and perceived progress in English learning?

RQ2: What are the possible influences of metacognitive strategies, self-efficacy belief, and language learning motivation on students' perceived progress in online English learning from a longitudinal perspective?

3 Method

3.1 Participants

The present study surveyed 627 university students from various universities in China in online learning settings. The participants had an average age of 19.4 years (SD = 1.63), with a gender distribution of 305 males and 322 females. These students had been studying English as a foreign language for an average of 10 years prior to the survey. Data collection occurred at two points in time, referred to as T1 and T2. At T1, 628 valid responses were obtained, while at T2, 627 valid responses were collected.

3.2 Measures

The present study employed four distinct surveys to assess various aspects of language learning: metacognitive strategies, self-efficacy belief, language learning motivation, and perceived progress in online English learning. Each survey utilized a seven-point Likert scale, ranging from 1 ("not at all true of me") to 7 ("very true of me"), to gauge participant responses. Detailed descriptions of the measures can be found in the Appendix.

3.2.1 Metacognitive strategies

The items measuring metacognitive strategies were adapted from the Online Self-Regulated Learning Questionnaire (OSLQ) developed by Barnard et al. (2009). This survey focused on learners' awareness and application of metacognitive strategies to manage their online English learning. Fourteen items specifically addressed four key areas: goal-setting (four items), task strategies (four items), help-seeking (three items), and self-evaluation (three items). These items were modified to fit the context of online English learning. Exploratory Factor Analysis (EFA) revealed significant loadings for each item (> .5) within their respective dimensions, and Cronbach's alpha indicated acceptable reliability (see the results section).

3.2.2 Self-efficacy belief

Learners' self-efficacy beliefs regarding online English learning were assessed using a 10-item survey adapted from Zimmerman and Kulikowich (2016). The original 22-item scale was condensed to better capture the characteristics of online English learning. EFA confirmed that the loadings for each item were appropriately high (> 0.5), validating the findings. Cronbach's alpha further verified the internal consistency and reliability of the survey within the given context (see the results section).

3.2.3 Language learning motivation

The investigation into language learning motivation utilized a measure adapted from Noels et al. (2000) and validated by Noels (2003). The survey was revised to align with the context of online language learning. Intrinsic motivation was divided into three components: knowledge, accomplishment, and stimulation, each comprising three items. Extrinsic motivation was also divided into three components: identified regulation, introjected regulation, and external regulation, each with three items. EFA demonstrated that the loadings for each item in their respective dimensions were above 0.5, indicating acceptable effect sizes. Cronbach's alpha confirmed the reliability of this measure (see the results section).

3.2.4 Perceived progress in online English learning

To measure students' perceptions of their progress in online language learning, a three-item survey was developed. The items assessed the respondents' ability to understand content in online English classes, keep up with the pace of online English learning, and achieve satisfactory results through online learning. Cronbach's alpha indicated reliable internal consistency among the survey items (see the results section).

3.3 Data collection

The surveys were administered twice: once in March 2020, and again in September 2020. Instructors facilitated data collection by distributing the survey link, along with demographic information and

consent forms, to their students via the popular Chinese social media platform WeChat. The use of WeChat ensured a high response rate due to its widespread use among university students in China.

3.4 Data analysis

To explore the directionality and strength of causal relationships between variables over time, cross-lagged analysis was employed. This method is particularly useful for determining whether changes in one variable cause changes in another (Bollen & Curran, 2006). Cross-lagged analysis has the advantage of accounting for the initial values of the variables under investigation, thereby reducing the influence of spurious relationships and enhancing the reliability of the results. The analysis was conducted using Mplus statistical software. The analysis was capable of handling complex longitudinal data, ensuring robust and valid findings.

4 Results

The reliability of all constructs in the present study was first tested. Table 1 presents the reliability test results for the constructs measured in the study. The Cronbach's alpha values for all constructs range from .742 to .909, indicating good to excellent internal consistency reliability. This suggests that the measurement scales used in the study have high reliability and can be considered suitable for further analysis.

Table 1
Reliability Test Results

Constructs	Reliability Test	
	Cronbach's α	No. of Items
Metacognitive strategies t1	.903	14
Language learning motivation t1	.909	18
Self-efficacy belief t1	.835	7
Perceived progress t1	.810	3
Metacognitive strategies t2	.899	14
Language learning motivation t2	.893	18
Self-efficacy belief t2	.742	7
Perceived progress t2	.783	3

Note: The variables with the suffix t1 were those collected at the first time, whereas those with t2 were collected at the second time.

Table 2 presents the descriptive statistics for the study variables at the two time points. The data shows that the mean scores for all variables are between 4.34 and 4.62, indicating generally high levels of metacognitive strategies, language learning motivation, self-efficacy belief, and perceived progress. The standard deviations range from 0.63 to 0.91, suggesting moderate variability in the responses. The skewness values are all close to 0, indicating the distributions are approximately symmetric. The kurtosis values range from 1.19 to 3.55, suggesting the distributions are generally mesokurtic (similar to a normal distribution) to leptokurtic (more peaked than normal). Overall, the descriptive statistics suggest the variables exhibit reasonable variability and distribution characteristics suitable for further analysis.

Table 2

Descriptive Statistics

Variable Name	Min	Max	Mean	SD	skewness	kurtosis
Metacognitive strategies t2	1.00	7.00	4.4372	.69675	-.146	2.697
Language learning motivation t2	1.22	6.72	4.4017	.62924	-.213	3.329
Self-efficacy belief t2	1.57	6.57	4.3958	.66603	.002	1.192
Perceived progress t2	1.00	7.00	4.6172	.87070	-.191	1.935
Metacognitive strategies t1	1.00	7.00	4.3423	.70285	-.073	3.154
Language learning motivation t1	1.00	7.00	4.3622	.67817	-.159	3.552
Self-efficacy belief t1	1.00	7.00	4.4404	.76714	-.133	2.443
Perceived progress t1	1.00	7.00	4.6215	.90785	-.252	1.679

Table 3 presents the correlations between the study variables collected at the two time points (T1 and T2).

