



Understanding students' self-regulated learning and anxiety in online English courses in higher education

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ABSTRACT

There is presently little known about students' use of SRL strategies and anxiety levels and the effects on learning outcomes overall and for specific skills in fully synchronous online English classes. Thus, this study explored 171 first-year non-English major students at an autonomous university in Thailand who had completed their first fully online courses for 12 weeks taught by foreign English lecturers. As measures, online self-regulated learning, students' anxiety in English learning, and course outcomes were employed by means of a mixed-method design. The findings revealed students' high use of SRL strategies and their significant contribution to their online learning outcomes. Nevertheless, students' anxiety levels were not a significant predictor of learning outcomes and could not dictate SRL strategies in online classes. These findings occurred among female and male students equally. This study observed an instrumental role of SRL strategies in students' online accomplishments in their first online learning experience. In conclusion, the current research highlights the crucial role of SRL strategies in online English language learning and provides valuable insights for language educators in designing effective pedagogical interventions. It suggests that SRL is not only important for achieving learning outcomes but also requires continuous monitoring and support from teachers and peers. Additionally, the study indicates that gender differences in SRL may not be significant in the context of synchronous online English classes. These findings have significant implications for the development of effective pedagogical practices for online language learning and underscore the need for further research in this area.

1. Introduction

For more than three decades, both self-regulated learning and anxiety have been intensively researched and identified as critical factors in students' success in learning English as a foreign language (EFL) [1–4]. To be successful, students must be personally involved, motivated, and willing to self-regulate their own learning [5,6]. Self-regulation is defined as the process by which students use various strategies to regulate and control their own learning [7]. Anxiety is a feeling of tension, dread, nervousness, or worry that comes from the activation of the autonomic nervous system [8]. The self-regulated learning strategies of EFL students have been found

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to have a favorable link with their language learning achievement and to have a direct influence on the growth of their English proficiency [9–11]. Similarly, the level of students' anxiety can have an impact on their performance and achievement when learning English [12–14]. However, little is known about how anxiety and self-regulated learning interact and influence students' English learning outcomes. Furthermore, early research in these two domains concentrated on face-to-face learning situations, necessitating future research on online learning environments. In terms of gender, previous research has demonstrated gender disparities in the utilization of SRL strategies [15] and anxiety levels between male and female students [16]. However, the research was conducted in contexts other than Thailand.

It is indisputable that the present COVID-19 pandemic has necessitated the deployment of synchronous and asynchronous English classes at universities worldwide [17]. The focus on exploring and improving the practice of online teaching and learning is greater than ever. Even if the pandemic is over, relevant online learning instructions and practices will still be implemented and will most likely become a regular part of teachers' and students' daily routines, particularly in higher educational institutions, due to the major changes that teachers and students have gone through for several years [18]. The largely autonomous online learning environment raises fundamental problems regarding how students self-regulate their online English learning and how that capacity coincides with their learning outcomes. There is currently a lack of understanding concerning how much anxiety students experience in online English classes and how this affects their learning outcomes. Understanding how students' self-regulated learning and anxiety levels interact in online classes can help improve online teaching and learning instruction to achieve the desired outcomes, both for emergency online classes and for online classes used for other educational purposes such as distance education and blended learning.

The current study addresses such knowledge gaps by researching students' self-regulated learning and anxiety in online English classes at a university in southern Thailand, along with their impact to students' English learning outcomes. The study is guided by the following research questions:

1. How do students self-regulate their learning during online English classes? And how do females and males differ?
2. How anxious are students when learning English online? How different is it by gender? And what are the factors that trigger students' anxiety in online English classes?
3. What is the interplay between students' self-regulated learning, anxiety, and English learning outcomes in online classes?

2. Literature review

2.1. Online self-regulated learning

Self-regulated learning (SRL) is a complicated interaction process that requires not only cognitive self-regulation but also motivational self-regulation [1,2]. It has been defined and conceptualized in various ways within different theoretical frameworks. According to social cognitive researchers, SRL entails self-initiated cognitions, emotions, and behaviors, which are strategically planned and dynamically adjusted in response to performance feedback, to achieve personal goals [19,20]. Further, self-regulated learning is an active, constructive process, where learners establish learning objectives and then systematically oversee, regulate, and control their cognitive processes, motivation, and behaviors, guided by their goals and the contextual factors in the environment [21]. It can occur outside of the classroom and in an unsupervised environment that requires self-initiated and self-managed learning to achieve desired academic outcomes [22]. The analysis of SRL has recently shifted to the online learning environment, as prior research has indicated that the context of learning influences students' learning approaches and that students' self-regulated learning behaviors are extremely context dependent [23]. Early research has established that self-regulated learning profiles exist among students enrolled in online classrooms and are associated with improved academic success [24,25]. Because the online learning environment is defined by autonomy and frequently requires a greater degree of learner autonomy than the face-to-face classroom, students' abilities to self-regulate their own learning are critical, as they are required to complete learning tasks independently both during and outside of online class hours [26].

