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Metacognitive Learning Strategies and English Language Proficiency of EFL Undergraduate Science Students: The Mediating Role of Self-efficacy

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Article information	
Abstract	This research aimed to study a direct positive effect of English self-efficacy on English language proficiency, a positive effect of metacognitive learning strategies on English self-efficacy, and an indirect effect of metacognitive learning strategies on English language proficiency with English self-efficacy as a mediator among 160 EFL undergraduate science students. Three research instruments were employed to collect data, namely, a questionnaire of English self-efficacy, a questionnaire of English self-regulated learning strategies, and an English exit exam. The data were analyzed by means of the structural equation model (SEM) with a second-order confirmatory factor analysis (CFA) using LISREL software. The findings confirmed a direct effect of English self-efficacy on English language proficiency, a positive effect of metacognitive learning strategies on English self-efficacy, and an indirect effect of metacognitive learning strategies on English language proficiency with English self-efficacy playing a mediator role among the participants.

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1. Introduction

Self-efficacy can be considered a non-cognitive factor that has been the topic of investigation in the field of cognitive psychology as well as language learning for decades. Such a factor is grounded in a self-efficacy theory which can be categorized as a subset of Bandura's (1986) social cognitive theory, a learning theory that focuses on learning from the social environment. According to the social cognitive theory, there is an interplay among personal, behavioral, and social or environmental factors (Schunk & DiBenedetto, 2023). Thus, based on the self-efficacy theory, which relies on a relation of the three factors, self-efficacy, referring to beliefs in individuals' capabilities to organize and execute necessary courses of action to attain a given goal (Bandura, 1997), is a personal construct that affects and is affected by behavioral and social or environmental constructs.

In the realm of English language teaching, self-efficacy has been explored in terms of its impact on a wide range of factors. Several researchers have investigated and reported on the role of self-efficacy on learners' English language achievements. This has been revealed in previous research at different educational levels and in different contexts. At a secondary level in a Korean setting, for instance, it has been found that self-efficacy from the second semester of eighth-grade students could positively predict the academic achievements for the first semester of ninth-grade and 12th-grade students (Hwang et al., 2015). Doordinejad and Afshar (2014) and Mahyuddin et al. (2006) have also reported positive correlations between students' self-efficacy with academics and their performance in the English language, in Iran and Malaysia, respectively. In

addition, at a tertiary level, Ayoobiyan and Soleimani (2015) have reported that Iranian students' self-efficacy was positively correlated with their language proficiency. Likewise, Kitikanan and Sasimonton (2017) have found a significant and positive correlation between English self-efficacies of four skills and English learning achievement among Thai university students. Distinctly, self-efficacy can be said to be associated with learners' progress in the English language, both their language proficiency and their language achievement.

While certain academicians have examined the effect of self-efficacy on related constructs, particularly learners' language success, quite a number of scholars have investigated the impact of associated factors on learners' self-efficacy. Among such a range of factors, metacognitive learning strategies, as part of self-regulated learning strategies, have gained attention among English language scholars. Based on the social cognitive learning theory, self-regulated learning is known as the process by which language learners use a variety of strategies, including metacognitive learning strategies, to regulate and control their own learning and performance (Zimmerman & Kitsantas, 1999). Pintrich et al. (1991) have mentioned that metacognitive strategies encompassing planning, monitoring, and regulating place an emphasis on learners' awareness and control of cognitive processes. Thus, according to the theory, the strategies can be referred to as a set of self-regulated learning strategies that help learners evaluate their own behaviors and select their effective learning behaviors to enable them to achieve success in a language task (Conley, 2014).

Due to their significance on learners' language learning process, metacognitive learning strategies have been stated with reference to their association with as well as their influence on learners' self-efficacy. To illustrate, in a social cognitive model of self-regulated learning, the self-regulatory processes are linked to several variables, including self-efficacy. Self-regulated students contain intrinsic motivation and self-satisfied beliefs (Pintrich & Schunk, 2002), which can result in 'mastery experiences,' the main source of efficacy information

(Bandura, 1977). The students thus use more cognitive and metacognitive learning strategies and believe in their own capabilities. This enables them to better achieve their goals and enhance their efficiency. The explanation corresponds with Pintrich and De Groot's (1990) discovery that students with greater self-regulatory strategy use had higher levels of intrinsic motivation and self-efficacy. In summary, self-regulated learning strategies, which consist of metacognitive learning strategies, are among the major factors that contribute to learners' self-efficacy beliefs.

As documented in relevant research, the findings show how metacognitive learning strategies, as a main type of self-regulated learning strategies, affect English self-efficacy. In the EFL context, at a university level, the correlation between online self-regulated English learning and the English language self-efficacy of Chinese students has been confirmed (Yu et al., 2018). It was also found that self-evaluation could be considered the most powerful indicator of the students' variance of self-efficacy in English listening, speaking, and reading. In the same way, the results gained from the study conducted by Lee et al. (2021) demonstrate that there was a statistically significant difference in the use of self-regulated learning strategies between international college students who had high self-efficacy and those who had low self-efficacy. Besides, in China, Zhang (2024) found that college students' self-regulation learning strategies enhanced their English language self-efficacy and desire for language acquisition. In conclusion, it is clear that metacognitive learning strategies, a subset of self-regulated learning strategies, have an influence on English language learners' self-efficacy.

Despite the vital role of metacognitive learning strategies on self-efficacy, using the strategies can be problematic among Thai university students. It was discovered that non-English major students employed metacognitive learning strategies at a moderate level (Zhang & Sukying, 2022). In addition, Thongwichit (2018) found that less successful readers used less metacognitive reading strategies than successful readers. It was also found that although both high-

proficiency and low-proficiency students could use metacognitive knowledge to accomplish speaking tasks, the low-proficiency learners' task knowledge still needed further training (Thawarom et al., 2022). This highlights how Thai undergraduate students have difficulties in using metacognitive learning strategies.

