An Investigation of Learners' Perceived Progress During Online Education: Do Self-Efficacy Belief, Language Learning Motivation, and Metacognitive Strategies Matter?

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Abstract Despite the large quantity of research projects about online learning, studies on students' language learning motivation, self-efficacy belief, and metacognitive strategy use in the online learning setting are limited. The present paper aims to fill this gap through assessing learners' metacognitive strategies, language learning motivation, self-efficacy belief, and their perceived progress in English learning. Responses to surveys were administered two times. The collected data were subject to longitudinal mediation analysis. The participants were a total of 627 university students in China. Results showed a positive and significant relationship among the four variables. The findings highlighted four significant longitudinal mediation patterns. Overall, self-efficacy belief predicted the use of metacognitive strategies, which in turn predicted their language learning motivation and perceived online English learning progress. The findings supported the mediating role of language learning motivation and metacognitive strategies. The findings showed the potential to enhance online English learning by facilitating learners' self-efficacy belief, language learning motivation, and metacognitive strategies.

Keywords Metacognitive strategies · Language learning motivation · Self-efficacy belief · Perceived online learning progress

Introduction

Accustomed to in-person learning and face-to-face interactions, a plethora of students and educators around the globe, due to the outbreak of the novel coronavirus 2019 (COVID-19), have been forced to adapt to an online remote mode of learning and teaching. Learners are *pushed* to make quick technological and psychological adjustments to online education; not only do learners need to cope with difficulties of managing a variety of digital tools and platforms, but students may also experience mental health issues, including depression, loneliness, anger, boredom, or anxiety (Teng & Wu, 2021). Such mental challenges during the pandemic have distracted students' competence and confidence in online learning.

The present study investigated university undergraduates' psychological state when taking an online English as a foreign language (EFL) course. The primary motive for conducting the current research project was that learners who took online language courses had been reported to hold significantly less positive attitudes towards English courses compared with students who took other courses (Oliver et al., 2012). Yet, what factors contribute to students' less positive attitudes remained unclear. In terms of online education, helping students implement self-regulated learning has been a prominent and constant challenge (Zheng et al., 2018). In order to succeed in conducting online learning, learners are supposed to possess a relatively high degree of autonomy (Teng, 2019). In particular, learners should advance their capabilities to plan, monitor, and make judgments about their own learning progress and therefore adjust their learning pace. Previous studies reported that language learning performance was closely related to a higher locus of control and better ability in maintaining self-directed learning (Lin et al., 2017). One reason, as summarized in a

research synthesis article (Barbour & Reeves, 2009), is that students who had strong motivations in self-regulated learning were more likely to be fully engaged in online learning.

The primary purpose of the present study was to examine the various factors that influence learners' perceived progress in online language courses. The particular focus was on how metacognitive strategies, motivation, and self-efficacy beliefs affect their perceived online English learning progress. The challenges of online language learning highlight students' self-regulated learning behaviors (Lin et al., 2017). It is essential to understand how and why self-efficacy belief, metacognitive strategies, and motivation may work together in influencing learners' perceived progress in online language courses (Teng et al., 2021; Teng & Yang, 2022). The examined variables, including metacognitive strategies, language learning motivation, and self-efficacy beliefs, have been separately researched. Research on the unique and joint contributions of the mentioned variables in a longitudinal way remains unknown. The present study attempts to bridge this gap through collecting data two times to create longitudinal mediation models. The hypothesis is that metacognitive strategies, language learning motivation, and self-efficacy belief will separately and jointly contribute to learners' perceived progress.

This article aims to (a) examine the self-efficacy belief in predicting learners' perceived online English learning progress and (b) identify how metacognitive strategies and language learning motivation mediate the relationship between self-efficacy belief and perceived progress in English learning. Disentangling the separate and joint role of metacognitive strategies, language learning motivation, and self-efficacy belief in perceived online English learning progress provides implications to students' self-regulated behaviors for online learning.

Literature Review

Metacognitive Strategies

According to Flavell (1976), metacognition refers to "one's knowledge concerning one's own cognitive processes and products or anything related to them" (p. 232). Metacognition is comprised three dimensions, i.e., metacognitive knowledge, metacognitive experiences, and metacognitive strategies (Flavell, 1979). Metacognitive knowledge, derived from long-term memory, is about knowledge about one's own learning such as "person, task, and strategy knowledge" (Wenden, 1987, p. 518). Metacognitive knowledge could be classified into procedural, declarative, and conditional knowledge (Paris et al., 1984). Metacognitive experiences are "any conscious cognitive or affective experience that accompany or pertain to any intellectual enterprise" (Flavell, 1976, p. 906). Efklides (2006) explained that metacognitive

experiences are associated with an individual's working memory as they monitor the detailed aspects of the metacognitive processing. In addition to the affective dimension such as the feeling of difficulties, confidence, and anxiety, metacognitive experiences regulate one's metacognitive judgment about learning, including the effort and time required to achieve success in learning. Wenden (1998) described metacognitive strategies as "general skills through which learners manage, direct, regulate, guide their learning, i.e., planning, monitoring and evaluating" (p. 519). They are specific actions that guide learners to take control of their cognitive activities and have been argued as an integral part of the self-regulation process (Pintrich et al., 2000).