Recent research has investigated students' self-regulated learning in environments containing online learning elements, such as blended learning classes and massive open online courses (MOOCs). Broadbent [27], for example, investigated the SRL techniques of 466 undergraduate students in Melbourne who took online classes and classes that used a blended learning approach. Except for peer learning and help seeking, the study indicated that online students used SRL methods more frequently than blended learning students. The study also found that, despite modest changes in individual predictive value across enrolment status, the primary SRL determinants of academic achievement for online and mixed learning students were substantially identical. It emphasized the relevance of employing time management and elaboration methods, while avoiding rehearsal strategies, in relation to academic subject grade for both study modes. In the context of MOOCs, there were three types of students among 3458 high school and college students in Spain enrolled in three MOOCs: 1) those who followed the sequential structure of the course materials and set a goal of gaining a deeper understanding of the course content, 2) those who only set a goal of passing the assessments, and 3) those who lacked a fixed-learning goal orientation; these students admitted to using fewer SRL strategies [28]. Further, students' frequency of usage of SRL strategies could be used as significant predictors of students' dropouts from self-paced MOOCs [29].

Using the Online Self-Regulated English Learning (OSEL) developed by Ref. [26], Zheng et al. [30] identified five strategies employed by university students who learned through online and face-to-face instructions, encompassing Goal Setting and Planning, Environmental Structuring, Task Strategies and Time Management, Help-Seeking, and Self-Evaluation. Current research has expanded on these findings by investigating the links between students' SRL strategies in online learning and other characteristics that have a significant impact on students' English learning. Su et al. [31] investigated the links between students' online SRL strategies and

self-efficacy. It was discovered that self-evaluation was the most powerful predictor for explaining students' variance in self-efficacy in English listening, speaking, and reading. Furthermore, learners' environment structuring could considerably explain their self-efficacy in both speaking and writing, whereas goal setting could only predict students' self-efficacy in writing. The regular employment of SRL strategies has been found to have a favorable impact on students' satisfaction and academic performance in online classes [32]. Positive correlations between SRL strategies and attitudes have been confirmed in an online course implementing a collaborative learning approach, specifically students' goal setting acted as a significant predictor of their perceived usefulness of and self-efficacy in performing online collaborative learning activities, while self-evaluation was discovered to be the variable to predict the learners' affection for and behavior in performing online collaborative tasks [33].

2.2. Anxiety in offline and online English classes

Anxiety is defined as a subjective feeling of tension, apprehension, nervousness, and worry generated by an autonomic nervous system activation [8]. Since the 1980s, its major impact on English language learning has been debated and researched [2,3]. Some major findings have been established after more than 30 years of investigation. Early studies have confirmed that anxiety is closely associated with learning difficulties, implying that anxious students may have a history of English learning problems, receive low grades, struggle with classroom learning, and exhibit poor developmental skills, all of which have a negative impact on current learning outcomes [12,34]. Anxiety is related to other social-psychological variables, such as attitudes and motivation, which have been extensively examined as key determinants of English learning success [35,36]. The level of anxiety among students has an impact on their ability to improve in the four major English skills of listening, reading, speaking, and writing [37,38].

In recent years, research has shifted toward investigating students' anxiety in online learning environments, owing to the availability of numerous online tools that enable synchronous online meetings and the breakout of COVID-19. Yang et al. [39] confirmed the presence of anxiety among students enrolled in online courses; this emotion is likely influenced by environmental antecedents such as internet connectivity and workload outside the classroom, as well as individual antecedents such as students' self-regulation of learning behavior and learning environment. Similarly, Li and Dewaele [40] examined the anxiety of 1526 Chinese secondary students enrolled in online English classes using the Foreign Language Classroom Anxiety Scale (FLCAS) [2]. They discovered a moderate level of anxiety, which was primarily influenced by general grit and the classroom environment. At the beginning and conclusion of the semester, students' anxiety remained stable at a moderate level [41]. Fang and Tang [42] identified dread of a poor evaluation and speaking without adequate preparation as the primary sources of students' anxiety, which would most likely be alleviated by close relationships with teachers and peers.

2.3. Gender in SRL and anxiety in online learning environment

Among the few studies that have investigated gender roles in online SRL, female students have been found to have a higher proclivity to utilize SRL strategies in their learning and a better capacity to apply SRL strategies than males [15,43]. However, qualitative data that can explain the reasons behind females' outstanding SRL performance are still sparse. As a result, the current study used a mixed-method strategy to address this information gap. Early research on gender roles in SRL in face-to-face classrooms found that female students have higher self-efficacy [44,45] and are more confident in their metacognitive abilities, which necessitates the use of multiple strategies to manage their learning and complete tasks successfully. Female students can learn the abilities needed to finish assignments, obtain material from textbooks, and participate in class discussions with confidence [46]. Female students, on average, outperform their male counterparts in terms of goal setting, planning, and self-monitoring [47,48].