With respect to the significance of self-efficacy on learners' language learning processes, the factor has been widely explored with regard to its relation with learners' English language proficiency. Yet, in Thailand, English language instruction can lead to low English self-efficacy among students. Siritararatn (2013) found that Thai university students' English self-efficacy was low due to their unsuccessful previous experiences. Narupoljirakul (2021) also discovered that university students' self-efficacy depended on their success or failure in the past. The results show how negative learning experiences can cause undergraduate students' low self-efficacy in the Thai scenario.

To overcome this limitation, the present study aimed to investigate the role of English self-efficacy on the English language proficiency of EFL undergraduate students in the setting of Thailand as well as the influence of metacognitive learning strategies, as a type of self-regulated learning strategies, on the students' English self-efficacy. Besides, in order to better probe the effect of metacognitive learning strategies on students' language learning process, the current research highlighted an indirect impact of metacognitive learning strategies on the English language proficiency of EFL undergraduate students through their English self-efficacy.

1.1 Research objectives

The objectives of the study were 1) to explore the direct positive effect of English self-efficacy on English language proficiency of EFL undergraduate science students, 2) to examine the positive effect of metacognitive learning strategies on English self-efficacy of EFL undergraduate science students, and 3)

to study the indirect effect of metacognitive learning strategies on English language proficiency of EFL undergraduate science students through their English self-efficacy.

1.2 Hypothesis

H1: English self-efficacy has a direct effect on the English language proficiency of EFL undergraduate science students, indicating that the students with higher levels of self-belief in their English abilities exhibit greater English language proficiency.

H2: Metacognitive learning strategies have a direct effect on the English self-efficacy of EFL undergraduate science students, indicating that the students who employ more effective metacognitive strategies demonstrate higher levels of self-belief in their English abilities.

H3: Metacognitive learning strategies have an indirect effect on the English language proficiency of EFL undergraduate science students through their English self-efficacy. The more students use effective metacognitive learning strategies, the more confident they feel in their English self-efficacy, and this in turn leads to better English language proficiency.

2. Literature Review

2.1 The social cognitive learning theory

The social cognitive learning theory can be traced back to the social cognitive learning theory proposed in the 1960s by Albert Bandura. Regarding the social learning theory (Bandura, 1977), human beings are active processors of information, and they acquire new behaviors by means of the observation and imitation of others' behaviors. That is why the theory emphasizes a relationship between human behaviors and their consequences (Mcleod, 2024). In 1986, the notion of the social learning theory was developed and expanded into the social cognitive learning theory (Bandura, 1986) which concentrates on learning that occurs in a particular social context through the reciprocal interaction of the person, environment, and behavior. Based on the theory, the focus has been

directed to social influence as well as external and internal social reinforcement. As a result, the theory takes into account how individuals learn and maintain their behaviors within the influence of the social environment, particularly their past experiences that have an impact on reinforcements and expectations. This involves their decision to perform and maintain a certain behavior eventually.

Since the social cognitive learning theory aims to explain in what way individuals regulate their behaviors via control and reinforcement to achieve their goals, six constructs have been established (Bandura, 1977; Bandura, 1986): 1) reciprocal determinism, with three sub-components: learned experiences, external social context, and behavior that concerns; 2) behavioral capability, or an individual's actual ability to perform a behavior on the basis of necessary skills and knowledge; 3) observational learning, or how an individual observes and learns from others' behaviors; 4) reinforcements, which refer to internal and external responses to an individual's behavior; 5) expectations, or how an individual anticipates the consequences of his or her behavior; and 6) self-efficacy, which refers to the degree of an individual's confidence in his or her ability to succeed in the performance of a behavior.

By virtue of the six constructs of the theory, the social cognitive learning theory has led to implications for teaching and learning in a wide range of fields, including teaching English as a foreign language. First, creating a learning environment could be a method that helps encourage students' learning processes (Main, 2023). Besides, reinforcement, such as rewards, one of the focused on theoretical issues, can be applied to enhance students' behavioral capability and observation learning (Nabavi & Bijandi, 2023). Also, self-efficacy, which is a new central idea of theory, plays a vital role in determining a behavioral change, and its applications in instruction can be seen in existing research studies as well as related training on fostering self-efficacy competencies (Bembenutty ei al., 2016).

To conclude, the social cognitive learning theory is a learning theory that highlights the interplay among various types of factors: personal, behavioral, and social. It addresses how such an interaction influences individuals' learning. The theory consists of key features including reciprocal determinism, behavioral capability, observational learning, reinforcements, expectations, and self-efficacy. The concentration on the elements has caused its pedagogical implications, particularly the creation of an environment that helps learners better master their learning by means of observational learning, reinforcements, and self-efficacy beliefs.

2.2 Self-efficacy

The term 'self-efficacy' was first coined by Albert Bandura (1977), an influential psychologist and professor working at Stanford University. It is defined as an individual's set of beliefs that influences the likelihood of accomplishing a particular task in a certain situation (Bandura, 1977). Simply put, self-efficacy is an individual's belief in his/her capacity that that he/she is able to succeed in a prospective situation. According to Bandura (1977, 1986, 1997), self-efficacy helps portray how confident an individual is to control his/her motivation, behavior, and social environment in a circumstance. Such confidence has an impact on the actions which include the goals to attain and the attempts made to achieve the goals.