Table 3

Correlation of Variables Collected Between T1 and T2

	Metacognitive strategies t1	Language learning motivation t1	Self-efficacy belief t1	Perceived progress t1	Metacognitive strategies t2	Language learning motivation t2	Self-efficacy belief t2
Metacognitive strategies t1	1						
Language learning motivation t1	.775**	1					
Self-efficacy belief t1	.686**	.795**	1				
Perceived progress t1	.553**	.659**	.693**	1			
Metacognitive strategies t2	.632**	.548**	.526**	.384**	1		
Language learning motivation t2	.589**	.672**	.578**	.469**	.772**	1	
Self-efficacy belief t2	.545**	.593**	.599**	.454**	.681**	.777**	1
Perceived progress t2	.447**	.501**	.489**	.510**	.507**	.616**	.586**

Note: *p <0.05, **p <0.01, ***p<0.001

The correlations in Table 3 show several key findings: First, the variables measured at T1 are all significantly and positively correlated with each other, with correlation coefficients ranging from 0.553 to 0.795. Second, the variables measured at T2 are also significantly and positively correlated with each other, with correlation coefficients ranging from 0.507 to 0.777. Finally, the variables measured at T1 are significantly and positively correlated with the corresponding variables measured at T2, with correlation coefficients ranging from 0.384 to 0.632. Overall, these results suggest that the constructs measured in the study are related to each other both concurrently and across the two time points, indicating the variables are interconnected and stable over time.

The longitudinal data, which could demonstrate whether certain relationship is reciprocal or directional, was analysed employing cross-lagged panel model. For instance, in Figure 1 and Table 4, the cross-lagged panel model includes pre-test correlation, post-test correlations, cross-lagged paths 'SEBt1 → PPt2' and 'PPt1 → SEBt2', autoregressive paths 'SEBt1 → SEBt2' and 'PPt1 → PPt2'. In this model, after controlling the pre-test correlation, post-test correlation, and autoregressive effects, the SEBt1 could positively predict PPt2 (β=.262，p<.001) whereas PPt1 could not exert statistically significant effects on SEBt2 (β=.074，p>.05). This suggests that the relationship between the two focal variables is not reciprocal but causal, with SEB as the cause and PP as the effect.

Figure 1

Cross-lagged Panel Model 1 - 'Self-efficacy belief → Perceived progress' (Model 1)

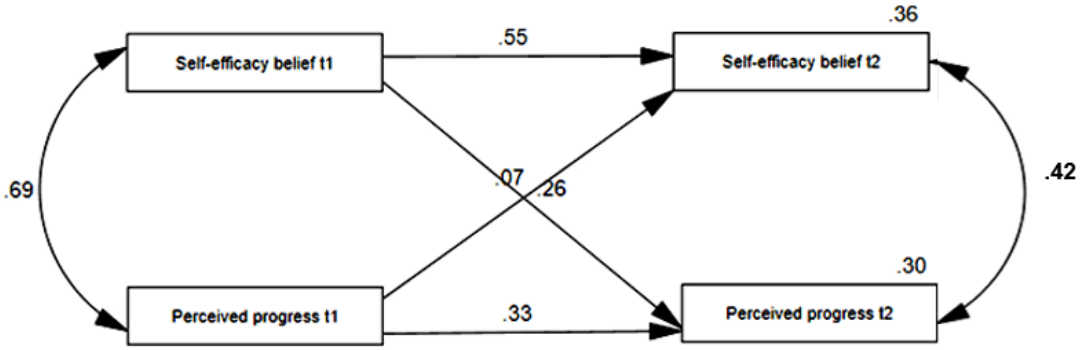


Table 4

Correlation and Coefficients in the Cross-lagged Panel (Model 1)

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
PPt2	<---	PPt1	.315	.045	7.053	***	.328
SEBt2	<---	SEBt1	.475	.038	12.339	***	.547
SEBt2	<---	PPt1	.054	.033	1.673	.094	.074
PPt2	<---	SEBt1	.297	.053	5.618	***	.262
Correlations							
PPt1	<-->	SEBt1	.482	.034	14.258	***	.693
e1	<-->	e4	.163	.017	9.659	***	.418

Note: The relationship between e1 and e4 represents the post-test correlation. LLM= Language learning motivation; SEB =Self-efficacy belief; MS= Metacognitive strategies; PP= Perceived progress.

In Figure 2 and Table 5, the cross-lagged panel model includes pre-test correlation, post-test correlations, cross-lagged paths 'LLMt1 → SEBt2' and 'SEBt1 → LLMt2', autoregressive paths 'SEBt1 → SEBt2' and 'LLMt1 → LLMt2'. In this model, after controlling the pre-test correlation, post-test correlation, and autoregressive effects, the LLMt1 could positively predict SEBt2 (β=.318，p<.001) and SEBt1 could also exert statistically significant effects on LLMt2 (β=.119，p<.05). This suggests that the relationship between the two focal variables is reciprocal, with SEB and LLM influence each other mutually.

Figure 2

Cross-lagged Panel Model 2- 'Self-efficacy belief → Language learning motivation' (Model 2)

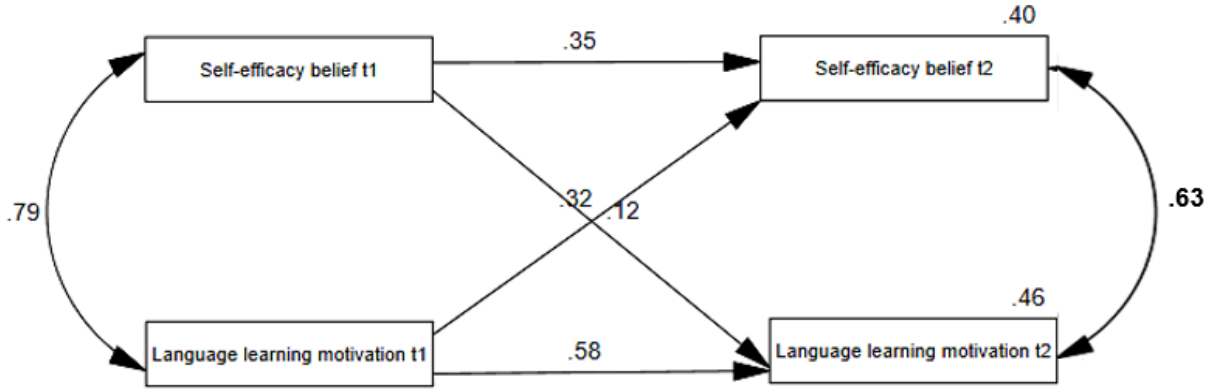


Table 5

Correlation and Coefficients in the Cross-lagged Panel (Model 2)

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
LLMt2	<---	LLMt1	.536	.045	11.900	***	.578
SEBt2	<---	SEBt1	.300	.044	6.758	***	.346
SEBt2	<---	LLMt1	.312	.050	6.211	***	.318
LLMt2	<---	SEBt1	.097	.040	2.446	.014	.119
Correlations							
LLMt1	<-->	SEBt1	.413	.027	15.566	***	.795
e1	<-->	e2	.152	.011	13.398	***	.634

Note: The relationship between e1 and e2 represents the post-test correlation.