This study focused on metacognitive strategies for two main reasons: (1) metacognitive strategies are of prime importance to online learners to self-regulate their learning performances and to move forward deep learning (Anthonysamy, 2021), and (2) research suggests that developing suitable metacognitive strategies in online English learning is particularly challenging for EFL learners (Teng et al., 2021). In a previous study (Teng & Zhang, 2021), the focus was on young EFL learners' metacognitive knowledge. Results showed that the activation of metacognitive strategies can aid students in reflecting on what they know and develop their awareness for planning, monitoring, and evaluating their language learning process, thus leading to better reading and writing performance. Researchers have pointed to the positive impacts of metacognitive strategies on English learning in the fields of writing (Teng, 2020; Teng & Yue, 2022), reading literacy (Wu & Peng, 2017), and vocabulary acquisition (Teng & Zhang, 2021; Tseng & Schmitt, 2008). However, those studies were conducted in an offline context. In contrast with face-to-face classrooms, online teaching generally requires a higher degree of autonomy from the learner's side in light of the lack of teacher support compared to the traditional classroom learning (Barnard et al., 2009), and higher levels of motivation for better English learning achievement (Zheng et al., 2018). Meanwhile, researchers such as Anthonysamy (2021) rightly remind us that metacognitive strategies differ in online and offline learning settings as online learning generally provides less direct interactions from peers and instructors, and more self-efficacy for learners, even for those born as digital natives. Yet, though learners may be aware of the importance of metacognitive strategies, it is still daunting and hard for them to develop and deploy the appropriate strategies in the online mode of language education (Azevedo et al., 2008), thus influencing their motivation and self-efficacy for online English learning achievement (Teng et al., 2021). Learners may need to adjust their online metacognitive strategies so as to achieve better learning performance and thus this study is significant in revealing the role of metacognitive strategies in emergence online education.

Language Learning Motivation

Language learning motivation, as conceptualized by Dörnyei (2009), entails personal factors (e.g., prior learning experiences and perceptions of the usefulness of the target language) and social factors (e.g., attitudes towards the social status of the target language) that influence one's attitudes and behavior towards learning the target language. From a different perspective, Deci and Ryan's (1995) remark that intrinsic motivation and extrinsic motivation are fundamental to learning outcomes. Learners with intrinsic motivation tend to enjoy the learning process with a high degree of gratification and low level of anxiety. Furthermore, with such learning experiences learners often gain more intrinsic motivation. By contrast, some learners rely on external stimuli including rewards and punishments to engage in learning.

To better delineate the concept of motivation, Dörnyei (2009) conceptualized second language (L2) motivational self-system. He described the system as consisting of the Ideal Self, the Ought-to Self, and the L2 Learning Experience. The Ideal Self orients L2 learners to enact learning behavior so as to bridge the gap between actual and visionary L2 learning proficiencies. The Ought-to Self refers to the attributes that an individual believes he/she should possess. The L2 Learning Experience includes choice of learning modes, teacher's management of teaching, and peer support. Previous studies have reached a general conclusion that the Ideal Self contributes positively to the L2 learning process while the Ought-to Self has a less positive and sometimes negative impact on students' language learning motivation (Man et al., 2018; Ushioda & Dörnyei, 2009; Yashima, 2009; You & Dörnyei, 2016).

In terms of L2 motivation in online learning environments, researchers such as Cai and Zhu (2012) reported that virtual learning experiences have the merit of augmenting learners' L2 Learning Experience, however, the other two aspects (the Ideal Self and the Ought-to Self) are not significantly improved. This finding points to the fluidity of L2 Learning Experience that is easier to change within a short period of time. Another recent study by Lee and Lu (2021) revealed that compared to the Ought-to Self, the Idea Self is a more robust indicator of learners' willingness to communicate in online learning. A positive Idea Self can be constructive to online learning since it can improve learners' psychological and affective states by reducing learning anxiety and increasing interest, which in turn may prompt learners to take more active roles in such online mode of education.

The three constructs in Motivational Self System are in essence closely related to one's self-efficacy beliefs (Man et al., 2018). Scholars have reported that perceived self-efficacy leads to the development of motivation and can be a strong indicator of learner performance in student learning activities (Bandura & Schunk, 1981; Glynn et al., 2011; Shea & Bidjerano, 2010), including the online learning setting (Kim et al., 2014; Teng & Yue, 2022). Yet, most of the existing studies focused on the traditional online learning contexts, whereas the connections between motivation and self-efficacy belief have not been fully understood during the emergency remote learning.

Self-efficacy Beliefs

Self-efficacy beliefs, central to the development of self-regulated learning, are defined as "people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1993, p. 118). From Bandura's socio-cognitive perspective, self-efficacy beliefs impact people's lives through four different ways, including "cognitive, motivational, affective, and selection processes" (Bandura, 1997, p. 117). From a cognitive and motivational standpoint, learners' self-regulatory behavior is influenced by their preconceived notions of self-efficacy belief (King et al., 2000). Self-efficacy belief is an important factor of setting learning goals and investing their effort in learning. For example, students with forethought of success in online learning are more likely to have higher expectations of such mode of learning and be self-motivated to continue to participate in online learning activities (Shea & Bidjerano, 2010).

Affectively and selectively, students who experience negative emotions such as stress, anxiety, and anger are less likely to own a sense of control in their own learning. Contrarily, those with successful learning experiences tend to develop positive self-efficacy beliefs and thus manage the negative states positively (Robbins et al., 2004). Self-efficacy belief is important in the current virtual mode of learning when students are pushed to make quick adjustments to a comparatively new learning environment. Self-efficacy beliefs influence how students make learning decisions. In online learning, learners with a strong sense of self-efficacy often (a) perceive challenges as opportunities for them to develop more skills rather than personal threats; (b) view failure as remediable and controllable; and (c) recover quickly from setback and invest more effort so as to perform better in the future (Peacock et al., 2020).