From the perspective of Bandura (1977), self-efficacy beliefs result from four major sources of influence: mastery experiences, vicarious experiences, social persuasion, and emotional and physiological states. Mastery experiences can be referred to as performance outcomes. It is the most prominent source of efficacy and is caused by an individual's previous performance involving a new successful experience. Vicarious experience concerns observing others complete a task and experience success. These social role models can be members of the family, friends, and teachers. Social persuasion refers to positive verbal feedback an individual receives when performing a complicated task. This can persuade

him/her to believe in the ability to succeed in the task. The last source of influence is emotional and physiological states which are connected with the emotional, physical, and psychological well-being of an individual.

Self-efficacy has been investigated in terms of its relationship with, as well as its impact on, students' academic performance in various fields of study, including teaching English as a foreign language. At a university level, Ayoobiyan and Soleimani (2015) found that the self-efficacy of 120 Iranian medical science students was positively linked to their English language proficiency. This corresponds with what was reported by Apridayan and Teo (2021) that the self-efficacy of 215 first-year Thai students was positively correlated with the level of their four skills of English. To elaborate, students of both B1 and B2 CEFR levels had a high extent of self-efficacy, while students of A1 and A2 CEFR levels exhibited a moderate extent of self-efficacy. In addition, Kitikanan and Sasimonton (2017) reported a significant and positive relationship between English self-efficacy beliefs of four skills and English learning achievement among 32 Thai fourth-year university students. The higher the students' English self-efficacy was perceived, the higher the English language achievement they obtained. The findings aligned with Truong and Wang's (2019) discovery that there was a positive relationship between self-efficacy and English language proficiency among 767 Vietnamese first-year college students.

However, in Thailand, the English language learning process can cause undergraduate students to have low English self-efficacy. Siritararatn (2013) investigated students' English self-efficacy at a public university by using questionnaires and interviews. The findings showed that the students' failure in English learning experiences at elementary and secondary schools might influence their self-efficacy. Similarly, Narupoljirakul (2021) explored the sources of English self-efficacy of 405 undergraduate students and found that mastery experience was a strong indicator of their self-efficacy. Those findings reveal how

unsuccessful English learning experiences can result in Thai students' low self-efficacy (Apridayan & Teo, 2021).

In summary, self-efficacy refers to one's confidence in the ability to achieve an academic goal. It arises from several sources of influence. More exactly, it involves an individual's new successful experiences, how he/she observes others' promising experiences, praise gained from others, and his/her emotional and physiological well-being. Self-efficacy has been widely stated as a factor that affects or is associated with learners' language progress as disclosed in prior related literature in various educational levels, particularly, at a university level. Yet, previous studies reflect on how Thai undergraduate students' low self-efficacy can result from their English learning process, especially failure in their learning experiences.

2.3 Metacognitive learning strategies

Metacognition refers to thinking about one's own thinking (Jaleel & Premachandran, 2016). Learners who have metacognitive learning strategies can think about their own thoughts. Thus, they can plan, monitor, and evaluate their learning process in order to effectively achieve an academic goal (Herlanti et al., 2019). According to Sword (2021), metacognitive learning strategies are a vital tool in creating effective learning which can lead to satisfying learning outcomes. The strategies hence play a significant part in shaping autonomous learners by means of self-regulated learning. Metacognitive learning strategies are also an important factor that can be used by an instructor to see how well students understand their learning process and how they regulate their learning. The understanding helps the instructor be able to design an appropriate learning environment to support them.

Metacognitive learning strategies have originated from 'learning strategies' referring to "actions, behaviors, steps, or techniques students use, often unconsciously, to improve their progress in apprehending, internalizing, and using

the L2" (Oxford, 1994, p. 1). The notion of learning strategies was developed in the 1980s and early 90s, and a significant amount of research has focused on the categorization of such strategies. As for English language teaching, the classification of language learning strategies proposed by O'Malley and Chamot (1990) has been well-received. The classification covers both language learning strategies in general and language sub-skills strategies in particular. Based on the taxonomy, language learning strategies have been divided into three categories: cognitive, metacognitive, and socio-affective. Among the three, metacognitive learning strategies involve planning for an individual's learning, thinking about his/her own learning processes, monitoring the production or comprehension, and evaluating the learning when that certain task is accomplished.

Metacognitive learning strategies as a main division of language learning strategies have been said to make a fruitful contribution to learners' advancement in their language learning. The strategies help learners regulate their learning process through planning, controlling, and evaluating their own learning (Graham, 1997). Besides, according to Shannon (2008), learners who have such a self-regulation process can become autonomous learners who have the ability to control and manage their thinking and to place them in the right direction, which supports their learning progress in the long run. Furthermore, metacognitive awareness influences learners' cognitive learning. In other words, it enables learners to develop cognitive strategies that encompass sets of mental processes allowing them to eventually achieve an academic goal (Anderson, 2002).

During the 1980s and early 90s, metacognitive learning strategies were discussed and incorporated as one of the major sets of self-regulated learning strategies. Grounded on the social cognitive learning proposed by Bandura (1986), metacognitive learning strategies have been accounted for as one of the three main components of self-regulated learning strategies (Mannion, 2018) which concern how individuals' cognitive processes work. To be specific, self-regulation relies on three main subfunctions: self-monitoring (monitoring an individual' s own

performances), standard setting (evaluating their behavior with reference to their standards), and evaluative judgment (making a judgment on their performances) (Bandura, 1991). Self-regulation thus revolves around the process of affecting the external environment on the basis of individuals' emotions and behavior (Bandura, 1986). Metacognition as a subset of self-regulation involves the process of controlling and monitoring thoughts to achieve a goal in a particular situation (Flavell, 1979).