Regarding anxiety level, Abdous [49], who researched the feelings of anxiety of online students in a large sample size, discovered that females (70.6%/1025) reported a higher level of anxiety than males. Despite their high degree of anxiety, females were shown to be more prepared to confront online classes [50]. As per the findings of the most recent studies on online learning at COVID1-9, female students in Spain and China were found to be more worried than their male counterparts (16,51). A review study from Jehi et al. [51] elaborated, "... being a female, living in rural areas, facing financial hardship, working full-time, spending the quarantine in isolation, worrying about infection for themselves and others, having the uncertainty of the future, having reduced sleep quality, and transitioning to online learning were factors associated with increased anxiety during the pandemic" (p.1). Nonetheless, Wang et al. [52] discovered high levels of anxiety among male and female students, but no significant differences were detected. These reviewed studies indicated that females are more anxious in online learning, but that inconsistency is possible. All these studies were not especially directed towards online English classes, where the findings could have been different or comparable.

2.4. Effects of SRL and anxiety on learning outcomes in online classes

Previous research extensively exploited learning outcomes in the form of course grades to reveal the impacts of SRL. Wang et al. [53], for example, investigated the link between students' SRL and course outcomes. The findings revealed that students' SRL, in terms of motivation and learning strategies, strongly impacted their course outcomes, including achievement and course satisfaction, in online learning settings. They stressed that students with prior online learning experiences tended to have more effective learning strategies and higher levels of motivation when attending online courses. These findings are supported by Ergen and Kanadli [54], who discovered a large effect of ($d = 0.859$) on students' academic achievement in a meta-analysis research. Broadbent and Fuller-Tyszkiewicz [55] conducted latent profile analysis on students enrolled in online and blended learning contexts in their study. They discovered that students who used limited SRL methods, also known as minimal regulators, had low levels of learning

engagement, which resulted in significantly inferior academic achievement, propensity to study, and automaticity. There is little known about whether these favorable outcomes occur with students taking online English classes for the first time, which is what the current study aims to examine.

Meanwhile, in terms of anxiety, Fraschini and Tao [56] conducted an exploratory study in a foreign language class implementing a complete synchronous online learning mode. The study discovered negative connections between anxiety and learning outcomes. Anxiety influences not only learning outcomes, but also students' perceived knowledge improvement and cognitive load [57]. It may have an impact on learning outcomes since it is a substantial mediator between students' cognitions and learning outcomes in an online learning environment [58]. Improving students' time management behaviors during online learning through regular study support and counseling can lead to a reduction in anxiety levels [59]. Russell [60] analyzed studies on foreign language classroom anxiety and related the findings to the present issues experienced by online learners during pandemic conditions. The study recommended not downplaying the effects of anxiety in online learning because it can impede learning outcomes, and teachers should consider using different techniques and interventions suitable for addressing learners' feelings during online learning, such as isolation and less connection to teacher and peers.

3. Methods

3.1. Research design

This study aimed to investigate students' self-regulated learning and anxiety during the online classes in the COVID-19 outbreak. The investigation involved the examinations of data collected from surveys and essays. These two types of data allowed the researchers to explore both constructs, e.g., self-regulated learning and anxiety, by using statistical and content analyses. The findings were expected to provide insights from the target participants as a group while being able to disclose insights from the participants as an individual. Thus, to achieve such objective, this study employed a mixed-method research design that collects and analyzes data quantitatively and qualitatively to address the research questions [61]. Fig. 1 below illustrates the research design.

3.2. Context and participants

The context of the study was an autonomous university located in the south of Thailand. The participants were 171 first-year non-English major students (80.1% females, 19.9% males). They were aged between 18 and 20. They came from different faculties, including Engineering and Technology (15.8%), Informatics (4.1%), Liberal Arts (20.5%), Management (8.8%), Nursing (17.5%), Pharmacy (11.7%), Public Health (13.5%), and Allied Health Sciences (8.2%). The students were having their first full online learning experience in one academic term through the ZOOM application. Most of the students attended the online English course from home due to the high number of COVID-19 cases throughout Thailand. The English course was also the first General English (GE) that the students ever took at a university level. The English course developed students' receptive skills (listening and reading) and productive skills (speaking and writing) through integrated methods, which also covered sub-skills, such as grammar and vocabulary. Students were expected to be able to do English conversations naturally and write a short paragraph in English. The students were divided into several sections, each consisting of 35–40 students. The course was taught by foreign English lecturers from different countries, e.g., Indonesia, Iran, Philippines, India, Bhutan, etc. The course lasted 12 weeks.