Figure 3 and Table 6 supported that Metacognitive strategies at Time 2 (MS_t2) is significantly predicted by metacognitive strategies at Time 1 (MS_t1), with a standardized regression coefficient of 0.512 (p < .001). Self-efficacy belief at Time 2 (SEB_t2) is significantly predicted by self-efficacy belief at Time 1 (SEB_t1), with a standardized regression coefficient of 0.424 (p < .001). Self-efficacy belief at Time 1 (SEB_t1) significantly predicts metacognitive strategies at Time 2 (MS_t2), with a standardized regression coefficient of 0.175 (p < .001). Metacognitive strategies at Time 1 (MS_t1) significantly predicts self-efficacy belief at Time 2 (SEB_t2), with a standardized regression coefficient of 0.254 (p < .001). These results indicate a reciprocal relationship between self-efficacy belief and metacognitive strategies over time.

Figure 3

Cross-lagged Panel Model 3- 'Self-efficacy belief → metacognitive strategies' (Model 3)

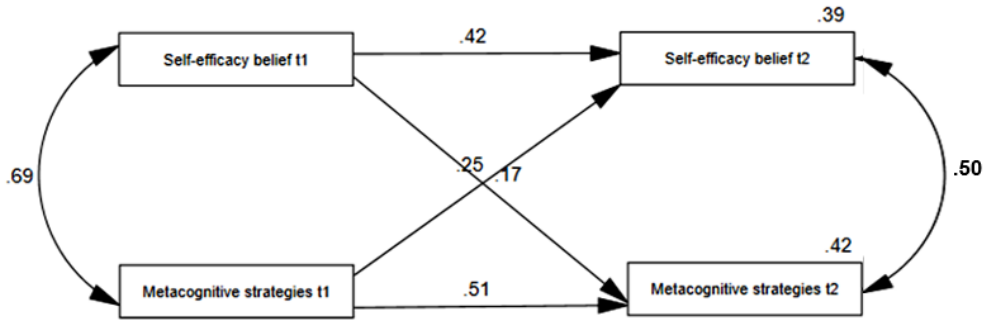


Table 6

Correlation and Coefficients in the Cross-lagged Panel (Model 3)

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
MSt2	<---	MSt1	.508	.042	12.215	***	.512
SEBt2	<---	SEBt1	.368	.037	9.909	***	.424
SEBt2	<---	MSt1	.241	.041	5.946	***	.254
MSt2	<---	SEBt1	.159	.038	4.169	***	.175
Correlations							
MSt1	<-->	SEBt1	.369	.026	14.149	***	.795
e1	<-->	e2	.138	.012	11.173	***	.634

Figure 4

Cross-lagged Panel Model 4- 'language learning motivation → metacognitive strategies'(Model 4)

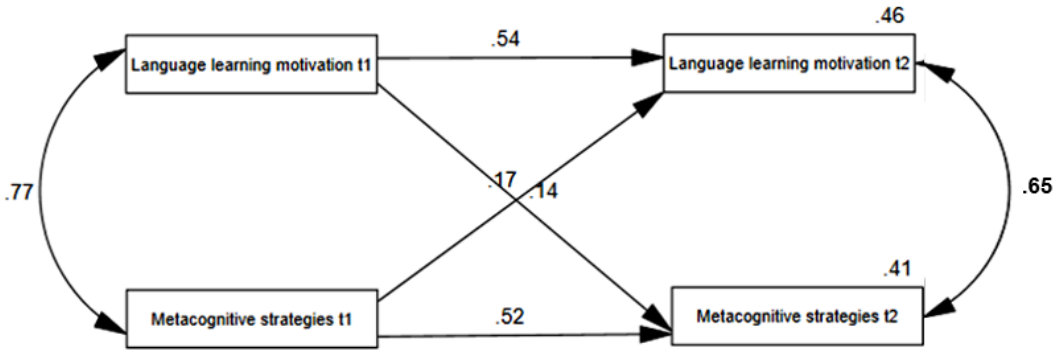


Figure 4 presents the cross-lagged panel model that examines the relationships between language learning motivation (LLM) and metacognitive strategies (MS) over time. Table 7 provides the correlation and path coefficients for this model. Metacognitive strategies at Time 2 (MS_t2) is significantly predicted by metacognitive strategies at Time 1 (MS_t1), with a standardized regression coefficient of 0.521 ($p <$ .001). Language learning motivation at Time 2 (LLM_t2) is significantly predicted by language learning motivation at Time 1 (LLM_t1), with a standardized regression coefficient of 0.539 ($p <$ .001). Language

learning motivation at Time 1 (LLM_t1) significantly predicts metacognitive strategies at Time 2 (MS_t2), with a standardized regression coefficient of 0.144 ($p < .01$). Metacognitive strategies at Time 1 (MS_t1) significantly predicts language learning motivation at Time 2 (LLM_t2), with a standardized regression coefficient of 0.171 ($p < .001$). These results indicate a reciprocal relationship between language learning motivation and metacognitive strategies over time.

Table 7

Correlation and Coefficients in the Cross-lagged Panel (Model 4)

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
MSt2	<---	MSt1	.516	.048	10.705	***	.521
LLMt2	<---	LLMt1	.500	.043	11.635	***	.539
LLMt2	<---	MSt1	.153	.041	3.695	***	.171
MSt2	<---	LLMt1	.148	.050	2.960	.003	.144
Correlations							
MSt1	<-->	LLMt1	.369	.024	15.327	***	.775
e1	<-->	e2	.161	.012	13.695	***	.654

Figure 5 and Table 8 present the cross-lagged panel model examining the directional relationship between language learning motivation (LLM) and perceived proficiency (PP) over time. Perceived proficiency at Time 2 (PP_t2) is significantly predicted by perceived proficiency at Time 1 (PP_t1), with a standardized regression coefficient of 0.318 ($p < .001$). Language learning motivation at Time 2 (LLM_t2) is significantly predicted by language learning motivation at Time 1 (LLM_t1), with a standardized regression coefficient of 0.641 ($p < .001$). Language learning motivation at Time 1 (LLM_t1) significantly predicts perceived proficiency at Time 2 (PP_t2), with a standardized regression coefficient of 0.291 ($p < .001$). The path from perceived proficiency at Time 1 (PP_t1) to language learning motivation at Time 2 (LLM_t2) is not statistically significant ($p = .239$). These results indicate a unidirectional relationship between language learning motivation and perceived proficiency. Language learning motivation at an earlier time point predicts subsequent perceived proficiency, but the reverse path (from perceived proficiency to language learning motivation) is not supported.