Self-efficacy beliefs, as a whole, "influence how people feel, think, motivate themselves, and behave" (Bandura, 1993, p. 118). The positive connections between self-efficacy beliefs, students' commitment and motivation, and learning performance have been evidenced by previous studies. Cho et al. (2017), for example, inquired about the students' self-efficacy and self-regulated learning beliefs in an online credit-bearing course at an American public university. Results from a survey with 180 university students suggested a positive relationship between students'

autonomous learning and their self-efficacy beliefs. Yet, the study cautioned that mid-level self-efficacy is less connected to self-efficacy beliefs, depending on the design of student learning activities. This finding is further supported in Lee and Park (2017) with 236 Korean pupils who participated in an online virtual exchange learning project. This study showcased that though self-efficacy was found as a crucial factor in the successful implementation of the virtual exchange project, the quality of exchange projects and the classroom infrastructure were more important to such online learning projects, especially in the initial stage of learning. As Lee and Park (2017) suggested, when new pedagogical methods or technologies are utilized, self-efficacy beliefs play a much salient role in student learning satisfaction and achievements. Prior research (e.g., Wang et al., 2022) has explored the association between emotional adjustment and self-efficacy beliefs within the context of online learning environments. Findings from a latent profile analysis identified three distinct profiles: high adaptation, moderate adaptation, and low adaptation. Students exhibiting high adaptation displayed more positive self-efficacy beliefs and experienced lower levels of anxiety. Conversely, students characterized by low adaptation exhibited less favorable self-efficacy beliefs and demonstrated higher levels of anxiety.

## Gaps in Previous Literature and the Hypothesized Model

Two pertinent studies serve as the foundation for the current research. Both studies (Teng et al., 2021; Teng & Yang, 2022) investigated the interplay between metacognitive strategies, language learning motivation, and self-efficacy beliefs during online learning. Teng et al. (2021) focused on single-timepoint self-reported data, finding that self-efficacy beliefs predicted English learning achievement, with language learning motivation and metacognitive strategies acting as mediators in this relationship. They emphasized the importance of fostering learners' self-efficacy beliefs, motivation, and metacognitive strategies. Teng and Yang (2022), on the other hand, utilized

a longitudinal mediation modeling approach to explore the same variables in the context of online English learning. Surveys were administered twice, and their findings echoed the role of self-efficacy beliefs in English learning achievement. Moreover, the results highlighted the combined mediating effect of language learning motivation and metacognitive strategies on the relationship between self-efficacy beliefs and English learning achievement. The present paper aims to fill the gap through exploring the relationships among metacognitive strategies, language learning motivation, self-efficacy beliefs, and perceived progress in English learning over time. The present study suggests a proposed model that involves metacognitive strategies, self-efficacy belief, and language learning motivation, and perceived English learning progress from a longitudinal perspective (Fig. 1). The hypothesized model reflects the important role of self-efficacy belief in taking actions for self-regulation and maintaining motivation (Bandura, 1997). The hypothesized model extends to an understanding of how metacognitive strategies and language learning motivation mediate the effects of self-efficacy belief on students' perceived learning progress.

Through this hypothesized model, we tested the following dimensions: (a) the indirect effects of language learning motivation on the relationship between self-efficacy belief and perceived progress in learning English over time; (b) the indirect effects of metacognitive strategies on the relationship between self-efficacy beliefs and perceived progress in learning English over time, and (c) two mediational models of language learning motivation and metacognitive strategies on the relationship between self-efficacy belief and perceived progress in learning English over time. The present study attempt to address the following research questions:

1. To what extent are metacognitive strategies, language learning motivation, self-efficacy beliefs, and perceived progress in English learning related with each other?
2. To what extent do language learning motivation and metacognitive strategies mediate the relationship between self-efficacy belief and perceived progress in English learning over time?

Fig. 1 The hypothesized model
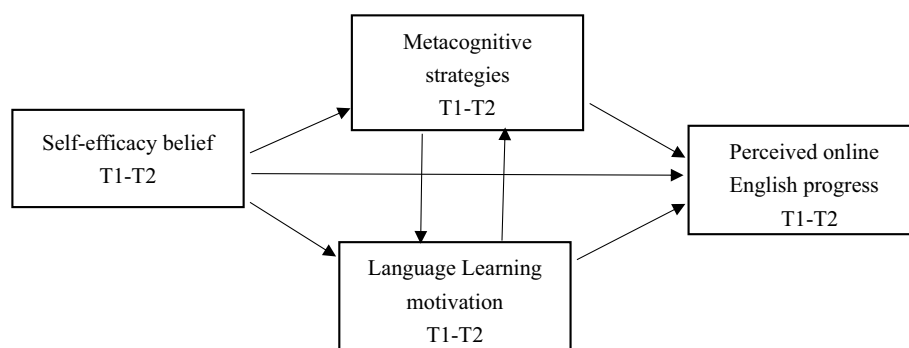
Method

Participants

The study focused on university students in China. Due to the influence of the pandemic, all face-to-face classes were shifted to online mode at the time when the study was conducted. The participants were 627 students who completed the surveys both times. They were non-English major students in China. The university where the participants were from was a medium-sized university in China. The participants' mean age was 19.4 ($SD = 1.3$). Among the participants, 305 were male and 322 were female. They have learned English as a foreign language for around 10 years. They received four hours of online learning instruction per week. The online English learning course was previously the English learning course for all non-English major students. The requirement of the course syllabus was to improve students' listening, speaking, reading, and writing skills.

Measures

Measures in the current study included four instruments, including metacognitive strategies, self-efficacy belief, language learning motivation, and perceived progress in language learning. A seven-point Likert-scale, ranging from 1 "not at all true of me", to 7 "very true of me", was adopted to measure the four surveys. Exploratory factor analysis (EFA) showed that the loadings of each item in each dimension of each survey were higher than 0.5, showing acceptable effect size (Blunch, 2008). Cronbach's alpha showed acceptable reliability for the four surveys (see "Results" section).