3.3. Instruments and measure

Online self-regulated learning questionnaire. To explore students' self-regulated learning during online English learning, a questionnaire adapted from Ref. [30] was used in this study. It comprised 13 items on a five-point Likert scale: 1 (never), 2 (seldom), 3 (sometimes), 4 (often), and 5 (always). It examined students' self-regulated learning in five categories, including Goal Setting and Planning (4 items), e.g., "I arrange the schedule to review what I have learnt in my online English class.", Environmental Structuring (2 items), e.g., "I find an appropriate place for me to concentrate in my online English class.", Task Strategies (2 items), e.g., "I take notes of the materials I have learned in my online English class.", Help-Seeking (3 items), e.g., "I ask my teachers when I encounter difficulties in my online English class.", and Self-Evaluation (2 items), e.g., "I take notes my teachers' feedback on my work in my online

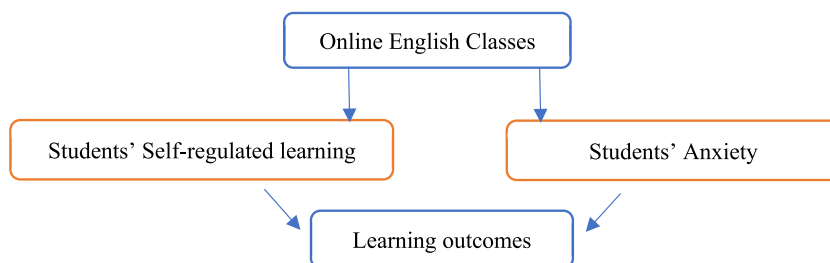


Fig. 1. Illustration of the research design involving quantitative and qualitative data.

English class.”

Students’ anxiety in English learning questionnaire. To assess students’ anxiety, this study adapted the Foreign Language Classroom Anxiety Scale (FLCAS) [2]. Some modifications on the wordings were made to the items used to evaluate students’ anxiety in online learning settings, such as by adding the words “my online English class”. The scale consisted of 12 items evaluating students’ anxiety in four components, namely, Communication Apprehension (3 items), e.g., “I feel confident when I speak in my online English class.”, Test Anxiety (3 items), e.g., “I worry about the consequences of failing in my online English class.”, Fear of Negative Evaluation (3 items), e.g., “I am afraid that the other students will laugh at me when I speak in my online English class.”, English Learning Environment/Atmosphere (3 items), e.g., “I feel more tense and nervous in my online English class.”, presented in the format of a five-point Likert scale: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree).

Open-ended questions. Two open-ended questions were given to the participants to elicit their opinions on how they self-regulated their online learning and what factors that made them anxious during the online English learning. The survey collected responses comprising 10669 words from the participants. The questionnaire items and open-ended questions were translated into Thai to ensure that students understood and responded accurately to all questions.

Learning outcome. Aside from the surveys, this study also collected data of the students’ learning outcomes in specific skills as well as the students’ final course grade. These data were utilized as indicators of how self-regulated learning and anxiety in online English courses affected learning achievements. The students’ learning outcomes in specific skills involved their scores on vocabulary, reading, listening, speaking, writing, and grammar. Table 1 below provides details on how each skill was assessed. Meanwhile, the students’ final course grade was the accumulations of these specific skills at the end of the academic term ranging from 0 to 100.

3.4. Validity and reliability

The construct validity of the questionnaires was investigated using Stapleton’s Exploratory Factor Analysis (EFA) (1997). The EFA procedures were developed in response to a recommendation made by Phakiti [62] in the field of applied linguistics research. Because it is considered robust and widely used, Principal Axis Factoring (PAF) was chosen as the extraction method [63]. A Kaiser criterion eigenvalue greater than one determined the number of factors to be retained. The KMO and Bartlett’s tests, with a sampling adequacy threshold of .50, were used to determine whether the factors were extractable [64]. Because it was assumed that some factors were unrelated, orthogonal rotation, i.e., Varimax, was used. The accepted factor loading cut-off point was set at .30 [63]. The results were significant ($\chi^2(78) = 723.334, p < .001$) for self-regulated learning questionnaire and ($\chi^2(66) = 731.452, p < .001$) for students’ anxiety questionnaire. The results indicated the validity of the survey constructs for evaluating students’ self-regulated learning and anxiety in the context of online English learning.

The reliability of the questionnaire items was examined by using Cronbach’s alpha. The analysis results displayed acceptable internal consistencies for both self-regulated learning questionnaire ($\alpha = 0.852$) and students’ anxiety questionnaire ($\alpha = 0.735$). The data were then checked for normality by looking at Skewness and Kurtosis values between -2 and $+2$, as recommended by George and Mallery [65]. The results revealed that the data had a normal distribution, implying that it could be investigated further using parametric tests.

3.5. Data collection

Prior to the data collection, the study was approved by the ethics committee at Human Research Walailak University, and a certificate of human research ethics approval was obtained (WUEC-22-201-01). In this study, a Google Form was used to administer the questionnaire. The participants were informed of the research’s objectives. Each participant approved the use of pseudonyms with the full understanding that their participation was voluntary and would not affect their academic grades or performance.