Figure 5

Cross-lagged Panel Model 5- 'language learning motivation → perceived progress' (Model 5)

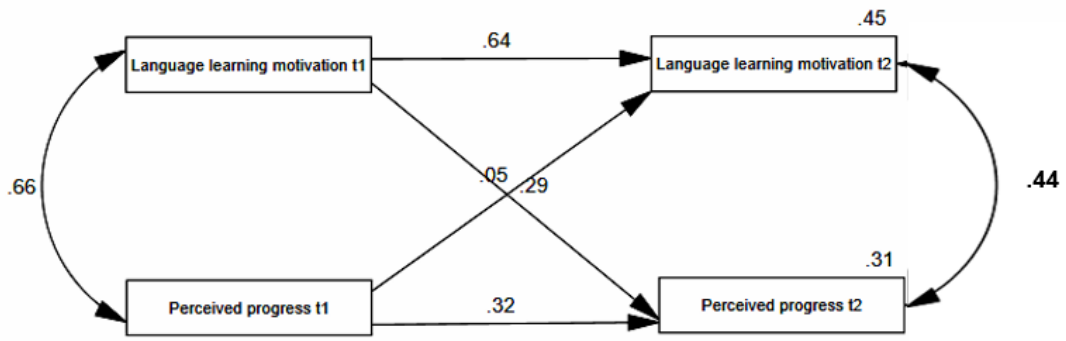


Table 8

Correlation and Coefficients in the Cross-lagged Panel (Model 5)

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
PPt2	<---	PPt1	.305	.042	7.194	***	.318
LLMt2	<---	LLMt1	.595	.036	16.312	***	.641
LLMt2	<---	PPt1	.032	.027	1.178	.239	.046
PPt2	<---	LLMt1	.374	.057	6.580	***	.291
Correlations							
PPt1	<-->	LLMt1	.405	.029	13.768	***	.659
e1	<-->	e2	.148	.015	10.084	***	.440

Figure 6 and Table 9 present the cross-lagged panel model examining the directional relationship between metacognitive strategies (MS) and perceived proficiency (PP) over time. Perceived proficiency at Time 2 (PP_t2) is significantly predicted by perceived proficiency at Time 1 (PP_t1), with a standardized regression coefficient of 0.379 ($p < .001$). Metacognitive strategies at Time 2 (MS_t2) is significantly predicted by metacognitive strategies at Time 1 (MS_t1), with a standardized regression coefficient of 0.605 ($p < .001$). Metacognitive strategies at Time 1 (MS_t1) significantly predict perceived proficiency at Time 2 (PP_t2), with a standardized regression coefficient of 0.238 ($p < .001$). The path from perceived proficiency at Time 1 (PP_t1) to metacognitive strategies at Time 2 (MS_t2) is not statistically significant ($p = .183$). These results indicate a unidirectional relationship between metacognitive strategies and perceived proficiency. Metacognitive strategies at an earlier time point predict subsequent perceived proficiency, but the reverse path (from perceived proficiency to metacognitive strategies) is not supported.

Figure 6

Cross-lagged Panel Model 6- 'metacogtive strategies→ perceived progress' (Model 6)

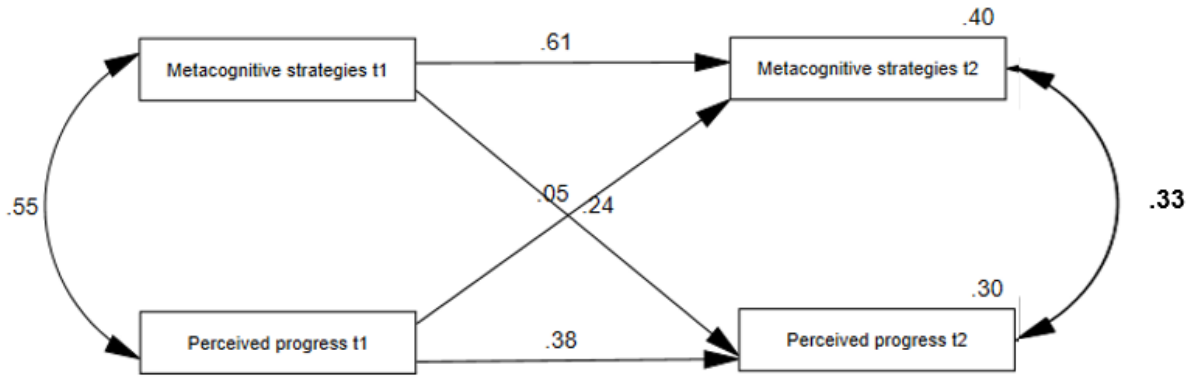


Table 9

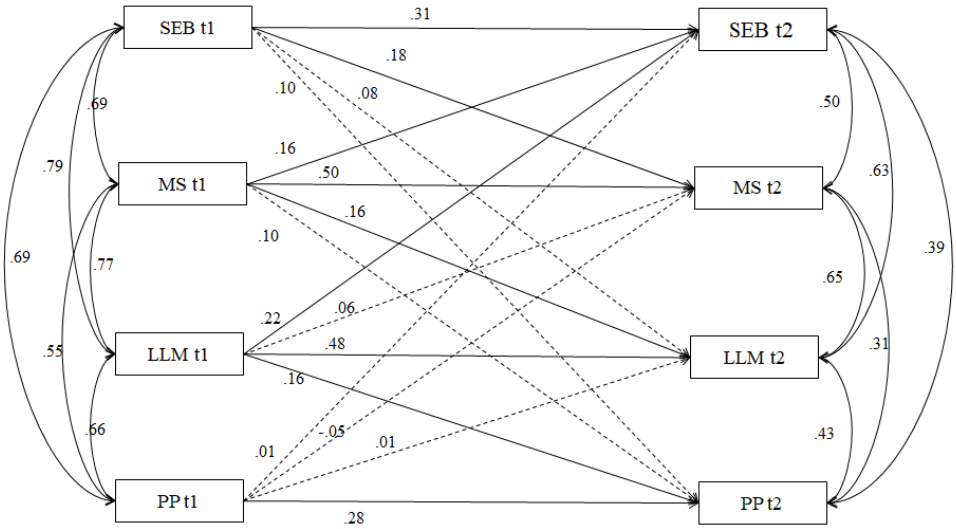
Correlation and Coefficients in the Cross-lagged Panel (Model 6)