Metacognitive Strategies

Metacognitive strategies centered on learners' awareness and use of strategies in taking control of their online learning. Survey items were adapted from the Online Self-Regulated Learning Questionnaire (OSLQ) (Barnard et al., 2009). OSLQ was applied and validated in Barnard et al. (2009). The original OSLQ included 24 items. The present study targeted at 14 items to purposefully reflect students' metacognitive strategies for online learning. The survey included task strategies (four items), goal-setting (four items), help-seeking (three items), and self-evaluation (three items). The items were adapted to reflect the online English learning setting. For instance, "I set goals to help me manage study time for my online courses" was revised into "I set learning goals to manage my learning time during online English learning".

Language Learning Motivation

Language learning motivation explores learners' intrinsic and extrinsic motivation for learning English. This measure was adapted from Noels et al. (2000), which was applied and validated in Noels (2003). We revised the items to reflect learners' motivation for online language learning. Intrinsic motivation included three components, i.e., knowledge, accomplishment, and stimulation. Knowledge included three items (e.g., I learn English because I can learn knowledge from the online learning group). Accomplishment also included three items (e.g., I learn English because I intend to make progress in online learning). Finally, stimulation included three items (e.g., I learn English because I need to understand my teacher's online instruction).

Extrinsic motivation focused on three components, i.e., identified regulation, introjected regulation, and external regulation. Identified regulation included three items (e.g., I learn English because different online learning groups provide me with helpful feedback). Introjected regulation included three items (e.g., I learn English because I can find more information to comfort myself when I am anxious). External regulation included three items (e.g., I learn English because I need help from different online groups).

Self-efficacy Belief

Self-efficacy belief was evaluated through 10 items that focus on learners' self-efficacy belief toward online learning (Zimmerman & Kulikowich, 2016). The original scale in their study included 22 items. We adapted 10 items to reflect learners' confidence or belief in online learning. A sample item is "I can use real-time technological tools to communicate with others for online learning".

Perceived Progress in English Learning

Three items were used to evaluate learners' perceived progress in online English language learning. The items included "I can comprehend most of the content in the online English class", "I can focus a lot on online English language learning", and "I can engage myself in different online language learning activities".

Procedures

The surveys were administered two times, January and December of 2020. The first time (T1) was the time when strict control measures were adopted throughout China following the outbreak of COVID-19 in Hubei. All classes were suddenly turned into online mode. The second time was a time when face-to-face classes were resumed following the control of COVID-19. The students were invited through the

help of their instructors. The instructors helped collect the data. The instructors sent a link through WeChat, a popular social media in China. The link also included some demographic information, as well as the consent form for the participants to fill.

Data Analysis

We examined patterns of missing data before addressing the research questions. Little's χ^2 test results showed that data were not missing completely at random. Full information maximum likelihood imputation through Mplus was done to maximize statistical power while minimizing bias in model estimation procedures (Enders, 2001). This method is preferable to listwise deletion, as listwise deletion may significantly reduce the sample size and produce biased model parameter estimates (Muthén & Muthén, 2004).

Structural equation modeling (SEM) was performed to assess associations and statistical mediations among metacognitive strategies, language learning motivation, self-efficacy belief, and perceived English learning progress at both timepoints. In particular, we developed mediation structural equation models to examine all possible longitudinal mediations (see gaps in previous literature). Following Hu and Bentler (1999), fit indices, including chi-square goodness-of-fit (χ^2), Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Residual (SRMR), Normed Fit Index (NFI), Relative Fit Index (RFI), Tucker–Lewis Index (TLI), and Comparative Fit Index (CFI), were adopted to assess good model fit. A cutoff value close to 0.95 for TLI and CFI; a cutoff value close to 0.08 for SRMR; and one close to 0.06 for RMSEA are needed to demonstrate a good fit between the hypothesized model and the observed data. Maximum likelihood estimation with 5000 bootstrapped iterations was used for estimation and testing of SEM. Latent mean was used for each construct or responses to each item.

Results

Descriptive Statistics

Table 1 presents the descriptive data. In terms of the surveys administered at the first time, the participants reported a mean score of 4.34 ($SD = 0.70$) for metacognitive strategies, 4.36 ($SD = 0.688$) for language learning motivation, 4.44 ($SD = 0.77$) for self-efficacy belief, and 4.62 ($SD = 0.91$) for perceived progress. In terms of the surveys administered at the second time, the participants reported a mean score of 4.44 ($SD = 0.70$) for metacognitive strategies, 4.40 ($SD = 0.63$) for language learning motivation, 4.40

Table 1 Descriptive statistics

Variables	N	M	SD	Skewness	Kurtosis
Metacognitive strategies t2	627	4.44	0.70	− 0.15	2.70
Language learning motivation t2	627	4.04	0.63	− 0.21	3.33
Self-efficacy belief t2	627	4.40	0.67	0.02	1.19
Perceived progress t2	627	4.62	0.87	− 0.19	1.94
Metacognitive strategies t1	627	4.34	0.70	− 0.07	3.15
Language learning motivation t1	627	4.16	0.68	− 0.16	3.55
Self-efficacy belief t1	627	4.44	0.77	− 0.13	2.44
Perceived progress t1	627	4.62	0.91	− 0.25	1.68

t1 time 1 and *t2* time 2

Table 2 Reliability of the four measures

Variables	Reliability analysis	
	α	Items
Metacognitive strategies t1	0.90	14
Language learning motivation t1	0.91	18
Self-efficacy belief t1	0.84	7
Perceived progress t1	0.81	3
Metacognitive strategies t2	0.90	14
Language learning motivation t2	0.89	18
Self-efficacy belief t2	0.74	7
Perceived progress t2	0.71	3

t1 time 1 and *t2* time 2

($SD = 0.67$) for self-efficacy belief, and 4.62 ($SD = 0.87$) for perceived progress.