3.6. Data analysis

To explore students’ self-regulated learning and anxiety levels while learning English online, descriptive statistics such as means, and standard deviation were used to analyze the data. As presented in Table 2, the ratings provided the criteria for evaluating the mean values of the students’ questionnaire responses.

Table 1

Outlines of the learning materials and assessments of the English course.

Skill	Learning materials	Assessments
Vocabulary	500-Words (A1-A2) through word lists provided by the lecturers	Multiple-choice vocabulary tests in class on weekly basis for 10 weeks
Reading	Short texts under the themes related to daily life, e.g., Daily Routine, Festivals, etc.	In-class reading quizzes
Listening	Short-daily conversations in English	In-class listening tests
Speaking	Role-play and interview	Performing online role-plays and doing short interview with the lecturers
Writing	Writing short paragraphs under the themes related to daily life, e.g., Daily Routine, Festivals, etc.	Two essays
Grammar	Basic tenses, e.g., present tense, present continuous, past tense, future tense, etc.	Two in-class grammar quizzes

The data were analyzed using an independent *t*-test to determine differences in students' self-regulated learning and anxiety between genders. Pearson correlation analysis was used to investigate the relationship between self-regulated learning, anxiety, and English learning outcomes in students. Multiple regression analyses were carried out in order to determine the predictive value of students' self-regulated learning and anxiety on their English learning outcomes.

In addition, the qualitative data were examined using a thematic analysis. Thematic analysis is a technique for identifying, analyzing, and reporting patterns (themes) in data [66]. The themes were created using the literature and research questions as a foundation. Researchers used a deductive strategy to code and analyze data by applying a succession of concepts, ideas, or subjects to it. Researchers lay the groundwork for data analysis by examining how meanings are coded and arranged to produce themes [67]. The emphasis was on investigating the elements that contribute to students' SRL and anxiety in online English learning. The steps of the used thematic analysis are depicted in Fig. 2 [66].

4. Results

4.1. Quantitative findings

4.1.1. Students' SRL strategies and differences by gender

Students reported a high utilization of SRL strategies during online English classes ($M = 3.81, SD = 0.55$). Task Strategies were the most often used strategies by students ($M = 4.05, SD = 0.69$), followed by Environmental Structuring ($M = 3.94, SD = 0.63$), Self-Evaluation ($M = 3.91, SD = 0.81$), and Goal Setting and Planning ($M = 3.91, SD = 0.63$). However, Help-Seeking strategies were used moderately ($M = 3.35, SD = 0.76$). Moreover, the independent *t*-test results indicated no significant difference in the usage of SRL strategies between female and male students ($t = 2.021, p = .05$). Specifically, no significant differences were observed in Goal Setting and Planning ($t = 1.119, p = .265$), Environmental Structuring ($t = 1.496, p = .136$), Task Strategies ($t = 1.913, p = .057$), Help-Seeking ($t = 1.545, p = .124$), and Self-Evaluation ($t = 1.810, p = .072$).

4.1.2. Students' anxiety, differences by gender, and contributing factors

As shown in Table 3, students reported moderate levels of anxiety during online English classes ($M = 3.24, SD = 0.52$). They reported a high level of communication anxiety ($M = 3.69, SD = 0.69$) as one of the anxiety components. Other components, such as test anxiety ($M = 3.44, SD = 0.61$), fear of negative evaluation ($M = 3.05, SD = 0.88$), and English learning environment/atmosphere ($M = 2.75, SD = 0.55$), indicated that students experienced moderate levels of anxiety.

By gender, as presented in Table 4, there were no significant variations in overall student anxiety between males and females ($t = 0.212, p = .832$). Communication apprehension ($t = 0.910, p = .364$), test anxiety ($t = 0.222, p = .825$), fear of negative assessment ($t = -0.031, p = .975$), and English learning environment/atmosphere ($t = -0.536, p = .592$) also exhibited similar findings.

4.1.3. The interplay of students' SRL strategies, anxiety, and learning outcomes

Overall, as seen in Table 5, a positive significant relationship was found between students' SRL strategies and their learning outcomes in online English classes ($r = .262, p = .001$) with a medium effect size ($r^2 = 0.06$), yet a significant relationship was not established between students' anxiety and English learning outcomes ($r = -.042, p = .590$) as well as between students' self-regulated learning and their anxiety ($r = 0.066, p = .394$).

In terms of specific skills of English, as shown in Table 6, there were positive significant relationships between students' SRL strategies and their learning outcomes in vocabulary ($r = 0.303, p < .001$), listening ($r = 0.166, p < .05$), speaking ($r = 0.170, p < .05$), writing ($r = 0.167, p < .05$), and grammar skills ($r = 0.257, p = .001$). However, a significant relationship was not validated between students' SRL strategies and reading learning outcomes ($r = .092, p = .232$). No significant relationships were also shown between students' anxiety and their online English learning outcomes in particular skills.