Path			Estimate	S.E.	C.R.	P	Std Estimate
Regression							
PPt2	<---	PPt1	.363	.039	9.429	***	.379
MSt2	<---	MSt1	.600	.037	16.313	***	.605
MSt2	<---	PPt1	.038	.028	1.332	.183	.049
PPt2	<---	MSt1	.294	.050	5.916	***	.238
Correlations							
PPt1	<-->	MSt1	.352	.029	12.101	***	.553
e1	<-->	e2	.128	.016	7.756	***	.326

Figure 7 presents an integrative cross-lagged panel model that examines the longitudinal relationships among metacognitive strategies (MS), learning-related motivations (LLM), self-efficacy beliefs (SEB), and perceived proficiency (PP). The key findings from this model (Table 10) are: First, autocorrelations: Metacognitive strategies at Time 2 (MS_t2) is significantly predicted by metacognitive strategies at Time 1 (MS_t1), with a standardized regression coefficient of 0.495 ($p < .001$). Learning-related motivations at Time 2 (LLM_t2) is significantly predicted by learning-related motivations at Time 1 (LLM_t1), with a standardized regression coefficient of 0.478 ($p < .001$). Perceived proficiency at Time 2 (PP_t2) is significantly predicted by perceived proficiency at Time 1 (PP_t1), with a standardized regression coefficient of 0.281 ($p < .001$). Second, Cross-lagged Effects: Metacognitive strategies at Time 1 (MS_t1) significantly predict learning-related motivations at Time 2 (LLM_t2), with a standardized regression coefficient of 0.155 ($p < .001$). Learning-related motivations at Time 1 (LLM_t1) significantly predict perceived proficiency at Time 2 (PP_t2), with a standardized regression coefficient of 0.158 ($p = .015$). Self-efficacy beliefs at Time 1 (SEB_t1) significantly predict metacognitive strategies at Time 2 (MS_t2), with a standardized regression coefficient of 0.176 ($p = 0.001$). Self-efficacy beliefs at Time 1 (SEB_t1) significantly predict self-efficacy beliefs at Time 2 (SEB_t2), with a standardized regression coefficient of 0.313 ($p < .001$). The paths from learning-related motivations at Time 1 (LLM_t1) to self-efficacy beliefs at Time 2 (SEB_t2) ($p = 0.106$) and from metacognitive strategies at Time 1 (MS_t1) to perceived proficiency at Time 2 (PP_t2) ($p = 0.059$) were not statistically significant.

Figure 7

Integrative Cross-lagged Panel Model (Model 7)



Note. The dotted line indicates statistically non-significant result.

Table 10

Correlation and Coefficients in Model 7

Path			Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
MSt2	<---	MSt1	.491	.049	10.087	***	.495
LLMt2	<---	LLMt1	.443	.053	8.304	***	.478
PPt2	<---	PPt1	.269	.045	5.925	***	.281
MSt2	<---	SEBt1	.160	.050	3.211	.001	.176
LLMt2	<---	MSt1	.139	.042	3.305	***	.155
PPt2	<---	LLMt1	.203	.084	2.431	.015	.158
LLMt2	<---	PPt1	.006	.029	.223	.823	.009
MSt2	<---	LLMt1	.058	.062	.936	.349	.056
SEBt2	<---	MSt1	.151	.047	3.216	.001	.160
LLMt2	<---	SEBt1	.070	.043	1.618	.106	.085
PPt2	<---	MSt1	.124	.066	1.885	.059	.100
SEBt2	<---	LLMt1	.213	.060	3.569	***	.217
MSt2	<---	PPt1	-.038	.034	-1.122	.262	-.049
SEBt2	<---	SEBt1	.272	.048	5.652	***	.313
SEBt2	<---	PPt1	.004	.032	.123	.902	.005
PPt2	<---	SEBt1	.114	.067	1.686	.092	.100
Correlations							
MSt1	<-->	SEBt1	.369	.026	14.149	***	.686
MSt1	<-->	LLMt1	.369	.024	15.327	***	.775
LLMt1	<-->	PPt1	.405	.029	13.768	***	.659
PPt1	<-->	SEBt1	.482	.034	14.258	***	.693
MSt1	<-->	PPt1	.352	.029	12.101	***	.553
LLMt1	<-->	SEBt1	.413	.027	15.566	***	.795
e1	<-->	e2	.137	.012	11.209	***	.501
e2	<-->	e3	.159	.012	13.678	***	.653
e3	<-->	e4	.143	.014	9.915	***	.432
e1	<-->	e3	.148	.011	13.304	***	.628
e1	<-->	e4	.145	.016	9.149	***	.393
e2	<-->	e4	.119	.016	7.426	***	.311

After deleting all the statistically insignificant paths from the formal model, Figure 8 presents the final results covering the four focal variables. In this model, after controlling the pre-test correlation, post-test correlation, and autoregressive effects, the four pre-test variables predict the post-test variables differently: (1) SEB correlates with MS in a reciprocal manner; (2) MS as the cause could predict LLM and PP as the effects; (3) LLM as the cause could predict SEB and PP as the effects; and (4) PP could only serve as the effect but not a cause among the variables covered in the present study.