Previous studies in English language teaching at a tertiary level have revealed a relationship between metacognitive learning strategies as part of self-regulated learning strategies and students' language proficiency. Zahidi and Ong (2023) have discovered that there was a relationship between self-regulated learning strategies and English language proficiency of five first-year ESL undergraduate learners in a Malaysian context. Specifically, the students focused on employing a self-evaluation strategy by using self-reflection for their learning progress. In addition, self-regulated learning strategies, comprising metacognitive learning strategies (self-evaluation, goal-setting, and planning), could predict 215 Thai EFL undergraduate students' English language proficiency (Apridayani & Teo, 2021).

In Thailand, undergraduate students have to cope with difficulties in using metacognitive learning strategies. In a research study undertaken by Zhang and Sukying (2022), the data obtained from a questionnaire showed that non-English major students used metacognitive learning strategies (planning, monitoring, and evaluating strategies) at a moderate level at 76.20% 73.60%, and 61.20%, respectively. Besides, according to the analysis made from the interviews, Thai EFL university learners were not proficient users of metacognitive learning strategies. This is consistent with another previous study revealing that both learners and test-takers did not use metacognitive learning strategies to a large extent, particularly when compared with cognitive learning strategies (Sukying, 2021). According to O'Malley and Chamot (1990), metacognitive learning

strategies are not usually used in the initial learning stage, and this helps explain why Thai university students were not proficient in using such strategies.

In brief, metacognitive strategies can be defined as thinking about an individual's own thoughts. These strategies concern those that learners use in planning, monitoring, and evaluating their own learning process so that they can accomplish an academic task. Metacognitive strategies can be considered a sub-type of language learning strategies. Also, such self-regulated learning strategies have been cited in the aforementioned Bandura's social cognitive learning theory as being a factor in how learners direct their own learning in a certain situation. Consequently, such strategies have been explored in terms of their impact on, or association with, language learners' success. Nevertheless, although research results prove the influence of metacognitive learning strategies on learners' language abilities, related studies disclose the low use of metacognitive learning strategies among undergraduate students in Thailand.

2.4 Metacognitive learning strategies and language learning success with self-efficacy as a mediator

Metacognitive learning strategies as a type of self-regulated learning strategy have a vital role in language learners' positive performance, and this has been shown in a number of research studies. Besides, metacognitive learning strategies have an association with non-cognitive factors, particularly self-efficacy. In the EFL context, the correlation between online self-regulated English learning and the English language self-efficacy of Chinese university students was confirmed (Yu et al., 2018). The results are in line with those discovered by Ozer (2021) that there was a positive relationship between self-regulation (with metacognitive learning strategies, namely, evaluating the information and comparing it to norms as well as assessing the plan's effectiveness) and foreign-language self-efficacy among 344 EFL Turkish learners attending a one-year preparatory program at a state university.

An interplay between metacognitive learning strategies and self-efficacy is quite clear. On the one hand, self-efficacy impacts how individuals think, feel, and behave, which affects how they regulate their own thinking (Šafranj, 2019). Kahraman and Sungur (2011) found that 115 Turkish elementary students reporting on their self-efficacy in science tended to employ their metacognitive strategies at higher levels. Likewise, Sungur (2007) affirmed that self-efficacy was one of the predictors of 391 high school students' metacognitive strategy use. On the other hand, metacognitive learning strategies affect self-efficacy. Pintrich and Schunk (2002) state that self-regulated students have intrinsic motivation and self-satisfied beliefs, and this leads to their mastery experiences which is a key to efficacy (Bandura, 1977). Similarly, Šafranj (2019) explains that metacognitive learning strategies, especially planning and self-evaluating, are significant mechanisms contributing to enhancing self-efficacy. Other evidence from research can be seen from Yu et al. (2018) who demonstrates that self-evaluation, a component of online self-regulated English learning, could be the most powerful predictor of Chinese university students' variance of self-efficacy in English listening, speaking, and reading.

Related literature has depicted a close relationship between metacognitive learning strategies, as well as the effects of metacognitive learning strategies on learners' self-efficacy and vice versa. In addition to the direct impact of metacognitive learning strategies on learners' language proficiency, their indirect effects on language learners' achievements should also be investigated. Nonetheless, little attention has been focused on the role of metacognitive learning strategies on students' English language proficiency through their use of English self-efficacy as a mediator. Besides, the literature review shows how undergraduate Thai students' low English self-efficacy can be caused by the negative experiences gained through their English language learning. Consequently, to bridge the gap in developing students' self-efficacy and English language proficiency, the present study aimed to explore the indirect impact of

metacognitive learning strategies on Thai undergraduate students' English language proficiency with English self-efficacy as a mediator.

3. Methodology

3.1 Research design and research setting

The present study was founded on descriptive inferential research which was undertaken at a public university in Thailand. This public university aims to provide educational and scientific services and create graduates who have expertise in science and technology for the labor market.

3.2 Participants

The participants of the study were 160 science students at a public Thai university who were in the final year of their studies who took part in the study on a voluntary basis. They were informed of the study process and signed the consent form before the data were collected. The participants took a batch of the English Exit Exam administered in the Academic Year 2022. The exam was organized monthly to reveal their English language abilities and knowledge based on the Common European Framework References (CEFR). This was implemented on a mandatory basis according to the announcement made by the Office of the Higher Education Commission (2016) with the aim to better equip Thai undergraduate students all around Thailand with more advanced English language proficiency. Of the 160 participants, 70 students (43.75%) were male, and 90 students (56.25%) were female, and their ages ranged from 20 to 21 years old. The grade point average (GPA) of the participants was between 2.50 and 3.15, with the mean of 2.82.

3.3 Research instruments

The research instruments comprised 1) the questionnaire of English self-efficacy (QESE), 2) the questionnaire of English self-regulated learning strategies (QESRLS), and 3) the English exit exam (EEE).