Reliability Analysis

Table 2 presents the reliability of the four measures at different administered time.

As shown in Table 2, Cronbach's alpha ranged from 0.71 to 0.91 for the four measures administered at two times. The Cronbach's alpha value indicated all the four measures demonstrated acceptable reliability (Schmitt, 1996).

Correlation Results

Table 3 presents the correlation results of the four dimensions administered at two times.

Based on Table 3, metacognitive strategies were significantly correlated with language learning motivation, self-efficacy belief, and perceived progress at the two times of data collection.

Longitudinal Mediation Results: Testing the Hypothesized Models

Mediation analysis provides a multivariate framework for testing hypotheses about chains of causal relationships among the four variables that were explored in the present study. The data analysis supported four models. The four resulting models yielded good model fit (Table 4).

SEM1: Self-efficacy Belief t1 → Language Learning Motivation t2 → Perceived Progress t2

SEM 1 estimates the relationships between self-efficacy belief at Time 1, language learning motivation at Time 2, and perceived progress at Time 2 (Fig. 2). It supported the mediating role of language learning motivation on the relationship between self-efficacy belief and perceived progress.

Table 3 Correlation results

	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	0.775**	1					
Self-efficacy belief t1	0.686**	0.795**	1				
Perceived progress t1	0.553**	0.659**	0.693**	1			
Metacognitive strategies t2	0.632**	0.548**	0.526**	0.384**	1		
Language learning motivation t2	0.589**	0.672**	0.578**	0.469**	0.772**	1	
Self-efficacy belief t2	0.545**	0.593**	0.599**	0.454**	0.681**	0.777**	1
Perceived progress t2	0.447**	0.501**	0.489**	0.510**	0.507**	0.616**	0.586**

$*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Table 4 Fit indexes for the four models

Models	χ^2/df	RMSEA	SRMR	NFI	RFI	IFI	TLI	CFI
SEM 1	3.59	0.06	0.08	0.99	0.96	0.99	0.97	0.99
SEM 2	3.94	0.07	0.09	0.97	0.94	0.97	0.95	0.97
SEM 3	3.19	0.06	0.08	0.97	0.94	0.97	0.95	0.97
SEM 4	4.19	0.06	0.08	0.97	0.94	0.97	0.95	0.97

Fig. 2 The mediating role of language learning motivation on self-efficacy belief and perceived progress. (a) *IM* intrinsic motivation, *EM* extrinsic motivation; (b) *t1* = time 1; *t2* = time
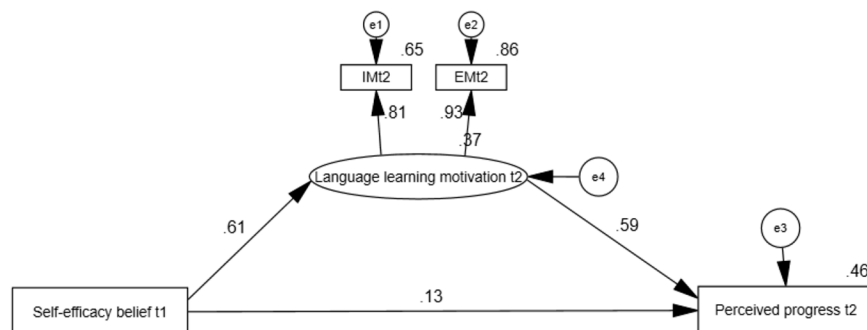
Note. (a) IM=Intrinsic motivation; EM: Extrinsic motivation; (b) t1 = time 1; t2 = time

The findings in Table 5 shows the following evidence. Self-efficacy belief at Time 1 significantly influenced language learning motivation at Time 2 ($\beta = 0.609$, $p < 0.001$). Language learning motivation at Time 2 was associated with perceived progress at Time 2 ($\beta = 0.591$, $p < 0.001$). Self-efficacy belief at Time 1 significantly influenced perceived progress at Time 2 ($\beta = 0.130$, $p < 0.001$).

SEM 2 Self-efficacy Belief t1 → Metacognitive Strategies t2 → Perceived Progress t2
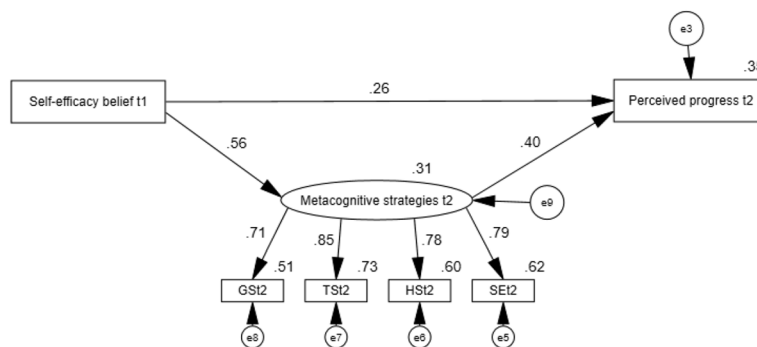
SEM 2 delineates the relationships between self-efficacy belief at Time 1, metacognitive strategies at Time 2, and perceived progress at Time 2 (Fig. 3). It supported the mediating role of metacognitive strategies on the relationship between self-efficacy belief and perceived progress. The findings in Table 6 shows that self-efficacy belief at Time 1 significantly influenced metacognitive strategies at Time 2 ($\beta = 0.561$, $p < 0.001$). Metacognitive strategies at Time 2 were associated with perceived progress at Time 2 ($\beta = 0.404$, $p < 0.001$). Self-efficacy belief at Time 1 significantly influenced perceived progress at Time 2 ($\beta = 0.263$, $p < 0.001$).