Figure 8

Integrative Cross-lagged Panel Model After Deleting Non-significant Paths (Model 8)

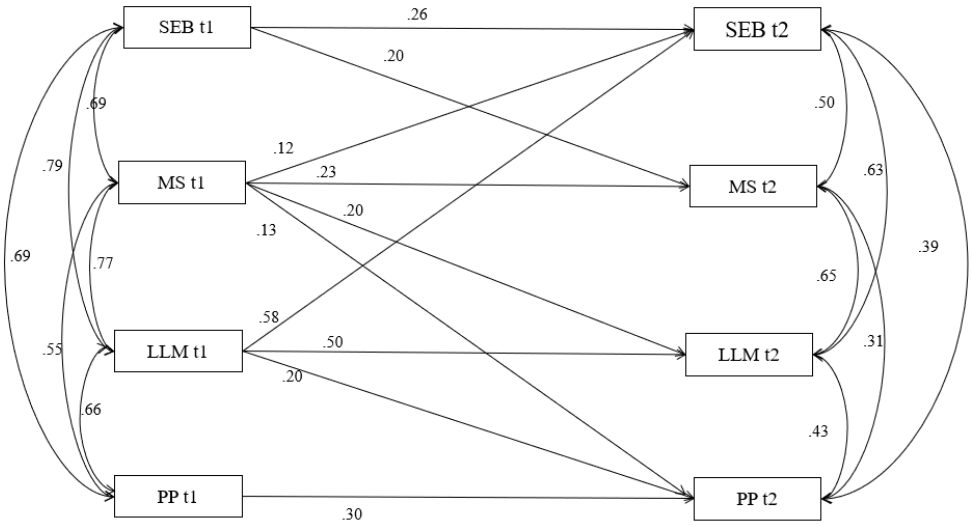


Table 11

Goodness-of-fit Index for Model 8

Fit Index	χ2/df (1-5)	RMSEA (<0.08)	RMR (<0.05)	NFI (>0.8)	RFI (>0.8)	IFI (>0.9)	TLI (>0.9)	CFI (>0.9)
Model 8	1.623	.032	.009	.997	.988	.999	.995	.999

In Table 11, the chi-square/degrees of freedom ratio (χ2/df) is 1.623, which falls within the acceptable range of 1-5. The Root Mean Square Error of Approximation (RMSEA) is 0.032, which is less than the threshold of 0.08. The Root Mean Square Residual (RMR) is 0.009, which is less than the recommended threshold of 0.05. The Normed Fit Index (NFI) is 0.997, the Relative Fit Index (RFI) is 0.988, the Incremental Fit Index (IFI) is 0.999, the Tucker-Lewis Index (TLI) is 0.995, and the Comparative Fit Index (CFI) is 0.999. All of these indices exceed the recommended thresholds of 0.8 or 0.9, indicating excellent model fit.

Table 12

Correlation and Coefficients in Model 8

	Path		Estimate	S.E.	C.R.	P	Std. Estimate
Regression							
MSt2	<---	MSt1	.546	.038	14.275	***	.553
LLMt2	<---	LLMt1	.462	.035	13.153	***	.502
PPt2	<---	PPt1	.282	.038	7.481	***	.296
MSt2	<---	SEBt1	.108	.031	3.471	***	.119
LLMt2	<---	MSt1	.182	.037	4.893	***	.205
PPt2	<---	LLMt1	.250	.071	3.520	***	.196
SEBt2	<---	MSt1	.186	.044	4.214	***	.198

PPt2	<---	MSt1	.165	.064	2.599	.009	.134
SEBt2	<---	LLMt1	.222	.049	4.502	***	.228
SEBt2	<---	SEBt1	.220	.034	6.414	***	.257
Correlations							
MSt1	<-->	SEBt1	.369	.026	14.149	***	.686
MSt1	<-->	LLMt1	.369	.024	15.327	***	.775
LLMt1	<-->	PPt1	.405	.029	13.768	***	.659
PPt1	<-->	SEBt1	.482	.034	14.258	***	.693
MSt1	<-->	PPt1	.352	.029	12.101	***	.553
LLMt1	<-->	SEBt1	.413	.027	15.566	***	.795
e1	<-->	e2	.137	.012	11.216	***	.501
e2	<-->	e3	.160	.012	13.670	***	.652
e3	<-->	e4	.144	.014	9.971	***	.435
e1	<-->	e3	.149	.011	13.326	***	.629
e1	<-->	e4	.146	.016	9.191	***	.395
e2	<-->	e4	.120	.016	7.461	***	.312

In Table 12, the regression paths show several significant relationships between the variables, with all paths being statistically significant at the $p < .001$ level, except for the path from MSt1 to PPt2, which is significant at the $p < .01$ level. The correlation coefficients indicate strong positive relationships between the latent variables, with the highest correlation being between LLMt1 and SEBt1 ($r = 0.795$). The error covariances (e1 to e4) also show significant positive correlations, indicating the presence of shared unexplained variance between the respective observed variables.

5 Discussion

The present study examined cross-lagged models based on surveys administered at two different times. The findings revealed three main insights. First, the relationship between self-efficacy belief (SEB) and perceived progress (PP) in online English learning was not reciprocal but causal, with SEB as the cause and PP as the effect. Second, language learning motivation (LLM) significantly predicts learners' PP in online English learning. Finally, the relationships between LLM and SEB, SEB and metacognitive strategies (MS), and LLM and MS were reciprocal, indicating mutual influence.

The findings provide robust evidence of a causal relationship between SEB and PP in online English learning. Specifically, SEB influenced learners' perceived progress in online English learning. This aligns with previous studies highlighting that learners who have confidence in executing behaviors are better able to self-regulate their learning processes (Zimmerman, 2000), thereby enhancing their perceptions of online English learning (F. Teng & Wu, 2024). Strengthened SEB decreases worry and anxiety (F. Teng, 2024), thus enhancing learners' perceived ability to achieve better performance in online learning (F. Teng & Yang, 2023). This underscores the importance of SEB in learners' perceived progress, suggesting that students who feel competent in online English learning are likely to achieve better learning outcomes. Consistent with Bandura's (1997) early work on self-efficacy, a strong sense of SEB determines learners' ability to note progress, attain goals, set new challenges, invest effort toward predetermined goals, and achieve potential learning outcomes.

The results also underscore the significant role of LLM in predicting learners' PP in online English learning. This supports the notion that LLM is crucial in increasing students' determination and interest

in online language learning (F. Teng et al., 2021). However, these results contrast with Lin et al. (2017), where motivational variables, including intrinsic and extrinsic motivation, did not significantly predict online learning outcomes. One potential explanation is that motivation may be intertwined with SEB, as suggested by F. Teng et al. (2021), a factor that Lin et al. (2017) did not adequately explore. Additionally, the unique challenges of online learning faced by participants in the present study, who were learning English as a foreign language, may differ from those in Lin et al. (2017). The stressful situation of online English learning may have led to lower motivation scores, affecting learners' perceptions of their progress. Therefore, LLM can be seen as an intrinsic drive towards more complex and differentiated development of mental structures, influencing learners' goals and their integration into the target language community.