1) The Questionnaire of English Self-Efficacy (QESE)

The questionnaire of English self-efficacy (QESE) was selected to reflect the English self-efficacy of the science students who participated in the study. The scale was developed by Wang and Bai (2017) to portray learners' self-efficacy in the four skills of English language: listening, speaking, reading, and writing. This is the version revised from that implemented in the Korean and Chinese settings (Wang et al., 2013; Wang et al., 2014) which still lacked difficult items used to measure a sample with a range of English language proficiency. The latest version of the scale (Wang & Bai, 2017) demonstrated its satisfactory validity and reliability as a statistical proof. The questionnaire was selected since it was developed to be used in China where English is a foreign language, similar to the context of the current study. In this study, the questionnaire was adapted to suit the Thai context and was translated into Thai to avoid language barrier issues. It included 32 items, eight items for each of the four skills of English (listening, speaking, reading, and writing). The participants were asked to judge their own abilities to achieve an academic task in English. Before it was used in the main study, the questionnaire was reviewed by a panel of three experts in the fields of English language instruction and English language assessment and evaluation to ensure its content validity and language appropriateness. It was also tried out with 40 business students who had similar characteristics to those of the participants of the present study. The internal consistencies (Cronbach's alpha) for the questionnaire were 0.96 (all items), 0.93 (listening), 0.92 (speaking), 0.91 (reading), and 0.91 (writing), which corresponded with the range for the Cronbach alpha test of the reliability of a questionnaire that should be equal to or above 0.7 (Cortina, 1993).

2) The questionnaire of English self-regulated learning strategies (QESRLS)

The questionnaire of English self-regulated learning strategies (QESRLS) was developed by Wang and Bai (2017) and was used in this study to elicit data regarding the students' use of metacognitive learning strategies. Only Category 7: Record keeping and monitoring and Category 9: Goal setting and planning were chosen to reflect students' metacognition (Jaleel & Premachandran, 2016).

Category 7: Record keeping and monitoring comprised two items: 1) write down the mistakes I often make in the process of studying English and 2) take notes in English classes. Category 9: Goal setting and planning consisted of four items: 1) set a goal to study English; 2) make a study plan in the process of studying English; 3) when a friend wants to play with me but I have not finished my homework yet, I do not play with him/until I finish my homework; and 4) find a quiet place when the environment is disturbing. It can be seen that the items under the two categories fit the definition of the metacognitive learning strategies which involve monitoring and planning learners' process. The Thai version of the questionnaire was reviewed by a panel of three experts in English language instruction and English language assessment and evaluation to ensure its content validity and language appropriateness. When the questionnaire was tried out, its internal consistency (Cronbach's alpha) was 0.91, which was considered acceptable (Cortina, 1993).

The metacognitive learning strategies of the participants were assessed using a two-factor questionnaire: Goal Setting and Planning and Record Keeping and Monitoring. Initially, the questionnaire comprised six items—four for Goal Setting and Planning and two for Record Keeping and Monitoring. However, the second-order confirmatory factor analysis (CFA) revealed that two items from the Goal Setting and Planning category had overlapping meanings. Specifically, one of these items exhibited an exceptionally high factor loading, while the others demonstrated considerably lower loadings, leading to a poor overall factor structure. To address this issue, the second overlapping item in the Goal Setting and Planning category was removed, resulting in an improved model fit with more balanced factor loadings across the remaining items. The final structure consisted of three items for the Goal Setting and Planning category and two items for the Record Keeping and Monitoring category. This revision improved the overall construct validity and internal consistency of the instrument.

3) The English exit exam (EEE)

The English exit exam (EEE), an in-house exam, was used to demonstrate the English language proficiency of the final-year students before their graduation. The exam consisted of 80 multiple-choice items covering 20 items for each of the four parts: grammar, reading, writing, and speaking (Language Function), which were written to align with the B1 (Threshold - Independent User Level) level of the Common European Framework of Reference for Languages (CEFR) descriptors (Council of Europe, 2020). The writing part contained the test items measuring students' sub-writing skills (writing an application letter, e.g. salutation, purpose of writing, and word choice related to job application, and writing a complaint letter, e.g. changing formal language to informal language, opening, and complimentary close). The speaking part included items emphasizing language functions, such as expressing feelings and emotions as well as describing places and experiences. The two parts then employed indirect writing and speaking assessment methods.

The EEE was examined by a panel of three experts in English language assessment and evaluation to confirm its content validity and language appropriateness before its administration among the study participants.

3.4 Data collection and data analysis

The hard copies of the QESE, the QESRLS, and the EEE were distributed to the science students in the 2022 academic year. Then, the data obtained were analyzed using a structural equation model (SEM) to examine the causative relations between the latent variables as expressed in the three hypotheses mentioned above. So as to conduct the SEM analysis, a second-order confirmatory factor analysis (CFA) was performed using LISREL software.

4. Findings

Table 1

The Measurement Model

Variables	L	SE	Z	λ	R^2
Metacognitive learning strategies	**ρ=0.91, AVE=0.57, α=0.81**				
Goal Setting and Planning	0.95	0.30	3.16	0.79	0.52
ρ=0.86, AVE=0.43					
Item 1	0.45	0.10	4.38	0.54	0.29
Item 3	0.62	0.14	4.54	0.76	0.57
Item 4	0.49	0.10	4.67	0.65	0.43
Record Keeping and Monitoring	0.79	0.20	3.89	0.72	0.62
ρ=0.96, AVE=0.76					
Item 1	0.79	0.11	7.41	0.85	0.72
Item 2	0.88	0.13	7.04	0.89	0.80
Self-efficacy	**ρ=0.97, AVE=0.76, α=0.94**				
Listening	0.65	0.05	12.32	0.81	0.66
Speaking	0.80	0.05	15.54	0.93	0.88
Reading	0.64	0.05	12.12	0.80	0.64
Writing	0.85	0.06	15.60	0.94	0.88
English language proficiency	**ρ=0.91, AVE=0.54, α=0.81**				
Grammar	2.37	0.22	11.04	0.80	0.65
Reading	2.41	0.23	10.68	0.79	0.62
Writing	1.77	0.23	7.57	0.60	0.35
Speaking (Language Function)	3.04	0.31	9.84	0.74	0.54
Chi-Square=68.95, df=59, CFI=0.99, TLI=0.99, RMSEA=0.032, SRMR=0.047					

The structural equation model (SEM) was assessed for its fit to the data. The comparative fit index (CFI) and Tucker-Lewis index (TLI) were employed to evaluate the model's goodness of the fit, and the root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were utilized to assess the model's fit.