The results of multiple regression analyses, as depicted in Table 7, showed that students' SRL strategies could significantly predict their English learning outcomes in online classes ($\beta = 0.266, t = 3.569, p < .001$) with a small effect size ($f^2 = 0.07$). Nevertheless, the finding pointed out that students' anxiety was not a significant predictor of their English learning outcomes ($\beta = -0.059, t = -0.792, p = .430$).

Moreover, it was found that students' SRL strategies predicted their learning outcomes in vocabulary ($\beta = 0.308, t = 4.196, p < .001$), listening ($\beta = 0.172, t = 2.268, p < .05$), speaking ($\beta = 0.174, t = 2.286, p < .05$), writing ($\beta = 0.171, t = 2.249, p < .05$), and grammar learning outcomes ($\beta = 0.261, t = 3.499, p = .001$). Nonetheless, this study indicated that students' self-regulated learning was not a significant predictor of their reading learning outcomes ($\beta = 0.090, t = 1.175, p = .242$). Additionally, the results also showed

Table 2
Interpretation of the mean values.

Responses	Mean values	Interpretation of learning strategies use
Never	1.00–1.49	Low
Seldom	1.50–2.49	Moderate
Sometimes	2.50–3.49	
Often	3.50–4.49	High
Always	4.50–5.00	

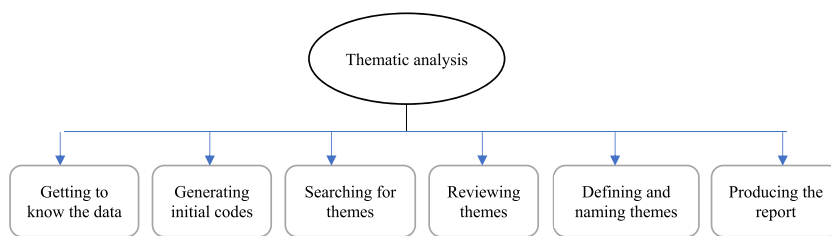


Fig. 2. Phases of the thematic analysis.

Table 3
Students' anxiety.

Components	Mean	Std. Deviation
Communication apprehension	3.69	.69
Test anxiety	3.44	.61
Fear of negative evaluation	3.05	.88
English learning environment/atmosphere	2.75	.55
Overall	3.24	.52

Table 4
Differences between genders.

	F	Sig.	T	Sig. (2-tailed)
Communication apprehension	.155	.695	.910	.364
Test anxiety	.387	.535	.222	.825
Fear of negative evaluation	3.761	.054	-.031	.975
English learning environment/atmosphere	.012	.912	-.536	.592
Overall	1.933	.166	.212	.832

Table 5
Results of Pearson's correlation analyses.

		Self-regulated learning	Anxiety	Learning outcomes
Self-regulated learning	r	1	.066	.262 ^a
	p		.394	.001
Anxiety	r		1	-.042
	p			.590
Learning outcomes	r			1
	p			

^a Correlation is significant at the 0.01 level (2-tailed).

that students' anxiety could not predict their learning outcomes in particular skills of English, including vocabulary ($\beta = -0.073, t = -0.999, p = .319$), reading ($\beta = 0.022, t = 0.281, p = .779$), listening ($\beta = -0.089, t = -1.175, p = .242$), speaking ($\beta = -0.054, t = -0.716, p = .475$), writing ($\beta = -0.063, t = -0.826, p = .410$), and grammar ($\beta = -0.064, t = -0.864, p = .389$).

4.2. Qualitative findings

4.2.1. Students' SRL strategies in English online classes

After evaluating the students' responses on how they self-regulated their learning during online English classes, three themes emerged that represented the three most commonly utilized SRL strategies.

4.2.1.1. Task Strategies. Most students confirmed that they always took notes on what they learned in online English classes. Some of the responses included: "I listen carefully to what my teacher is saying and take notes every time." (S8, S9) and "I take notes during my class and review the materials after the class." (S21, S26)

Students also admitted that they always translated what they heard into Thai to better understand the information from the teacher. They said, "I listen carefully while studying and translating the information from my teacher" and "I try to interpret what my teacher is talking about." If I don't understand, I will use a translator". (S47, S56, S70)

These findings are consistent with the quantitative findings that Task Strategies were the most frequently used strategies by students.

Table 6
Results of Pearson's correlation analyses in specific English skills.

		SRL	Anxiety	Vocabulary	Reading	Listening	Speaking	Writing	Grammar
SRL	<i>r</i>	1	.066	.303**	.092	.166*	.170*	.167*	.257**
	<i>p</i>		.394	.000	.232	.030	.026	.029	.001
Anxiety	<i>r</i>		1	-.053	.028	-.078	-.043	-.052	-.047
	<i>p</i>			.490	.720	.311	.576	.502	.539
Vocabulary	<i>r</i>			1	.520**	.485**	.575**	.435**	.682**
	<i>p</i>				.000	.000	.000	.000	.000
Reading	<i>r</i>				1	.354**	.348**	.231**	.421**
	<i>p</i>					.000	.000	.002	.000
Listening	<i>r</i>					1	.436**	.424**	.460**
	<i>p</i>						.000	.000	.000
Speaking	<i>R</i>						1	.391**	.459**
	<i>p</i>							.000	.000
Writing	<i>r</i>							1	.402**
	<i>p</i>								.000
Grammar	<i>r</i>								1
	<i>p</i>								

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 7
Results of multiple regression analyses.