Table 6 Path loadings for SEM2

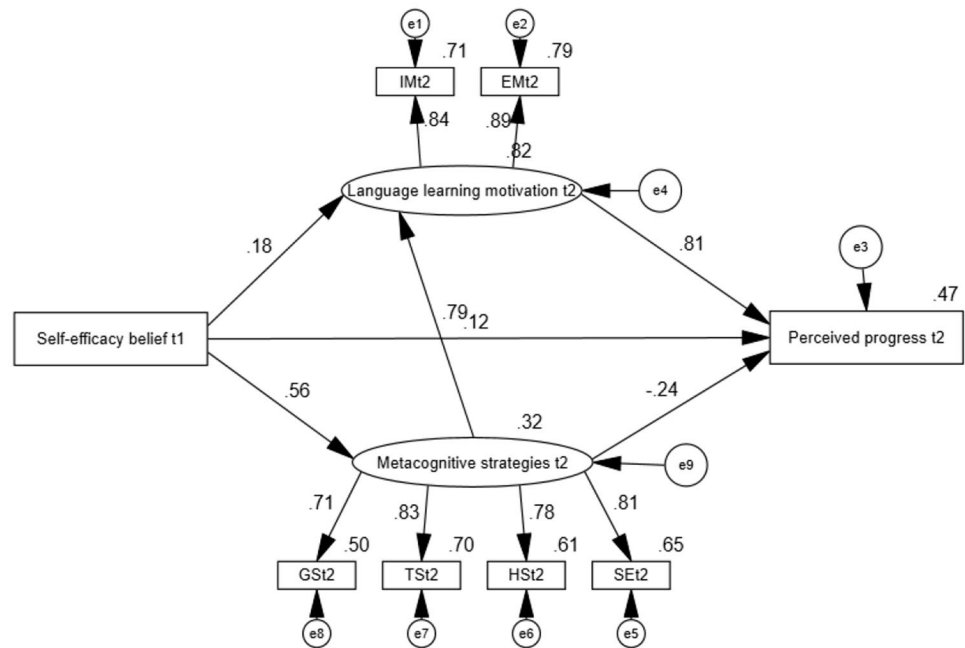| Path	Estimate	SE	C.R	P	β
MS t2 ← SEBt1	0.499	0.036	13.926	***	0.561
PP t2 ← SEBt1	0.298	0.047	6.411	***	0.263
SE t2 ← MS t2	1.000				0.787
HS t2 ← MS t2	0.969	0.048	20.020	***	0.776
TS t2 ← MS t2	0.950	0.043	22.106	***	0.854
GS t2 ← MS t2	0.878	0.048	18.169	***	0.713
PP t2 ← MS t2	0.516	0.058	8.880	***	0.404

SEB self-efficacy belief, *MS* metacognitive strategies, *PP* perceived progress, *GS* goal-setting, *TS* task strategies, *HS* help-seeking, *SE* self-evaluation, *t1* time 1 and *t2* time 2 ***$p < .001$

SEM 3 Self-efficacy Belief t1 → Metacognitive Strategies t2 → Language Learning Motivation t2 → Perceived Progress t2

We identified a longitudinal mediation pattern going from self-efficacy belief at Time 1 to language learning motivation, metacognitive strategies, and perceived progress at Time 2. SEM 3 tested the hypotheses about the mediating role of metacognitive strategies and language learning motivation in the relationship between self-efficacy belief and perceived progress (Fig. 4). Based on Table 7, self-efficacy belief at Time 1 significantly predicted perceived progress at Time 2 ($\beta = 0.119$, $p < 0.05$). Self-efficacy belief at Time 1 significantly influenced metacognitive strategies at Time 2 ($\beta = 0.562$, $p < 0.001$), and language learning motivation at Time 2 ($\beta = 0.177$, $p < 0.001$). Metacognitive strategies at Time 2 were associated with perceived progress at Time 2 ($\beta = -0.235$, $p < 0.05$). Language learning motivation at Time 2 significantly influenced perceived progress at Time 2 ($\beta = -0.807$, $p < 0.05$). Finally, metacognitive strategies at Time 2 were associated with language learning motivation at Time 2 ($\beta = -0.794$, $p < 0.05$).

Table 5 Path loadings for SEM1

Path	Estimate	SE	C.R	P	β
LLM t2 ← SEB t1	0.407	0.027	15.012	***	0.609
IM t2 ← LLM t2	1.000				0.806
EM t2 ← LLM t2	1.284	0.058	22.307	***	0.930
PP t2 ← LLM t2	1.002	0.078	12.884	***	0.591
PP t2 ← SEB t1	0.147	0.047	3.133	0.002	0.130

LLM language learning motivation, *SEB* self-efficacy belief, *IM* intrinsic motivation, *EM* extrinsic motivation, *PP* perceived progress, *t1* time 1 and *t2* time 2 ***$p < .001$

Fig. 3 The mediating role of metacognitive strategies on self-efficacy belief and perceived progress. (a) *GS* goal-setting, *TS* task strategies, *HS* help-seeking, *SE* self-evaluation; (b) *t1* = time 1 and *t2* = time 2

Note. (a) Goal-setting=GS; Task strategies=TS; Help-seeking = HS; Self-evaluation=SE; (b) t1 = time 1 and t2 = time 2.