The CFI and TLI values were both indicative of excellent model fit, with the values of 0.99 and 0.99, respectively, surpassing the recommended threshold of 0.90. These indices suggest that the hypothesized model adequately reproduced the observed covariance structure in the data.

The RMSEA value, along with its associated 90% confidence interval (CI), provided further insight into the model fit. With an RMSEA of 0.032 and a narrow confidence interval (0.000-0.060), the model demonstrated a close fit to the data. The p-value associated with the RMSEA null hypothesis (H0: RMSEA ≤ 0.050) was 0.830, which indicated that the model's RMSEA was within an acceptable range.

The SRMR, another measure of discrepancy between the observed and model-implied covariance matrices, yielded a value of 0.047, indicating a good fit as it fell below the conventional cutoff of 0.08.

Hence, these fit indices suggest that the proposed structural equation model provided a satisfactory representation of the relationships among the latent variables in the current study. The model exhibited an excellent fit to the data and served as a suitable framework for the investigation of the mediating effect of metacognitive learning strategies on students' English language proficiency through their English self-efficacy.

Table 1 presents the endorsement of the hypothesized model which showcases the second-order confirmatory factor analysis (CFA) for metacognitive learning strategies. Notably, all loadings exceeded the threshold of > .50, signifying statistical significance. Although each latent variable achieved an average variance extracted (AVE) exceeding 0.50, it was worth noting that the AVE for metacognitive learning strategies, the first-order construct of metacognitive learning strategies, fell slightly below this threshold. Nonetheless, this observation confirmed its convergent validity (Fornell & Larcker, 1981). Furthermore, the AVEs exceeded the square of the correlation between the corresponding pair of the construct

variables, which affirmed its discriminant validity as stated by Anderson and Gerbing (1988) and Fornell and Larcker (1981). Besides, the composite reliability scores exceeded 0.80, with the coefficient alphas above 0.70, indicating acceptable reliability.

Table 2

Hypothesis Testing

Direct Effect		**B**	**SE**	**Z**	β	**R^2**
Exogenous	**Endogenous**					
English self-efficacy	English language proficiency	0.36	0.08	4.48	0.43	0.19
Metacognitive learning strategies	English self-efficacy	0.87	0.18	4.95	0.66	0.43
Indirect Effect						
Metacognitive learning strategies	English language proficiency	0.31	0.08	4.05	0.28	

Structural equation modeling (SEM) was conducted to examine the three proposed hypotheses. According to Table 2, the analysis confirmed the significant findings supporting the hypothesized relationships, as follows:

First, there was a significant positive path from the participants' English self-efficacy to their English language proficiency ($\beta = .43$, $p < .01$), providing empirical support for the H1. This signified that the students' confidence in their English language abilities and knowledge positively influenced their overall proficiency in the language.

Second, the students' metacognitive learning strategies exhibited a positive effect on their English self-efficacy ($\beta = .066$, $p < .01$), validating the H2. This indicates that the use of effective metacognitive strategies could contribute to the students' confidence in their English language skills and knowledge.

Third, the analysis revealed that the influence of the students' metacognitive learning strategies on their English language proficiency was partially mediated by English self-efficacy, with an indirect effect of $\beta = .28$ ($p < .01$). Therefore, the H3 was supported, suggesting that the metacognitive learning strategies indirectly enhanced their English language proficiency by boosting the students' self-efficacy in English.