Model		Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	Sig.
		<i>B</i>	Std. Error	Beta		
1	(Constant)	70.390	4.640		15.171	.000
	Self-regulated learning	3.328	.933	.266	3.569	.000
	Anxiety	-.777	.981	-.059	-.792	.430

a. Dependent Variable: Learning outcomes.

4.3. Environmental Structuring

Students indicated that they chose a decent study location before the lesson began to avoid distractions during the online learning. They were able to focus better on their online English studies because they were in a calm environment. These results indicate that students are conscious of the impact of their environment when studying online. These conclusions are consistent with the quantitative data, which show that this method is the second most adopted by students.

4.4. Help-Seeking

Interestingly, while the quantitative results showed that students utilized Help-Seeking strategies moderately, the qualitative data demonstrated that the strategies were one of the most employed by students. Students testified that if they did not comprehend the learning materials, they would question the teacher. On other occasions, they would solicit assistance from their peers.

4.4.1. Factors contributing to students' anxiety in online English classes

The study examined students' responses to the question of the factors that made them feel anxious in online English classes.

4.4.1.1. Communication anxiety. The findings are in accordance with the quantitative findings, which demonstrated that students had a high level of communication anxiety. Most students admitted that they were not confident in their English abilities, for instance:

"I am not good at English. I don't dare to speak in English". (S2)

"I am not very confident in my English-speaking skills. I am worried about communicating in English". (S14)

Their low English self-efficacy was another factor that made them concerned about whether they would be able to retain the information and materials provided by the teachers in their online English classes. They said that they were always afraid of not being able to understand what the teacher was saying in class. As a matter of fact, all the English teachers teaching these sample students were foreigners who could not speak Thai language – the students' first language. Thus, the teacher would never reiterate their statements in a language other than English. Their worries are reflected in the following responses:

"I am afraid if I don't understand what my teacher is saying. I don't have a good foundation in English". (S72)

“I am not good at English. I feel worried if I don't understand some words my teacher is saying. I am also afraid if I can't respond to my teacher's question”. (S100)

4.4.2. Fear of negative evaluation

Fear of negative evaluation was also reported as the other factor that made students feel anxious in their online English lessons. Students would feel embarrassed if they could not answer a teacher's questions correctly. They feared being laughed at when speaking English in class. More importantly, their fear of negative evaluation may stem from their beliefs that their friends can communicate and do English tasks better.

4.4.3. Emerging factors

Aside from the previously mentioned anxiety components, this study discovered other new factors that exacerbated students' anxiety about online English learning. The first factor is the teaching styles of teachers. Some teachers may be unaware of their delivery and interaction styles with students, which can increase their students' anxiety in online English learning. Sample extracts can be seen below:

“I am worried if I can't hear clearly and understand what my teacher is talking about. Some teachers speak too fast”. (S104)

“When my teacher asks students to answer questions at random, I get scared”. (S27)

The following factors are related to situational, environmental, and technical support, such as a noisy environment, power outages, and internet connectivity issues. Students elaborated,

“Loud noises in my house or at my neighbour's house cause me to worry that I won't be able to concentrate on my online English class.” (S46)

“When my house's electricity goes out, I get nervous. I'm also concerned when I'm abruptly disconnected from my online English classes due to a poor internet connection.” (S42)

5. Discussion and implication

The primary goal of this study was to capitalize on students' SRL strategies and anxiety after completing a 12-week fully synchronous online learning English session at a university in southern Thailand. It also examined how these two variables interacted with one another and affected students' online English learning outcomes.

First, the quantitative findings revealed that students used SRL strategies often during their online English sessions, with Task Strategies and Environmental Structuring being the most used strategies. In their qualitative responses about how they self-regulated their online learning, students emphasized the usage of these strategies. These findings were unequivocally validated by both male and female students. These findings support the findings of [30], who evaluated Chinese learners' perceptions of English learning and self-regulation in online learning contexts. There has been virtually little research into students' SRL in totally online English classes. The only enlightenment for these preliminary findings is that students may have been “forced” to use SRL strategies due to the “unsupervised circumstances” of the online classes, in which they needed to be able to manage their learning tasks and learning environment in order to keep track of their studies. SRL can occur outside of the classroom and in an unsupervised environment that demands self-initiated and self-managed learning to obtain desired academic objectives, according to early academicians [1,4,22]. The nature of an online learning environment, ostensibly, necessitates a greater degree of learner autonomy [26]; completing learning tasks and adjusting the study site are some of the most important things students must do to ensure the smooth flow of their studies, leading to higher academic achievement [24,25].