Fig. 4 The mediating role of metacognitive strategies and language learning motivation on self-efficacy belief and perceived progress

Table 7 Path loadings for SEM3

Path	Estimate	SE	C.R	P	β
MS t2 ← SEB t1	0.514	0.036	14.244	***	0.562
LLM t2 ← SEB t1	0.124	0.023	5.274	***	0.177
LLM t2 ← MS t2	0.608	0.035	17.396	***	0.794
IMt2 ← LLM t2	1.000				0.844
EMt2 ← LLM t2	1.173	0.043	27.208	***	0.889
PPt2 ← LLM t2	1.308	0.212	6.167	***	0.807
PPt2 ← SEB t1	0.135	0.050	2.704	.007	0.119
SEt2 ← MS t2	1.000				0.809
HSt2 ← MS t2	0.948	0.044	21.311	***	0.780
TSt2 ← MS t2	0.902	0.039	23.237	***	0.835
GSt2 ← MS t2	0.845	0.045	18.769	***	0.706
PPt2 ← MS t2	− 0.292	0.149	− 1.966	0.049	− 0.235

LLM language learning motivation, *SEB* self-efficacy belief, *MS* metacognitive strategies, *PP* perceived progress, *GS* goal-setting, *TS* task strategies, *HS* help-seeking, *SE* self-evaluation, *IM* intrinsic motivation, *EM* extrinsic motivation

SEM 4 Self-efficacy Belief t1 → Language Learning Motivation t2 → Metacognitive Strategies → Perceived Progress t2

We also identified another longitudinal mediation pattern going from self-efficacy belief at Time 1 to language learning motivation, metacognitive strategies, and perceived progress at Time 2. Again, SEM 4 demonstrated the mediating role of metacognitive strategies and language learning motivation in the relationship between self-efficacy belief and perceived progress (Fig. 5). Table 8 shows the loading values

for the path. In particular, self-efficacy belief at Time 1 significantly predicted perceived progress at Time 2 ($\beta = 0.119$, $p < 0.05$). Self-efficacy belief at Time 1 did not significantly influence metacognitive strategies at Time 2 ($\beta = 0.008$, $p > 0.05$), but significantly influenced language learning motivation at Time 2 ($\beta = 0.623$, $p < 0.001$). Metacognitive strategies at Time 2 significantly influenced perceived progress at Time 2 ($\beta = − 0.235$, $p < 0.05$). Language learning motivation at Time 2 significantly influenced perceived progress at Time 2 ($\beta = − 0.807$, $p < 0.05$). Finally, language learning motivation at Time 2 significantly influenced metacognitive strategies at Time 2 ($\beta = − 0.888$, $p < 0.05$).

Discussion and Conclusion

The study examined the relationships among self-efficacy belief, metacognitive strategies, language learning motivation, and perceived progress in learning English under the online learning situation. The strengths of the study include the large sample size in the tertiary-level education and prospective design with validated scales. Although previous research has used indicators of metacognitive strategies, self-efficacy belief and language learning motivation (Teng et al., 2021; Teng & Yang, 2022), no longitudinal design has been developed to comprehensively capture the causal relationships of self-efficacy belief, language learning motivation, metacognitive strategies, and perceived progress in online English learning English. A few limitations should be cautioned: First, the current findings were interpreted based on self-reported data. Self-report bias may exist in

Fig. 5 The mediating role of language learning motivation and metacognitive strategies on self-efficacy belief and perceived progress
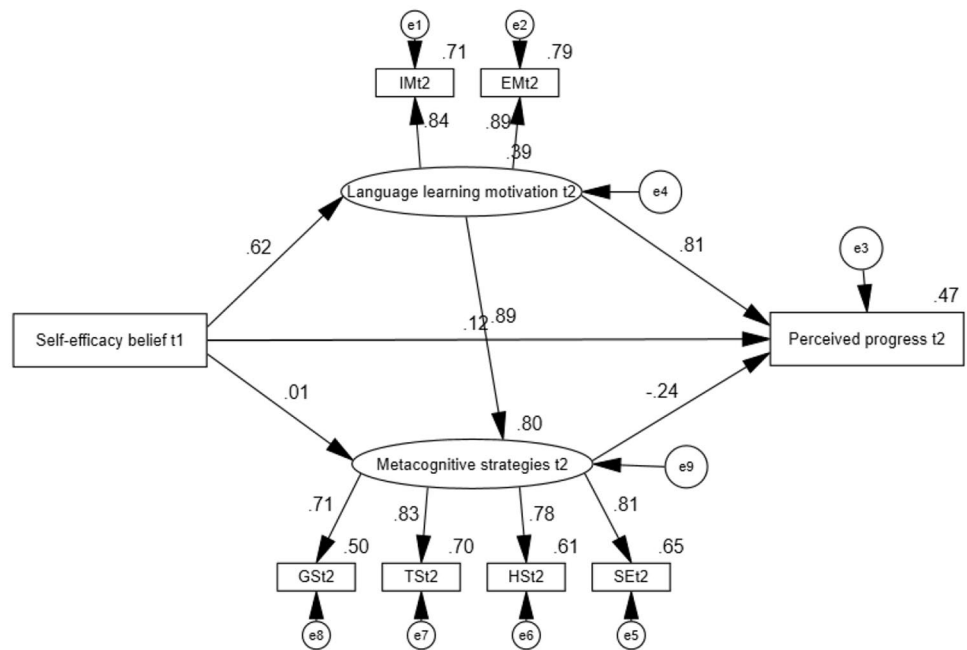
relation to common-methods variance. Second, data analyses were based on a quantitative method. Qualitative data can be triangulated with quantitative data to better understand students' online learning experiences. Finally, residual confounding might exist due to potential confounders that we did not include in the data collection, such as stressful life events and anxiety.