Figure 1

The Mediating Role of Self-efficacy

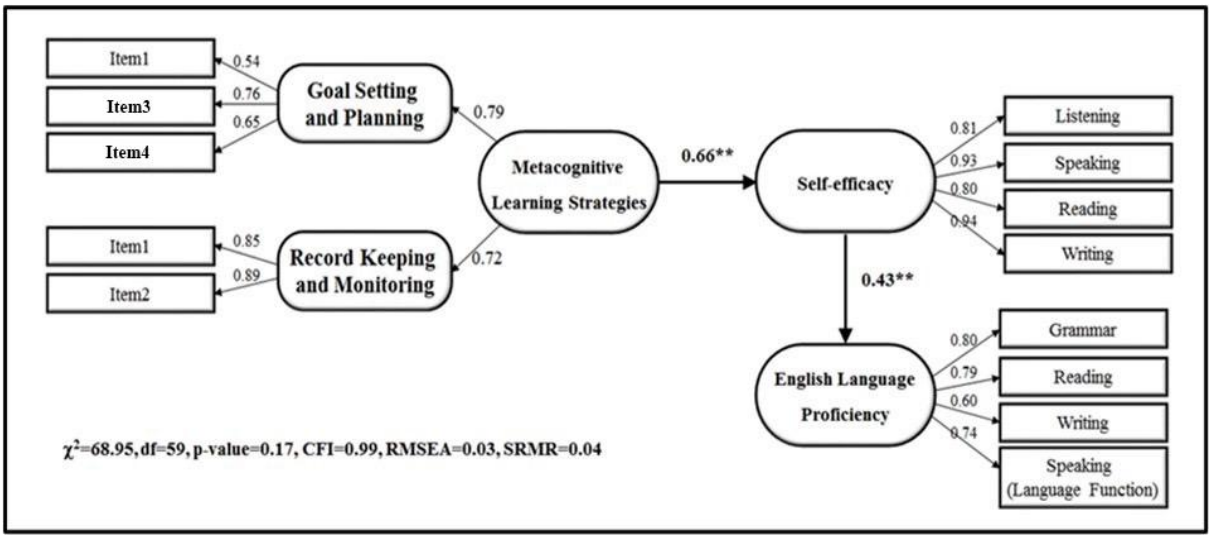

Figure 1 depicts the standardized path coefficients along with their significance levels and the role of metacognitive learning strategies on English language proficiency of EFL undergraduate students, with the mediating role of self-efficacy, highlighting significant paths ($\beta = 0.66$, $\beta = 0.43$). The model demonstrates excellent fit indices (CFI = 0.99, RMSEA = 0.03). This highlights the critical role of self-efficacy in enhancing the impact of metacognitive strategies on language proficiency.

5. Discussion

The finding showed that English self-efficacy had a direct effect on the English language proficiency of the participants. The significant positive path from the participants' English self-efficacy to their English language proficiency

revealed that the students' belief in their English language abilities and knowledge had a positive impact on their overall language proficiency. As Bandura (1994) explains, self-efficacy is specified to a particular task, and it aligns with specific levels of learners. It also affects individuals' psychological states, behaviors, and motivation (Bandura, 1997). Consequently, those who are confident in their capabilities tend to have belief in the outcomes they would attain, and that is why they have control over their traits assisting them to overcome any challenges they face while accomplishing a language task (Graham, 2022). Such a finding was in congruence with findings of several previous studies. For example, Apridayan and Teo (2021) have confirmed a positive correlation between the self-efficacy of 215 first-year Thai students and the level of their English language proficiency in four skills. B1- and B2-CEFR level-students had a high degree of self-efficacy, whereas A1- and A2-CEFR level-students had a moderate degree of self-efficacy. Correspondingly, as Kitikanan and Sasimonton (2017) have disclosed, there was a significant and positive relationship between English self-efficacy in the four English skills of 32 fourth-year university students in Thailand and their English learning achievement. In other words, students with higher English self-efficacy tended to have higher English language achievement. The findings are also in line with those reported by Truong and Wang (2019) which revealed a positive relationship between self-efficacy and English language proficiency among 767 first-year college students in the Vietnamese setting.

Moreover, it was found in this study that metacognitive learning strategies had a positive direct effect on the English self-efficacy of EFL undergraduate students, indicating that students who employed more effective metacognitive strategies had higher levels of self-belief in their English abilities. The finding suggested that the use of effective metacognitive strategies influenced the students' confidence in their English language skills and knowledge. This reflects the role of metacognitive learning strategies which embrace how individuals are thinking about their thinking (Jaleel & Premachandran, 2016). The skills could shape their awareness of their own thinking processes which are important factors

in developing their critical thinking, leading to progress in their language learning (Rivas et al., 2022). With reference to their significance, metacognitive learning strategies helping equip learners with language learning strategies have been incorporated into self-regulated learning as one of the three main components alongside motivation and learning strategies (Zimmerman, 1990). As a sub-set of self-regulated learning strategies, metacognitive learning strategies have a crucial role in controlling individuals' cognitive processes and their learning behaviors (Corno, 1986).

Similarly, in a Chinese context, besides a correlation between online self-regulated English learning and the English language self-efficacy of students, Yu et al. (2018) found that self-evaluation, one component of online self-regulated English learning, was the most powerful indicator of the students' variance of self-efficacy in English listening, speaking, and reading. Additionally, Lee et al. (2021) have reported that there was a statistically significant difference in the use of self-regulated learning strategies between international college students having high self-efficacy and those having low self-efficacy. Likewise, Zhang (2024) found that Chinese college students' self-regulation learning strategies enhanced their English language self-efficacy and desire for language acquisition.

In addition, metacognitive learning strategies were found to have an indirect effect on the English language proficiency of EFL undergraduate students through their English self-efficacy. In other words, the more students used effective metacognitive learning strategies, the more confident they felt in their English self-efficacy, and this in turn led to their better English language proficiency. Such a finding portrayed the way metacognitive learning strategies could indirectly enhance the students' English language proficiency by improving their self-efficacy in English. Such a finding yielded support to numerous studies such as those conducted by Yu et al. (2018) and Ozer (2021). Given that metacognitive learning strategies, especially when they are part of self-regulated learning strategies, can affect self-efficacy, such learning strategies thus encompass

planning and self-evaluating, which are key elements of language learners' advancement (Šafranj, 2019). Put simply, students who have metacognitive awareness tend to have better cognitive learning which causes them to be autonomous learners who are keen on controlling and managing their own thoughts (Demirci, 2021; Shannon, 2008).

It is worth noting that research studies aiming to analyze the indirect influence of metacognitive learning strategies on language proficiency with self-efficacy as a mediator can be rarely seen. Outside of the field of language teaching, Koyuncuoğlu (2023), for example, has reported that 360 university students' general self-efficacy was a partial mediator helping foster a relationship between metacognition and academic performance exposed by their grade point averages. Furthermore, Stephanou and Tsoni (2019) found that the general self-efficacy of 165 middle school students in both fifth and sixth grades mediated a relationship between metacognition and scholastic success.