Next, students were moderately anxious throughout their online English classes. Specifically, among the components of anxiety, this study indicated that students had high anxiety in terms of communication in online English learning regardless of gender. Li and Dewaele [40] discovered a moderate level of anxiety in 1526 students enrolled in online English classes using the Foreign Language Classroom Anxiety Scale (FLCAS) [2], and this level would likely remain moderate from the beginning to the end of the academic semester [41]. Students' concerns about being unable to speak effectively in English and comprehend the teachers' explanations may have hampered their involvement. If students have offered responses in class, this heightens their fear of negative evaluation from others, such as being embarrassed for erroneous answers, mocked at for speaking bad English, and so on. Fang and Tang's study [42] found similar results, demonstrating that students' anxiety is mostly caused by fear of a poor evaluation and speaking without appropriate preparation, but that it is likely to be reduced by close relationships with professors and classmates. Furthermore, this study identified various emerging elements that contribute to students' online learning anxiety, such as teachers' teaching methods and challenges with online learning aids such as electricity and internet connection. Environmental antecedents such as internet connectivity and workload outside of the classroom, as well as individual antecedents such as students' self-regulation of learning behavior and the learning environment, can all affect the existence of anxiety among students enrolled in online courses [39].

The last findings showed that students' SRL strategies in online English classes were positively associated to and significantly predicted their overall English learning outcomes and also specific skills such as listening, speaking, writing, grammar, and vocabulary. These findings are similar to those of Wang et al. [53] and Ergen and Kanadli [54]. It follows from this logic that students who used limited SRL strategies, referred to as minimal regulators, demonstrated low levels of learning engagement, resulting in much

worse academic performance [55]. Nonetheless, no matter how anxious students were in their online English sessions, it had no effect on their learning outcomes. It contradicts the findings of Fraschini and Tao [56], who discovered a negative association between anxiety and online learning results. Regardless, research in this field is still limited, necessitating additional research in the future. This study contends that the non-relationship between SRL techniques and anxiety, which was one of the study's final findings, explains why students' online learning outcomes were unaffected by their anxiety level. During COVID-19, they all experienced significant rates of fear of exposure to the virus, therefore their anxiety in English learning may have been "hierarchically nested" inside the clinical domains of anxiety. Therefore, these students' "overall anxiety" was elevated, and the relative effects of FLA were lost in this analysis. It was also natural that the students prioritized self-care in order to avoid infection. In essence, students' SRL strategies are more determinantal in the accomplishment of online English learning outcomes. Other studies, however, asserted that foreign language classroom anxiety was significantly influenced by gender [67] and that a subject's learning anxiety was positively related to academic performance [68]. Technology anxiety and instructor factors would not essentially enhance learner performance in the absence of e-learning satisfaction [69], but learner computer anxiety, instructor attitude, course quality, usefulness, ease of use, and assessment diversity are the critical factors affecting learner satisfaction in online environments [70].

Furthermore, the present study has important implications for the pedagogy of online English language learning, particularly with respect to self-regulated learning (SRL) strategies. Firstly, it is evident that the utilization of SRL strategies is critical for the success of online English learners. Therefore, language educators working in virtual environments must be aware of the need for both cognitive and motivational self-regulation, which are key components of SRL [1,4]. Given the dynamic nature of SRL, it is essential that teachers constantly monitor and provide support to students in this regard. This can be achieved by incorporating SRL strategies into the design of online learning materials and activities, as well as involving teachers and peers in the learning process. Moreover, the study suggests that there is no significant difference in the performance of male and female students in the context of fully synchronous online English classes. This finding is in contrast to previous studies conducted in non-online settings, which have suggested that females are more adept at deploying SRL strategies [15,43], and more apprehensive in online learning [16,49,50,71]. This underscores the importance of promoting consistent strategies for the development of SRL in online English learners, regardless of gender.

6. Conclusion and limitations

This study concludes that, in the context of fully synchronous online English classes at the university level, students employ SRL strategies extensively, resulting in good learning outcomes in overall and specific skills, except for reading learning outcomes. Students' anxiousness, on the other hand, has no effect on their learning outcomes and is not associated with their use of SRL methods. However, several limitations must be considered in this investigation. The sample was Thai EFL students in their first fully online learning due to the COVID-19 outbreak. Studies employing different types of samples may or may not yield similar results. The students in the study were taught by foreigners who may have had different situations than those who studied English with local teachers [72–75]. Finally, although qualitative data was used, it appears that qualitative data gathered through interviews would be more insightful and thorough. It is suggested that future studies continue to investigate students' use of SRL strategies and anxiety in online English classes to see if the results are consistent, especially given the paucity of data.

Author contribution statement

Aisah Apridayani: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Wei Han: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Budi Waluyo: Analyzed and interpreted the data; Wrote the paper.

Data availability statement

Data will be made available on request.

Additional information

No additional information is available for this paper.

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The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

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