Our findings provide evidence of a tight connection between self-efficacy belief and perceived progress. The pattern points to the key role of self-efficacy belief, that is, students who perceived confidence in their capacity to

Table 8 Path loadings for SEM 4

Path	Estimate	SE	C.R	P	β
LLMt2←SEB t1	0.436	0.026	16.515	***	0.623
MS t2←SEB t1	0.008	0.035	.220	.826	0.008
MS t2←LLM t2	1.160	0.068	16.965	***	0.888
IM t2←LLM t2	1.000				0.844
EM t2←LLM t2	1.173	0.043	27.208	***	0.889
PP t2←LLM t2	1.308	0.212	6.167	***	0.807
PP t2←SEBt1	0.135	0.050	2.704	.007	0.119
SE t2←MS t2	1.000				0.809
HS t2←MS t2	0.948	0.044	21.311	***	0.780
TS t2←MS t2	0.902	0.039	23.237	***	0.835
GS t2←MS t2	0.845	0.045	18.769	***	0.706
PP t2←MS t2	− 0.292	0.149	− 1.966	.049	− 0.235

Note. *LLM* language learning motivation, *SEB* self-efficacy belief, *MS* metacognitive strategies, *PP* perceived progress, GS goal-setting, TS task strategies, HS help-seeking, SE self-evaluation, *IM* intrinsic motivation, *EM* extrinsic motivation

execute behaviors may be better able to deliver information and facilitate purposive use of information to self-regulate their learning behaviors or orchestrate actions for learning (Bandura & Schunk, 1981; Cho et al., 2017). The strengthened self-efficacy belief would decrease the sense of worry and anxiety, thus enhancing confidence in learners' competence to produce specific performance attainments (Wang et al., 2022). Enlightened from the findings that self-efficacy belief significantly predicts learners' perceived progress in English learning, students who felt strongly competent in English learning may achieve better learning progress. Corresponding with earlier arguments (Bandura, 1993, 1997), a strong sense of efficacy influences one's learning experience, including the goals, the amount of involvement or efforts expended toward goal achievement, and the likelihood of attaining a particular learning performance.

Results of the longitudinal mediation models suggested that self-efficacy belief predicted language learning motivation, which in turn predicted learners' perceived progress in English learning. This supports the mediating role of self-efficacy belief in the relationship between language learning motivation and learning progress (Teng et al., 2021). In addition, in line with previous studies (e.g., Kim et al., 2014), motivational variables, including intrinsic or extrinsic motivation, significantly predicted online learning. However, the results stand in contrast to prior work, wherein language learning motivation did not influence online learning outcomes (Lin et al., 2017). One potential reason may be the special online learning challenges facing these learners as they may find it difficult to motivate themselves in English learning under such a stressful situation and the isolated world,

as shown in learners' relatively lower scores in motivation (Table 1). Some students could have low motivation when taking courses online, and it reflects the correlation between self-efficacy, motivation, and perceived learning progress. Lin et al. (2017) argued that students' possible low motivation during online learning might be one reason that motivation did not predict online learning outcome in their study, but the current study yielded a different result and therefore a similar argument to Lin et al. (2017) fails to back up the current finding. We may need to consider that the mechanism(s) by which language learning motivation influences online English learning in the COVID-19 situation may be different from the mechanism(s) by which it operates in other online learning settings. As argued by Teng and Yang (2022), motivation may be intertwined with students' self-efficacy belief in the virtual learning setting under the COVID-19 situation. Therefore, teachers are suggested to help learners to foster an awareness of language learning motivation, which may help them manage symptoms, like lack of confidence or belief, thus enhancing their coping capabilities to maintain competence in online English learning.

The identified longitudinal mediation models also suggest the mediating role of metacognitive strategies on the relationship between self-efficacy belief and perceived progress in English learning. When learners understand the use of metacognitive strategies, they may be more likely to be aware of the problems and take control of learning. The findings highlight the importance of planning, goal-setting, self-evaluation, and information organizing on English learning, expanding knowledge to previous research conducted in face-to-face contexts (e.g., Teng, 2020). In the mode of online learning, metacognitive strategies are essential. As argued by Zimmerman (2008), learners need to plan, set goals for, monitor and evaluate their learning for a better outcome. However, it tends to be challenging for learners to develop metacognitive strategies without the guidance from their instructors. Despite the online mode of English language education, instructors should not expect student learning to occur naturally, but instead teacher support about metacognitive skills should be ensured. For example, pre-learning training sessions led by instructors at the start of online learning regarding the importance and cultivation of metacognitive strategies may be useful for learners.

Finally, the identified longitudinal mediation models also suggest the intertwined relationship between language learning motivation and metacognitive strategies. Low levels of motivation exhibited by our participants may have hindered their use of metacognitive strategies in online learning. In contrast, the lack of use of metacognitive strategies may lead to lower language learning motivation. The findings provide knowledge of what has not been known about language learning motivation and metacognitive strategies. Learners' strengthened language learning motivation allows them to be more self-determined, and consequently, adopt metacognitive strategies to be independent of teachers or others for their online learning. Again, the strengthened awareness of metacognitive strategies may lead to enhanced language learning motivation. In line with Teng et al. (2021), the low level of self-efficacy belief may be related to low motivation and metacognitive strategies. Future research of online language learning may thus pay additional attention to learners' level of motivation, and the use of metacognitive strategies. In addition, the unplanned and rapid move to online learning may result in learners' lower level of self-efficacy belief. It is essential to ensure learners' positive self-efficacy belief in regulating their self-regulated strategies and metacognitive skills to keep motivated and cope with the challenges in online English learning.

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