The findings of the present study can be discussed in terms of gender, GPA, and age of the participants. That is, the majority of the participants in this study were female (56.25%). The participants' gender profile in the current study was in line with that of the participants in the studies conducted by Apridayan and Teo (2021) and Truong and Wang (2019). This confirmed the role of gender in the relationship between the participants' English self-efficacy and language proficiency. However, the alignment of the participants' gender profile in the present study and that included in related studies could not be found when it came to the relationship between the participants' metacognitive learning strategies and English self-efficacy. To be specific, the males outnumbered the females in the two studies implemented by Yu et al. (2018) and Lee et al. (2021). This may be related to the fact that all of the participants of the former study and more than half the participants of the latter one were from China which shows a population gender difference with more males than females (Textor, 2021).

In terms of the grade point average (GPA) of the participants and their age range, the participants' GPAs of 2.50-3.15 can be considered relatively good, and their age range represents adulthood (McCue, 2018). This suggests responsibility in many aspects, including academic endeavors. These characteristics may be associated with the participants' self-efficacy and metacognitive learning strategies. In other words, their GPAs and age are related to the confidence to control their behavior to achieve a goal and how they can regulate their learning process through planning, controlling, and evaluating their own learning. This may help explain a positive impact of English self-efficacy on the participants' English language proficiency, a positive impact of metacognitive learning strategies on English self-efficacy, and a positive impact of metacognitive learning strategies on English language proficiency through English self-efficacy.

6. Implications of the study findings

The finding that students' English self-efficacy had a positive effect on their overall language proficiency unveils the crucial role of self-efficacy in students' language success. Therefore, one of the keys to improving students' English language proficiency is to improve their English self-efficacy. In so doing, major sources of influence (Bandura, 1977) affecting self-efficacy beliefs should be highlighted. That is, instructors should create language lessons encouraging students' successful learning experiences (mastery experiences) since success or failure in English language learning could determine their confidence in their own language abilities. When students are doing a difficult or demanding task that contains complicated sub-tasks, the instructors can start with the simplest one. Once the students have had sufficient support and practice from an encouraging learning atmosphere and constructive feedback, they can move on to a more challenging task (Oxford University Press ELT, 2023). Apart from providing successful experiences, English language instructors should guide students so that they can learn from their role models who may be their classmates or schoolmates (vicarious experiences). It can be said that students could learn by means of their observations made on such models. This is because observing that

those with similar capacities have gained English language success can inspire them to try to achieve their goals. Other than mastery experiences and vicarious experiences, students should be provided with positive verbal feedback when performing a complicated task (social persuasion). Such praise can persuade them to believe in their abilities to succeed in a task. Also, with reference to the last source of influence (emotional, physical, and psychological well-being), instructors should concentrate on building a supportive learning environment because emotion, feeling, stress, and physical comfort and discomfort have an impact on the extent to which students believe in their language abilities. For example, instructors should allow students to be involved in their own classroom by sharing their thoughts on classroom decoration. Also, they can ask the students to brainstorm their ideas on the activities implemented in the classroom. Then, the students will be motivated and engaged in their learning process.

The finding that students' metacognitive learning strategies had a positive effect on their English self-efficacy implies that metacognitive learning strategies, particularly as a type of self-regulated strategy, play an important part in promoting English self-efficacy among undergraduate students. To improve metacognitive learning strategies of language learners, subtypes of such strategies should be taught by being integrated into English language lessons. Notably, when instructors design any language task for students, they should incorporate how students plan, monitor, and evaluate their learning process (Herlanti et al., 2019) through the use of group work and self-reflection tasks to attain that particular goal (Koyuncuoğlu, 2023). For instance, when they are producing a piece of writing, a certain student can share with his/her partner or peers how he/she plans to write about the topic, carefully check the work, make a judgment on it, and help correct his/her classmates' work. Moreover, to make students familiar with using these strategies, instructors have to be sure that they are adequately exposed to the use of metacognitive learning strategies with sufficient time allocated and frequency of practice. Finally, regarding the indirect effect of students' metacognitive learning strategies on their English language proficiency with

English self-efficacy as a mediator, incorporating metacognitive learning strategies into English language tasks and designing English language lessons that promote self-efficacy should be implemented simultaneously. This is because students who are able to regulate their learning process are more likely to have intrinsic motivation and self-satisfied beliefs; as a consequence, they tend to have a high level of self-efficacy beliefs (Pintrich & Schunk, 2002).

7. Conclusion

This study examined the direct positive effect of English self-efficacy on English language proficiency as well as the direct positive influence of metacognitive learning strategies on English self-efficacy among EFL undergraduate science students. It also aimed to identify an indirect effect of metacognitive learning strategies on the English language proficiency of EFL undergraduate science students through their English self-efficacy. The findings, aligning with those attained from certain previous literature, depicted the positive effect of English self-efficacy on English language proficiency as well as that of metacognitive learning strategies on English self-efficacy. Additionally, there was an indirect effect of metacognitive learning strategies on the English language proficiency of EFL undergraduate science students with the role of English self-efficacy as a mediator. Such findings could provide insights into how to further develop students' English self-efficacy and metacognitive learning strategies through a well-designed language lesson that emphasizes promoting the four sources of self-efficacy and the sub-strategies of metacognition which helps cultivate the use of self-regulated strategies.

However, there are limitations to the current study. First, this research placed its main focus on undergraduate science students as an intact group of participants. For this reason, by replicating this study, further research can be conducted by focusing on undergraduate students with other majors so that its findings can be generalized in a wider range of educational contexts. Besides, owing to a close relationship between English self-efficacy and metacognitive

learning strategies and that between English self-efficacy and English language proficiency, further research studies can explore the role of metacognitive learning strategies in mediating the correlation between English self-efficacy and English language proficiency of students. This can further illustrate the interplay between English self-efficacy, metacognitive learning strategies, and English language proficiency.

8. About the Authors

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