The study found reciprocal relationships between LLM and SEB, SEB and MS, and LLM and MS. Specifically, learners' motivation, both intrinsic and extrinsic, was significantly correlated with their SEB in online English learning. This supports previous research indicating that higher motivation levels are associated with better SEB in managing and regulating online learning (Barak et al., 2016). However, Barak et al. (2016) also argued that using English as the language of instruction online might exclude non-native speakers, potentially affecting motivation and SEB. While the present findings did not directly address this issue, it remains a concern for online language learning research. The present study documented the role of extrinsic and intrinsic motivation in guiding learners to be self-efficacious in navigating their online learning paths. As Zheng et al. (2018) argued, learners' promotional instrumentality positively predicts their intended language learning efforts, impacting their opportunity control, time management, and other self-regulatory strategies. Thus, learners with higher motivation in online courses are more likely to engage actively and view online English learning opportunities favorably.

Metacognitive strategies were found to have a beneficial relationship with SEB and LLM. Learners in the present study adopted metacognitive strategies to better understand their engagement in the online learning process. These findings are consistent with previous studies (Barnard et al., 2009; King, 2000; F. Teng et al., 2021), which highlighted the significant impact of metacognitive strategies on online learning. As F. Teng and Yang (2023) argued, the shift to an online environment demands greater learner autonomy, and adopting metacognitive strategies such as planning, monitoring, regulating, setting goals, and organizing information can enhance motivation and SEB. I argue that metacognitive strategies not only boost learners' confidence but also their willingness to exert effort in online English learning. Therefore, the adoption of metacognitive strategies is crucial for fostering higher levels of motivation and SEB, enabling learners to take proactive control of their learning process.

Based on the findings, I propose a theoretical model for online English learning that integrates self-efficacy belief (SEB), language learning motivation (LLM), and metacognitive strategies (MS). This model is designed to explain the dynamic and reciprocal relationships among these constructs and their impact on learners' perceived progress (PP) in online English learning. The proposed theoretical model delineates several critical interrelationships among the constructs of SEB, LLM, and MS. These relationships are pivotal in understanding and enhancing learners' perceived progress (PP) in online English learning environments.

First, the model posits a causal relationship between SEB and PP, wherein SEB directly influences learners' perceived progress. Self-efficacy belief, defined as an individual's confidence in their ability to execute tasks and achieve goals, is a foundational element in the online learning process. High SEB decreases anxiety and worry, thereby enhancing learners' perceived ability to achieve better performance (F. Teng & Yang, 2023), aligning with previous studies highlighting that learners with strong SEB are better able to self-regulate their learning processes, which in turn enhances their perceptions of online English learning (Bandura, 1997; Zimmerman, 2000). Bandura (1997) emphasized that individuals with high SEB are more likely to undertake challenging tasks, persist in the face of difficulties, and ultimately achieve higher levels of performance. This is corroborated by Zimmerman (2000), who noted

that learners with strong SEB are better equipped to self-regulate their learning, leading to enhanced academic outcomes. In the context of online English learning, fostering SEB is crucial as it mitigates anxiety and enhances learners' perceived capability to succeed, thereby directly contributing to their perceived progress.

Second, the model highlights the significant predictive power of LLM on learners' PP. Language learning motivation, encompassing both intrinsic and extrinsic motivational factors, drives learners' engagement and persistence in the learning process. F. Teng et al. (2021) found that LLM significantly enhances learners' perceived progress by fostering a sustained interest and commitment to learning activities. Motivated learners are more likely to engage deeply with the material, employ effective learning strategies, and persist through challenges, all of which contribute to improved learning outcomes. This underscores the importance of cultivating motivation in online learning environments to enhance students' engagement and persistence (F. Teng, 2024), ultimately leading to better perceived progress.

Finally, the model identifies reciprocal relationships among LLM, SEB, and MS. These interrelationships suggest that the constructs mutually reinforce each other, creating a dynamic interplay that enhances overall learning effectiveness. Learners adopting metacognitive strategies are better able to understand their engagement in the online learning process (L. Teng, 2022), thereby boosting confidence and motivation (F. Teng & Yang, 2023), consistent with previous studies that highlighted the significant impact of metacognitive strategies on online learning (Barnard et al., 2009; King, 2000). Higher levels of motivation are associated with stronger self-efficacy beliefs (F. Teng, 2024). When learners are motivated, they are more likely to set ambitious goals, invest effort, and persist in the face of challenges. This, in turn, boosts their confidence in their ability to succeed (Barak et al., 2015). Conversely, learners with high SEB are more likely to engage in and persist with learning activities, which further enhances their motivation. Effective use of metacognitive strategies enhances self-efficacy beliefs. Metacognitive strategies, such as planning, monitoring, and regulating one's learning activities, enable learners to manage their learning processes effectively (F. Teng, 2023). When learners successfully employ these strategies, they gain a sense of control and confidence in their ability to learn, thereby strengthening their SEB (Zheng et al., 2018). Additionally, high SEB encourages learners to adopt and persist with metacognitive strategies, creating a positive feedback loop. Motivation influences the use of metacognitive strategies. Motivated learners are more likely to employ strategies that help them plan, monitor, and regulate their learning. This strategic approach to learning not only enhances their engagement but also improves their learning outcomes. Conversely, the successful use of metacognitive strategies can enhance learners' motivation by providing a sense of accomplishment and progress.

The proposed theoretical model underscores the complex and interdependent relationships among SEB, LLM, and MS, and their collective impact on learners' perceived progress in online English learning. By fostering self-efficacy, cultivating motivation, and promoting the use of metacognitive strategies, educators can create a supportive and effective learning environment that enhances learners' engagement, persistence, and ultimately, their perceived progress. This model provides a comprehensive framework for understanding the multifaceted nature of online language learning and offers practical insights for improving educational practices.

6 Limitations and Implications

The present study, while providing valuable insights into the relationships among metacognitive strategies (MS), self-efficacy belief (SEB), language learning motivation (LLM), and perceived progress (PP) in online English learning, is not without its limitations. The first limitation is the reliance on self-report surveys to collect data from learners. Self-report measures can be subject to biases such as social desirability bias, where respondents may provide answers they believe are expected rather than their

true feelings or behaviors. Future research could address this limitation by incorporating qualitative data collection methods, such as in-depth interviews or focus groups, to gain a more nuanced understanding of learners' experiences and perceptions. Another limitation is the exclusion of learners' actual achievement in English learning as a variable in the study. Including objective measures of learners' performance, such as test scores or grades, could provide a more comprehensive view of the effectiveness of SEB, LLM, and MS on learning outcomes. Future studies should consider integrating these achievement metrics to validate and extend the findings of this study. The final limitation is that the research was conducted within the specific context of Chinese EFL learners. Cultural, educational, and contextual factors unique to China may influence the generalizability of the findings. Therefore, it is essential to replicate this study in diverse contexts and among different populations to determine whether the observed relationships hold true across various settings.

Despite these limitations, the findings of this study have several important implications for educators and instructional designers in the domain of online English learning. First, the present study underscores the critical role of learners' motivation and self-efficacy belief in their perceived progress in online English learning. It is well-established that students perform best when they believe in their capacity to succeed and are motivated to engage in the learning process. Educators should therefore focus on strategies to bolster students' self-efficacy and motivation. This can be achieved by setting realistic and attainable goals, providing constructive feedback, and highlighting the practical benefits of mastering the English language in an online learning environment. Second, teachers are encouraged to help learners develop a strong sense of language learning motivation. This involves creating a learning environment that is engaging, supportive, and aligned with learners' interests and goals. By fostering an awareness of the importance of motivation, educators can help students manage challenges such as lack of confidence or self-belief, thereby enhancing their ability to cope and maintain competence in online English learning. Finally, the findings also highlight the significance of metacognitive strategies in online English learning. English language teachers should raise learners' awareness of effective metacognitive strategies, such as planning, monitoring, and evaluating their learning processes. Educators can recommend a variety of metacognitive strategies tailored to different topics and learning activities. By doing so, they can assist learners in developing self-regulation skills, which are crucial for managing the demands of online learning and alleviating the associated stress.

Appendix

Surveys used in the present study

Metacognition

1. I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester) for online English learning. (GS)

2. I keep a high standard for online English learning despite the unpredictable nature of such learning mode. (GS)

3. Despite the unpredictable nature of online learning, I set goals to help me manage studying time for my English learning. (GS)

4. Despite the unpredictable nature of online learning, I set goals to make sure the quality of online English learning. (GS)

5. I try to take more thorough notes for my online English leanring courses because notes are important. (TS)

6. I read aloud instructional materials posted online to fight against distractions brought online English learning. (TS)

7. I prepare my questions for English learning before joining in the chat room and discussion. (TS)

8. I work extra problems in my online English learning courses in addition to the assigned ones. (TS)

9. I summarize my learning in online English learning courses to examine my understanding of what I have learned. (SE)

10. I reflect on how I can do better for my online English learning classes. (SE)

11. I ask myself a lot of questions about the course material for an online English learning course. (SE)

12. I find and consult someone who is knowledgeable in online English course content. (HS)

13. I share my problems with my classmates online so we know what we are struggling with and how to solve our problems for learning English. (HS)

14. I try to get help from the instructor through e-mail, or other means for my English learning. (HS)

GS=Goal setting; TS= task strategies; SE= self-evaluation; HS=help seeking

Self-efficacy beliefs

1. I can organize online English learning course materials efficiently.

2. I can communicate effectively with technical support via e-mail, telephone, or live online chat for learning English.

3. I can overcome technical difficulties on my own for my English learning.

4. I can learn to use a new type of technology or tool for efficient language learning.

5. I can search the internet to find answers to a course-related question for my English learning.

6. I can complete a group project for online language learning.

7. I can use synchronous technology to communicate with others (such as Skype, WeChat) for online English learning.

8. I can focus on schoolwork through online technology when faced with distractions in my English learning.

9. I can use the library's online resources for learning English efficiently.

10. I can concentrate on the online English learning syllabus.

Language learning motivation

Intrinsic motivation-knowledge

1. I study English language because I can learn knowledge from the online learning group.

2. I study English language for the satisfied feeling I get in finding out new features in online language learning.

3. I study English language because I can access more knowledge and information online.

Intrinsic motivation-accomplishment

1. I study English language because I want to make progress in online learning.

2. I study English language because I want to disperse the fear I experience in the online learning course.

3. I study English language for the satisfaction I feel because I can accomplish different online English courses.

Intrinsic motivation-stimulation

1. I study English language online because I want to understand my teacher's instruction.

2. I study English language for the pleasant feeling that I experience while talking with native speakers in the online course.

3. I study English language for the pleasure I get from hearing the foreign language spoken by my teacher and classmates in the online course.

Extrinsic motivation-Identified regulation

1. I study English language because different online learning groups provide me with helpful feedback.

2. I study English language online because I think it is good for me to find a job in the future.

3. I study English language online because I want to know global information.

Extrinsic motivation- Introjected regulation

1. I study English language online because I can find more information to comfort myself when I am anxious.

2. I study English language so that I would not feel negative because using that language to speak to my friends from the online learning community is meaningful.

3. I study English language online so that I would not feel anxious because learning and speaking that language opens a new window to me.

Extrinsic motivation-external regulation

1. I study English language because I need help from different online groups.

2. I study English language online because I want to watch some foreign movies to erase my worries.

3. I study English language online because it can help me earn better salary in the future.

Perceived progress in online English learning

1. I can understand most of the content in the online English class.

2. I can focus a lot on online English language learning.

3. I can engage myself in different online language learning activities.

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Mark Feng Teng, Ph.D., is Associate Professor in Applied Linguistics at Macau Polytechnic University. His research portfolio mainly focuses on computer-assisted L2 vocabulary learning and L2 writing. His publications have appeared in international journals, including Applied Linguistics, TESOL Quarterly, Language Teaching Research, System, Applied Linguistics Review, Computer Assisted Language Learning, Computers & Education, Foreign Language Annals, and IRAL, among others. His recent monographs were published by Routledge, Springer, and Bloomsbury. He serves as editor-in-chief for International Journal of TESOL Studies.

ORCID: https://orcid.org/0000-0002-5134-8504